United States Patent [19]

Sheppard

[11] **3,811,580**

[45] **May 21, 1974**

[54] **WAGON TIPPLERS**

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[22] Filed: **Apr. 16, 1973**

[21] Appl. No.: **351,411**

[30] **Foreign Application Priority Data**

Apr. 20, 1972 Great Britain 18476/72

[52] **U.S. Cl.** **214/55**

[51] **Int. Cl.** **B65g 67/54**

[58] **Field of Search** 214/55, 56

[56] **References Cited**

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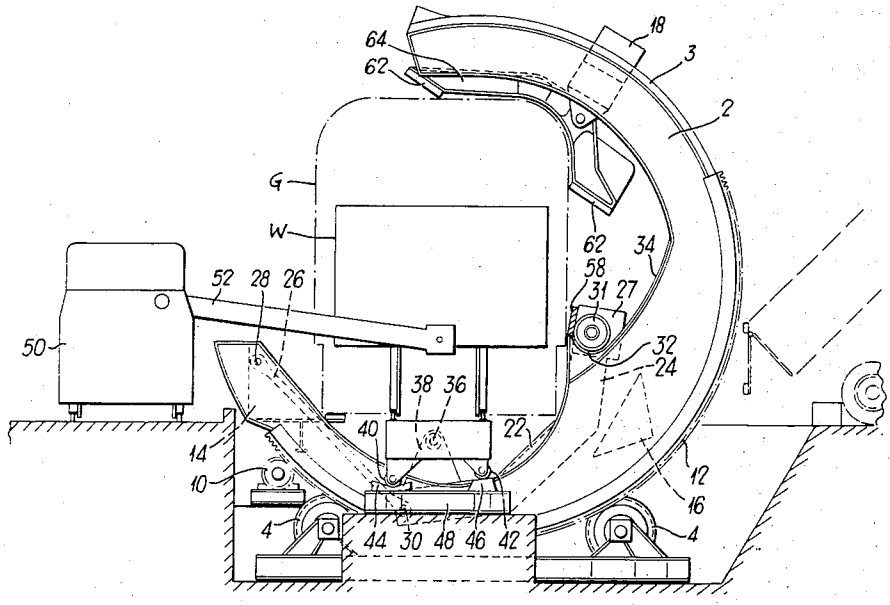
Attorney, Agent, or Firm—Jones and Lockwood

[57] **ABSTRACT**

A tippler for the discharge of rail wagons has a rail table mounted on a rotary support structure. The structure comprises spaced coaxial end frames of open arcuate form the central axis of the frames being the axis of rotation of the structure. The wagon track on the rail table has its centre line in a vertical plane at or close to said axis of rotation. A charger located alongside the tippler has a laterally extending arm and the arcuate forms of the end frames define aligned openings through which the arm passes to entrain wagons onto and from the tippler.

6 Claims, 6 Drawing Figures



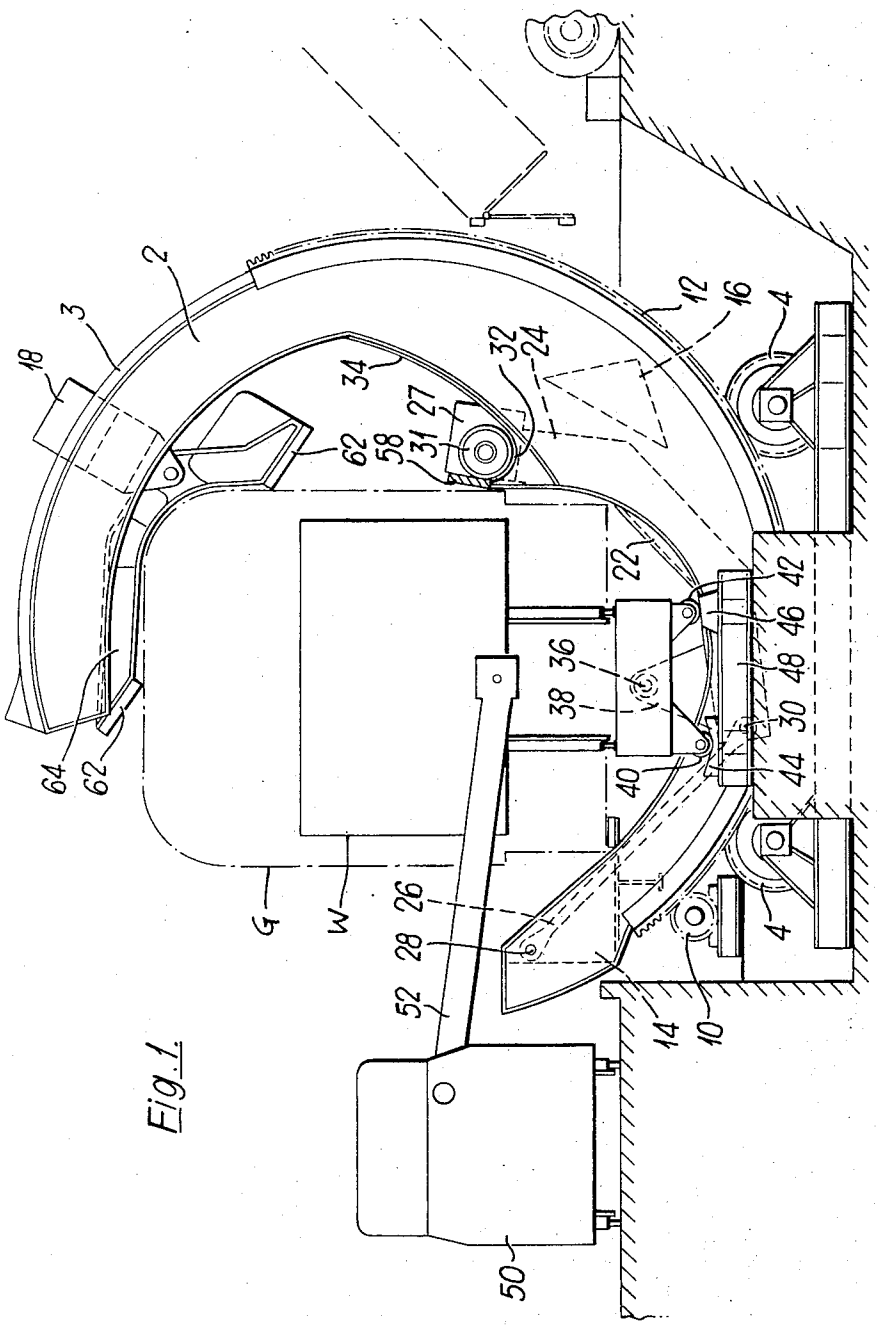

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Fig. 1.

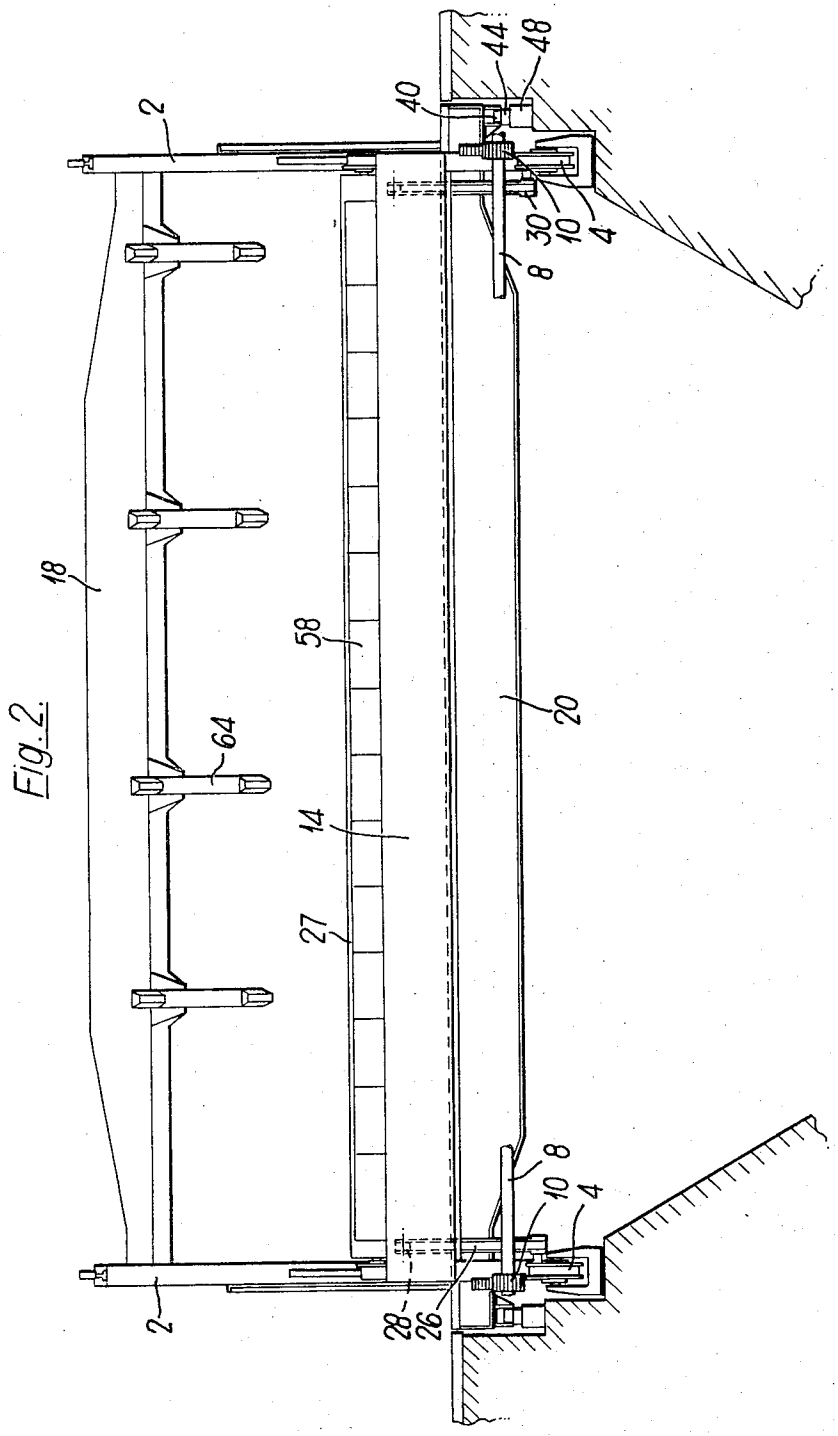


Fig. 2.

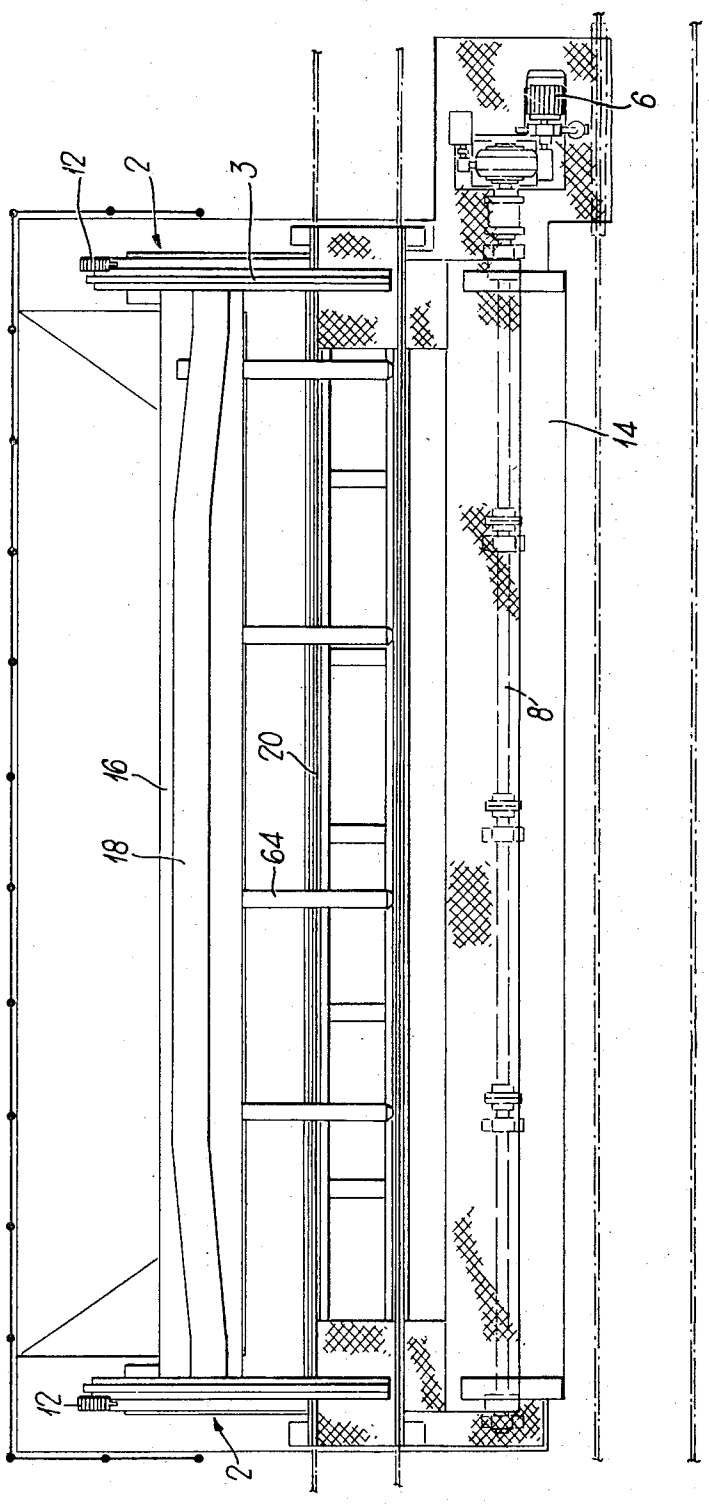
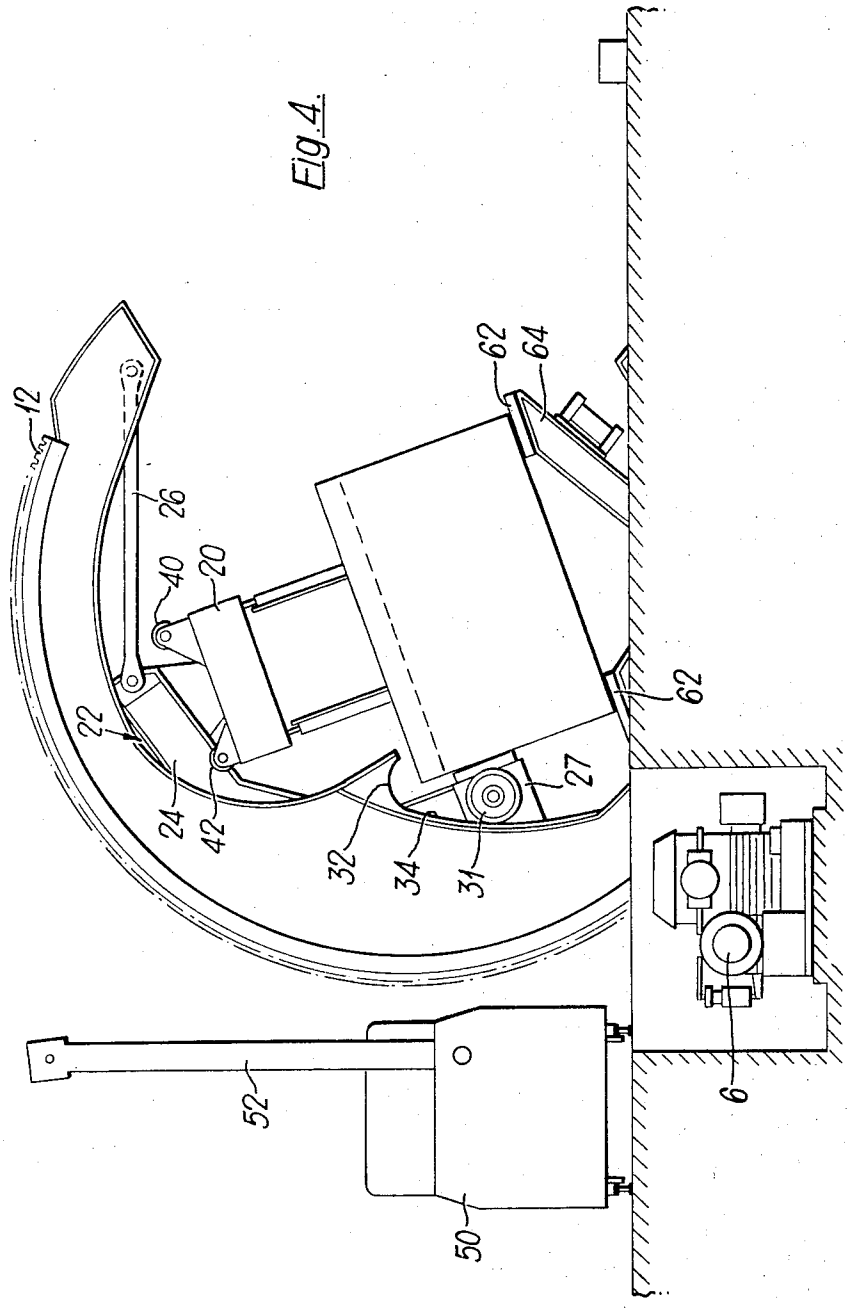
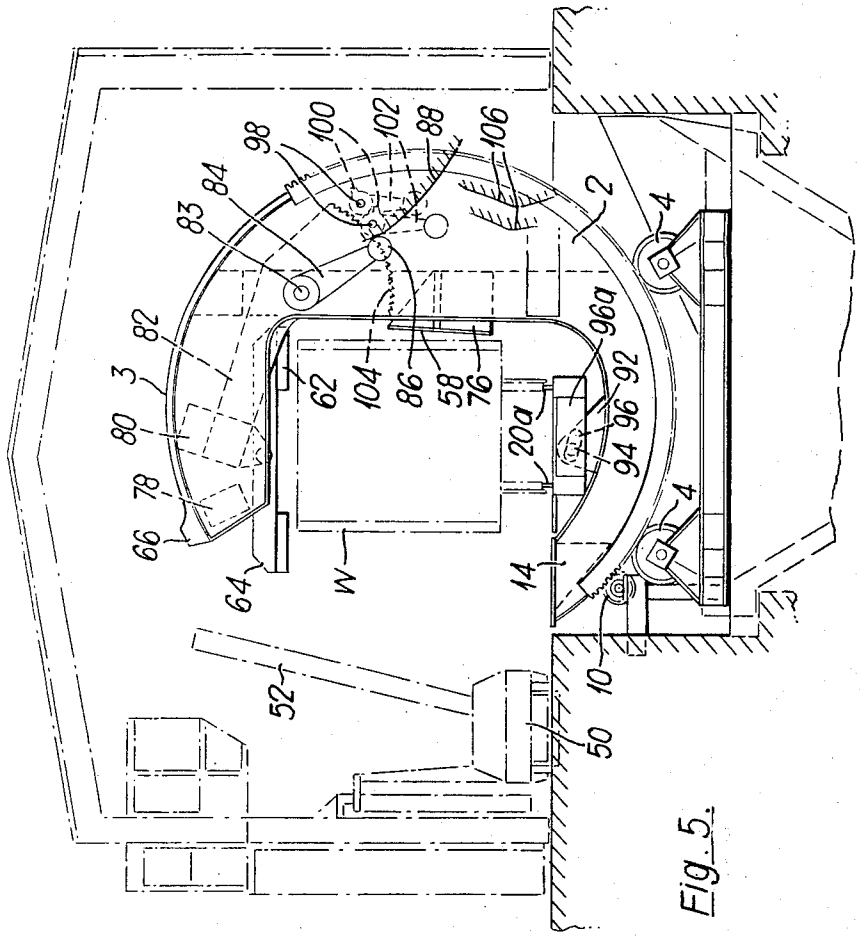


Fig. 3.

Fig. 4.




98
100
102
88
106
84
83
2
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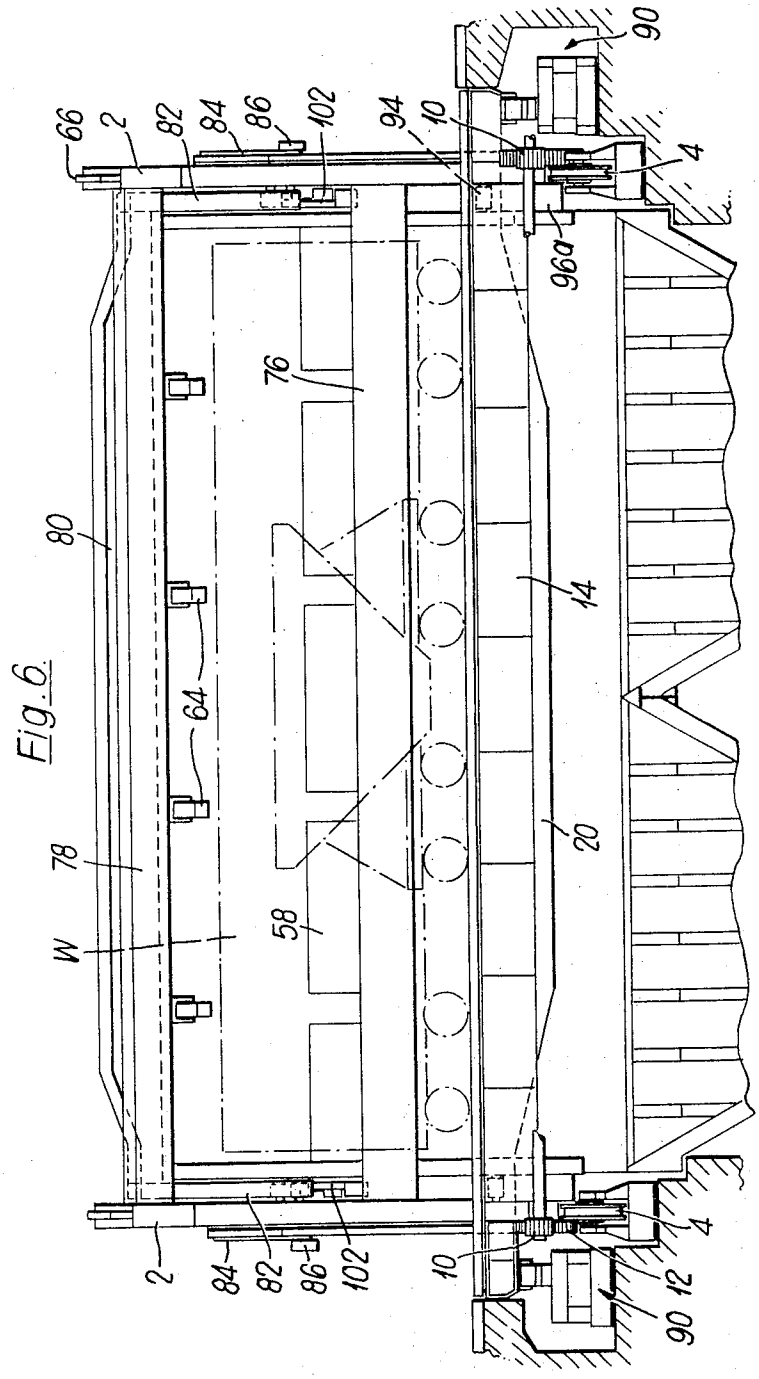
82
96a
3
62
104
86
58
76
92
80
20a
96
94
78
66
64
W
14
4
52
10
50

Fig. 5.


66
2
82
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102
94
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96a
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12
90

Fig. 6

WAGON TIPPLERS

This invention relates to equipment used for the handling and discharge of railway wagons.

High rates of throughput are often demanded at the bulk material stockyards of ports and heavy industries and it is known to provide systems for a corresponding high rate of handling and discharge of railway wagons whereby the train and wagon movement equipment is fully integrated to operate automatically with tipping or discharge means.

The known type of wagon handling and discharge means that is often preferred to achieve high throughput rates in such systems is that provided by rotary tipplers which tip a wagon about a fixed longitudinal axis arranged to lie between or very close to the respective centres of gravity of the wagon when in its loaded and unloaded state. This form of tippler is fed with wagons by means of a motive device located between the rails on which the wagon runs and there are limitations on the size, and therefore the power of such a device. With the trend to larger plant, and therefore the need to handle larger unit loads, this can be an extreme disadvantage.

Another known form of tippling device uses a side-arm charger, which is located on a track by the side of the wagon track. The tippling device itself in this instance holds the wagons on a side region of a support to give an orbital tippling action that requires a structural mass and power input considerably in excess of that for an equivalent rotary tippler.

According to the present invention, we provide a rotary tippler comprising a wagon support arrangment having spaced parallel rigid frames of open arcuate form disposed co-axially, and a wagon track having a centre line disposed in a vertical plane at or close to the common central axis of said frames, the openings of said frames being aligned so as to permit loading and unloading of wagons onto and from the tippler track by a motive device located alongisde the tippler and having engagement means adapted to pass through said openings while entraining a wagon, said support arrangement being rotatable about the axis of the frames to discharge a wagon on the tippler track.

The invention will be more particularly described with reference to the accompanying drawings, wherein:

FIG. **1** is an end elevation of one form of tippler according to the invention.

FIGS. **2** and **3** are side and plan elevations respectively of the tippler of FIG. **1**,

FIG. **4** is an end elevation, similar to FIG. **1** but showing the apparatus in the fully tipped condition, and

FIGS. **5** and **6** are end and side elevations, respectively, of a second form of tippler according to the invention.

Referring more particularly to FIGS. **1** to **4** of the drawings, the tippler comprises a tipping frame structure that has a pair of end frames **2** with arcuate outer peripheries **3** mounted on rollers **4** at fixed positions and arranged to be rotated in unison by a motor **6** which drives shaft **8** having pinions **10** engaging toothed racks **12** on the end frames. The tipping frame structure includes two lower girders **14, 16** and a top-stop girder **18** interconnecting the two end frames.

A rail table **20** comprising a track **20***a* extends through the end frames **2** with which it is connected by

respective cradles **22** each comprising a J-beam **24** and a link arm **26,** the cradles being rigidly interconnected by a side beam **27.** Each link arm is pivoted to its end frame at **28** and to its J-beam **24** at **30.** The other end of the J-beam has a roller **31** supported, in the rest position of the tippler, on a shoulder **32** at the end of a guide track **34** on the end frame, the function of the guide track being further described below.

The table **20** has end pivots **36** engaging lugs **38** on the J-beams **24.** In addition, transverse rollers **40, 42** rest on profiled blocks **44, 46** on supports **48** that may include or form part of a weight-recording unit.

The railway clearance gauge is indicated at G in chain lines in FIG. **1** and it will be clear from this that a wagon (illustrated in one form at W in FIGS. **1** and **4**) mounted on the rail table will have its centre of gravity close to the vertical plane containing the central axis of the end frame **2** and, depending upon the height and load of the wagon its centre of gravity will be at the most only a small vertical distance from that central axis.

With the rail table track aligned, in the position shown in FIG. **1,** with a fixed entry track (not shown), wagons are loaded one by one onto the rail table by a side-arm charger **50,** coupler arm **52** of the charger being pivotable between operative and inoperative positions shown in FIGS. **1** and **4** respectively and the arm in the operative position being able to pass through the open sides of the end frames **2** so that the charger can travel past either end frame with the arm **52** laterally extended. When a wagon W is loaded onto the table, its weight is supported wholly on the rollers **40, 42** since the pivot engagement **36, 38** is arranged to give a small amount of free play.

With the coupler arm **52** retracted, the motor **6** then rotates the tipping frame in the clockwise direction as seen in FIG. **1** to tip the wagon. The initial movement of the frame takes up the free play in the pivot engagement **36, 38** so that some of the weight of the rail table and wagon is now supported by the cradles **22.** The rotation of the tipping frame causes the rollers **40, 42** to run on their stationary blocks **44, 46** the profiles of which allow the wagon to tilt in a controlled manner until the side of the wagon is brought against side support pads **58** of the beam **27** interconnecting the J-beams, at which stage the rollers **40, 42** move out of contact with their blocks **44, 46.**

Up to this stage, the cradles **22** are fixed in position in relation to their end frames but as the tippling action proceeds, and the end frames have been rotated some 90°, the weight of the wagon on the side support pads **58,** causes the rollers **31** of the J-beams to leave the shoulders **32** and they now begin to roll along the spiral guide tracks **34.** This carries the wagon towards the top-stop girder **18** until the wagon top is brought against stop pads **62** of pivoted top supports **64** mounted on the top-stop girder. The wagon is then held, by gravity, between the rail table and the top supports with the side beam still providing location. This is the position shown in FIG. **4.**

In the illustrated construction, the angular extent of the open side of each end frame is dictated by the need to provide an end pivot location **28** for the link arm **26** and a sufficient length for the arcuate peripheral track **3** for the tipping motion (there being a terminating overrun stop **66** in this instance). It will be appreciated that with rotary tipplers of the form with which the

present invention is concerned, other forms of wagon location and clamping may be used that do not require a part equivalent to the link arm and that the angle of tipping motion required may be different, so allowing further modification of the form of the end frames.

As an example of a tippler according to the invention having a modified form of wagon location and clamping, reference will now be made to FIGS. **5** and **6** of the drawings, where the tippler shown is similar in many respects to that already described and corresponding parts have been given the same reference numbers.

The end frames **2** of the tipping frame structure, supported and driven as in the first example, are interconnected by a lower girder **14,** an intermediate girder **76,** which here carries the side support pads **58** so that these pads cannot move relative to the end frame, and an upper girder **78.** Pivoted top supports **64** are carried by a further girder or beam **80** mounted at its opposite ends to rack arms **82** supported on pivots **83** on the end frames.

Adjacent each end frame levers **84** also secured to the pivots are fixed non-rotationally relative to the arms **82** and carry follower rollers **86** that bear on respective fixed control surfaces or ramps **88** (shown only in FIG. **5**). When the tippler frame is upright, as illustrated, it is the engagement of the rollers **86** with the surfaces **88** that prevents the beam **80** dropping under its own weight from the position shown but the profiles of the control surfaces are arranged to allow the beam to descend when the frame structure rotates, as will be described in more detail below.

The rail table **20** extends through the end frames and is supported at its opposite ends upon weigh-bridge apparatus **90** when the tippler is in the state of rest shown. Lugs **92** on the end frames carry stub-shafts **94** that are located with some free play in slots **96** in dependent portions **96a** of the table, the shape and disposition of the slots being such that the sub-shafts do not bear on the slot edges when the frame structure is upright and thus cannot then interfere with the functioning of the weigh-bridge apparatus. The rail table can alternatively have support rollers resting on profiled blocks mounted on static supports, analogously to the first-described example.

In operation, a wagon W is brought onto the table **20** by the side-arm charger **50,** as in the first example, and as the tipping frame structure is rotated clockwise through the drive **10, 12.** The table begins to rotate when the lugs **92** on the end frames have moved far enough to take up the clearance between the stub-shafts **94** and the slots **96.** As before, the tilting of the table brings the wagon against the side support pads **58.**

From the start of the rotation of the frame structure, the follower rollers **86** of the levers **84** move relative to the fixed surfaces **88** and the beam **80** is thus allowed to swing downwards on the pivots **83,** under the action of gravity, until the top supports **64** engage the top of the wagon. The stage at which this occures will of course depend on the height of the wagon and the profile of the surfaces **88.** As rotation of the frame structure proceeds further, since further movement of the beam **80** about the pivots **83** is prevented, the follower rollers **86** come out of contact with the surfaces **88.**

On each end frame there are two spaced pivot supports **98** on which two locking pawls **100** can rotate freely, weighted balance arms **102** being fixed to the respective pawls so that they depend downwards to hold the pawls in the orientation shown during the initial rotation of the frame structure. This effect produces relative pivoting between the pawls and the end frames, and as the rotation of the frame structure proceeds, said pivoting brings the pawls of each end frame closer to a toothed rack **104** on the lower end of the associated rack arm **82.** It is arranged that shortly before the frame structure has been tipped through 90° (e.g. at about 80° rotation) one or both of the pawls come into engagement with the teeth of the rack and the disposition of the pivot supports **98** of the pawls relative to the pawls themselves and the rack teeth profiles is such that the pawls act in the manner of a ratchet locking the rack against return motion.

As the wagon is inverted, therefore, the shifting of weight onto the top supports **64** does not cause the beam **80** to move on the pivots **83** and the wagon remains firmly held. The two pawls at each end face are arranged to be out of phase with respect to each other by half a tooth pitch of the rack teeth, so that one or other of the pawls will be able to enter a racked tooth slot fully, regardless of any minor variations in the wagon height. This ensures that locking will occur without having to resort to an unduly small tooth pitch on the rack which would give an undesirably small bearing surface for a pawl.

After the wagon's contents have been tipped, when the frame structure is being rotated back to the upright position, the pawls are released shortly after the wagon has passed through its 90° tipped position. Those pawls locked into the rack teeth no longer depend freely, and are therefore so disposed that the outer end of the balance arms **102** come against fixed release surfaces **106** at this stage. The surfaces **106** so restrain the movement of the pawls with respect to the end frames as to pivot the pawls out of engagement with the rack teeth. The balance arms now again adopt a freely dependent position which, because of the orientation of the frame structure at this stage means that the pawls are clear of the rack teeth until in a further cycle the frame structure is again rotated past the position at which they were released. The release of the racks **104** of course allows the rack arms to pivot when the rollers **86** come against the control surfaces, allowing the top supports **64** to be raised out of engagement from the wagon top as the frame structure approaches the upright position.

It will be appreciated that the location of the centre of gravity of a loaded wagon close to the centre of rotation of a tippler, as in the illustrated examples, helps to reduce the power requirements for a tippling operation and the stresses imposed at any given rate of angular movement will be lessened. At the same time the open form of the end frames permits the use of a side-arm charger or wagon positioner so that there is no practical limitation on the power that can be deployed to marshal the wagons for tippling.

What I claim and desire to secure by Letters Patent is:

1. A rotary tippler comprising, in combination, a wagon support arrangement, spaced parallel rigid frames of open arcuate form in said support arrangement, interconnection means extending between said frames to join them rigidly and with their arcuate forms disposed about a common central axis, a wagon track having a centre line disposed in a vertical plane at or

close to the common axis of said frames, a motive device disposed alongside the wagon support arrangement for loading and unloading of wagons onto and from the wagon track, engagement means on said motive device for entraining said wagons, openings in said frames defined in each frame between the ends of the frame arcuate form and said openings being in alignment providing passage for movement of said engagement means past the frames for the loading and unloading of wagons, means mounting said support arrangement rotatably about the common axis of the frames, and drive means rotating said arrangement about said axis to discharge a wagon loaded onto said track.

2. A rotary tippler according to claim **1** further comprising end stop means on at least one of said arcuate frames has adjacent the opening thereof, said end stop means limiting overrun of the rotary movement for discharging a wagon.

3. A rotary tippler according to claim **1** wherein the wagon support arrangement comprises cradle means on which said wagon track is mounted, and pivot connections between the arcuate frames and the cradle means adjacent the lower termination of the arcuate frame openings, said cradle means being pivoted about said connections with the rotation of the support arrangement to a discharge position to displace the wagon track towards the axis of rotation, holding means of the support arrangment for engagement with a wagon top when the cradle means is pivoted and thereby limiting said displacement of the wagon track, said holding means providing support for the wagon when the wagon is in an overturned discharged position.

4. A rotary tippler according to claim **1** wherein the support arrangement comprises wagon top holding means, mounting means locating said holding means displaceably upon the arcuate frames, control means for said displacement of the holding means bringing the holding means against the wagon top during the initial part of said rotation of the arrangement, means locking the holding means in an operative position against the wagon top to maintain engagement with the wagon top during continued rotation of the tippler to an overturned discharge position of the wagon.

5. A rotary tippler according to claim **4** wherein said locking means comprise at least one gravity-operated member disposed on a mounting displaced in said rotation of the support arrangement to bring said member to a position blocking return movement of the holding means from said operative position, means being provided in the path of said at least one locking member on the return rotation of the tippler from the discharge position while in its blocking position to displace it therefrom whereby to free the holding means from the wagon top.

6. A rotary tippler according to claim **4** wherein the or each said locking member comprises a pawl, a toothed rack fixed to said holding means being engageable by said pawl to lock the holding means in the operative position.

* * * * *