April 26, 1927. 1,625,864

G. C. MELIN

BALLAST DIGGING AND CLEANING MACHINE

Filed July 9, 1926 8 Sheets-Sheet 1

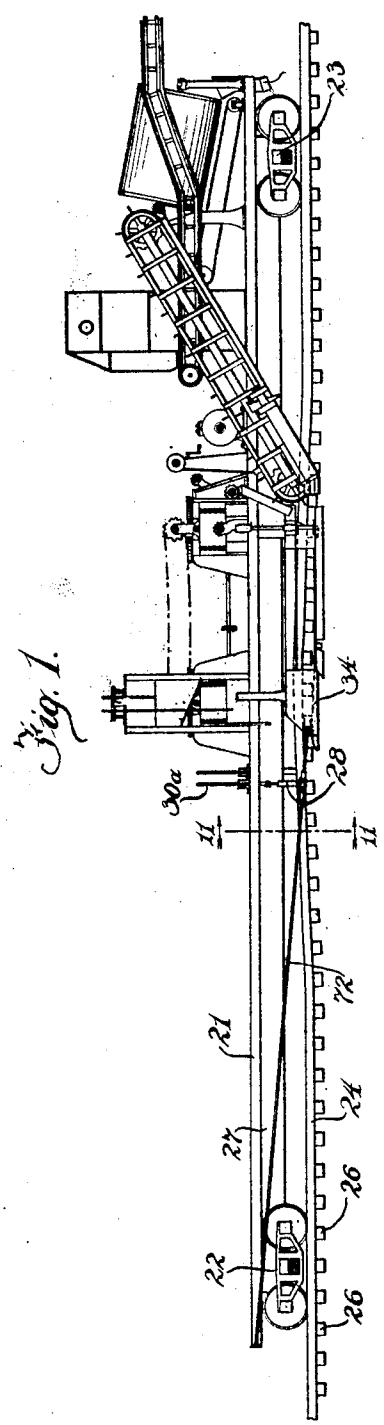


Fig. 1.

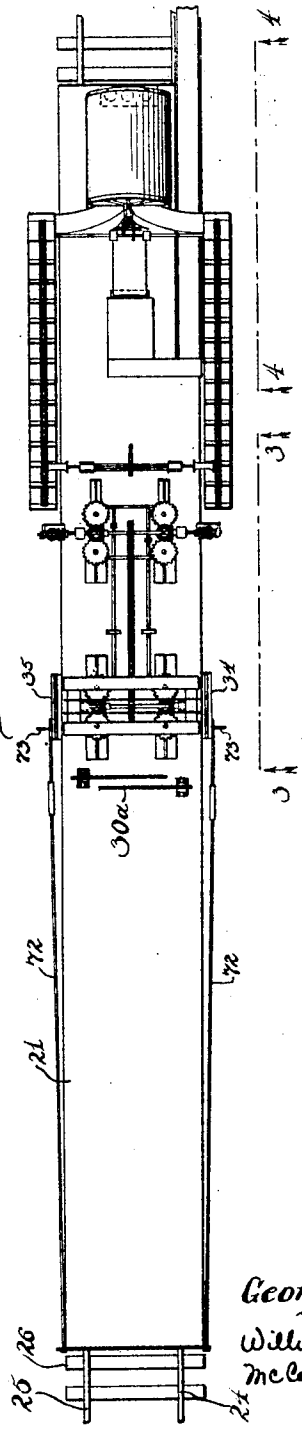


Fig. 2.

Inventor
George C. Melin
Williams, Bradbury, McCall & Hinkle.
Attorneys

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G. C. MELIN

BALLAST DIGGING AND CLEANING MACHINE

Filed July 9, 1926 8 Sheets-Sheet 2

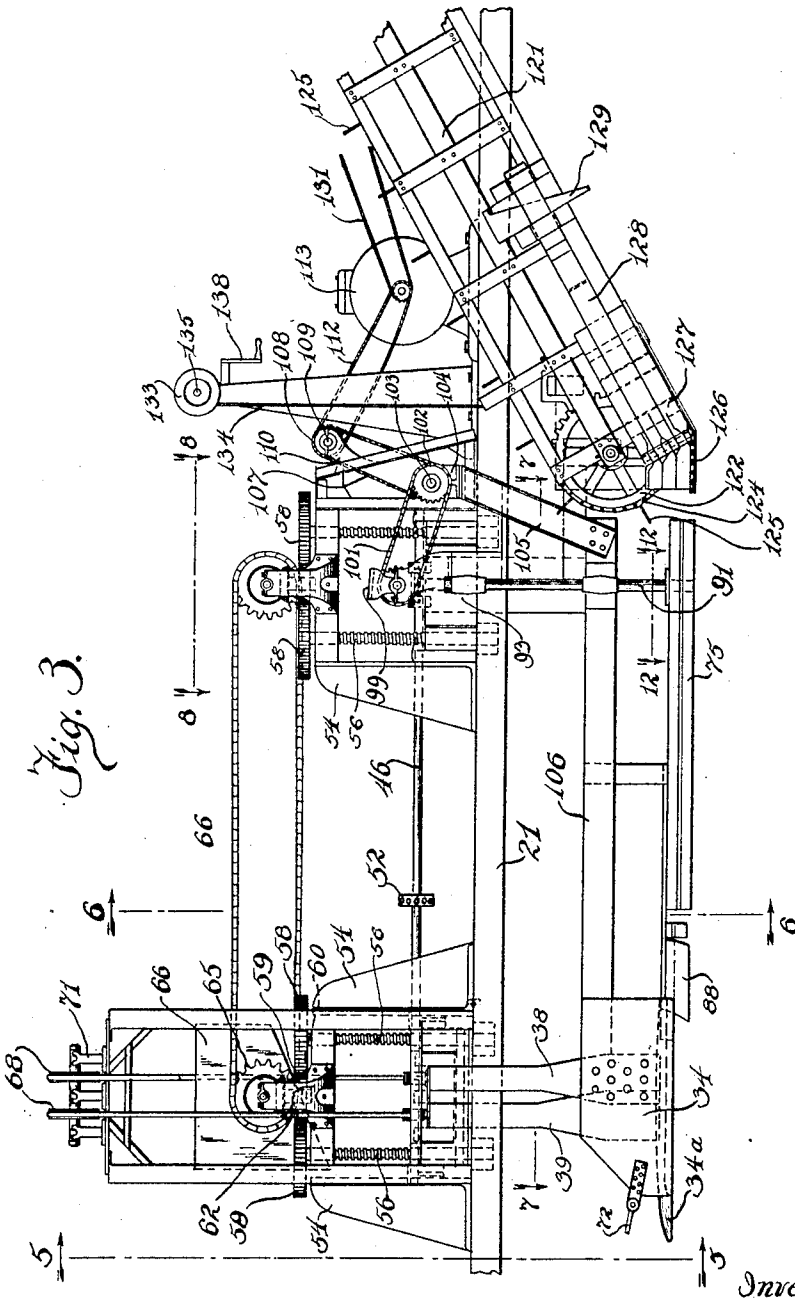


Fig. 3.

Inventor
George C. Melin
By Williams, Bradbury, McCaleb & Hinkle,
Attorneys

April 26, 1927. 1,625,864

G. C. MELIN

BALLAST DIGGING AND CLEANING MACHINE

Filed July 9, 1926 8 Sheets-Sheet 3

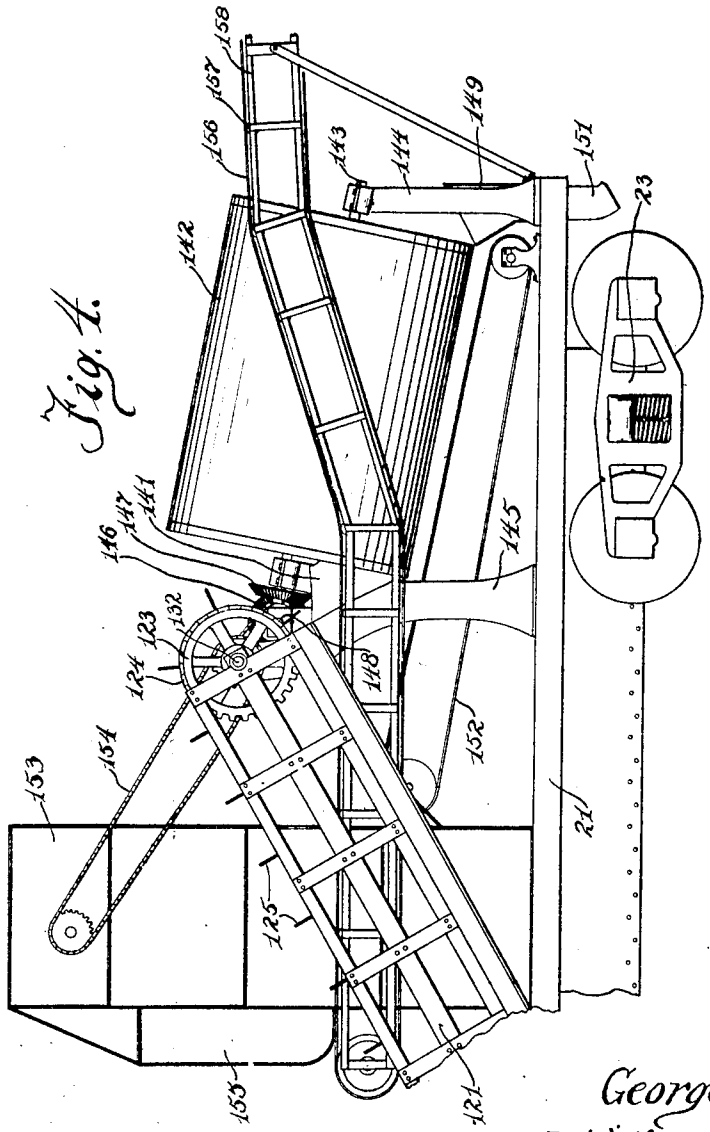


Fig. 4.

Inventor.
George C. Melin
By Williams, Bradbury,
McCaleb & Hinkle
Attorneys.

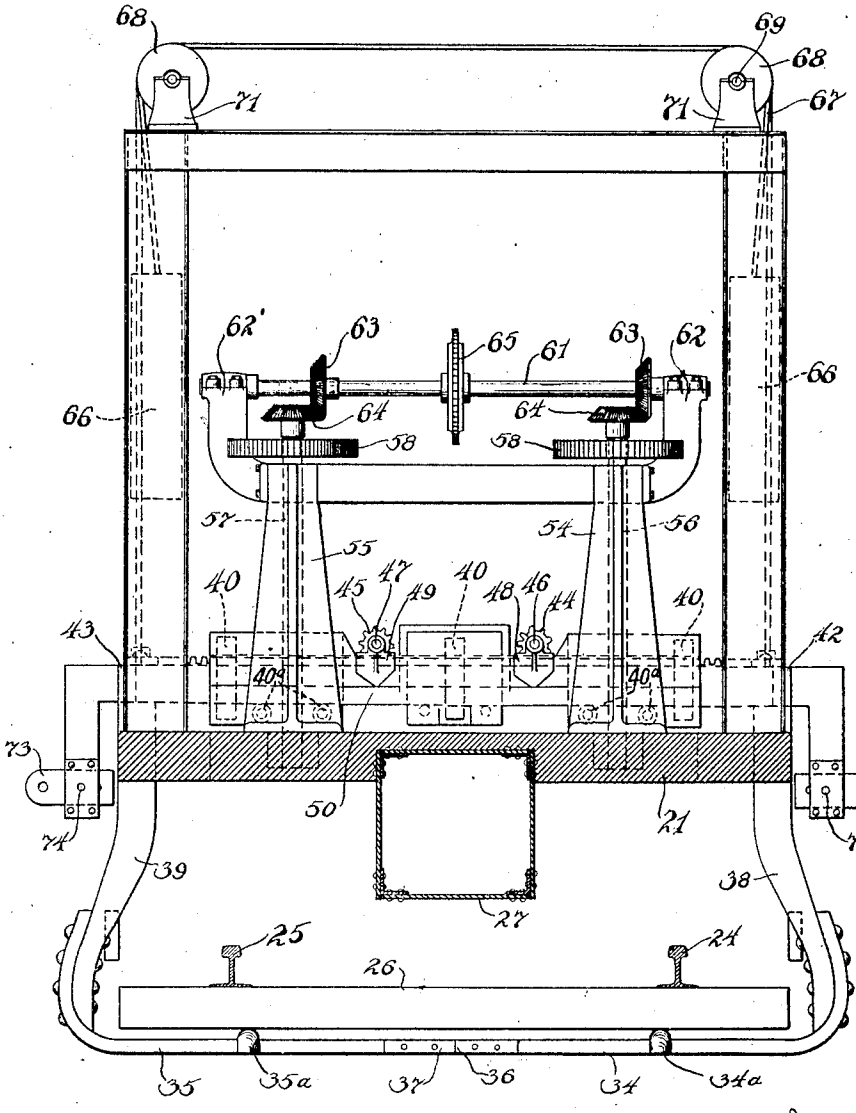
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G. C. MELIN

BALLAST DIGGING AND CLEANING MACHINE

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Fig. 5.



Inventor.
George C. Melin
By Williams, Bradbury,
McCaleb & Hinkle.
Attorneys.

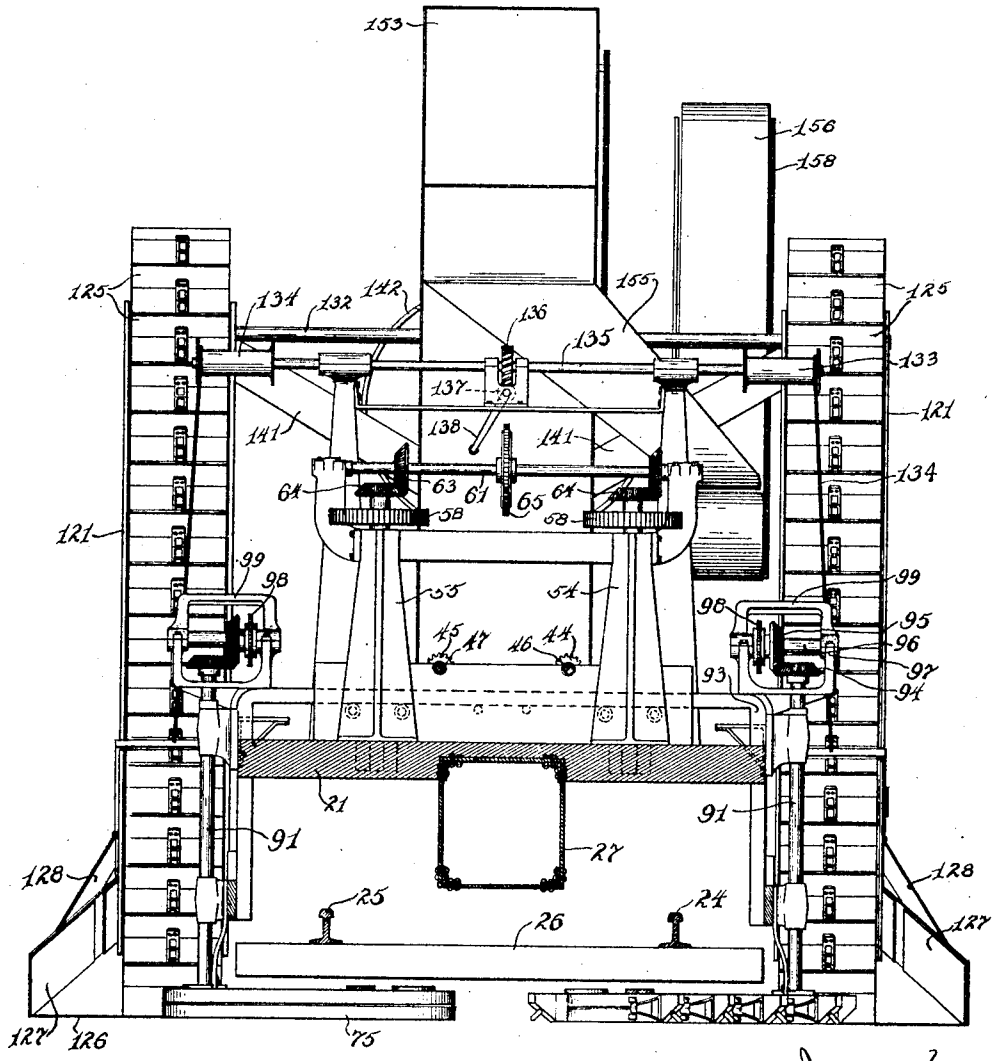
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G. C. MELIN

BALLAST DIGGING AND CLEANING MACHINE

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Fig. 6.



Inventor.
George C. Melin
By Williams, Bradbury, McCaleb & Hinkle
Attorneys.

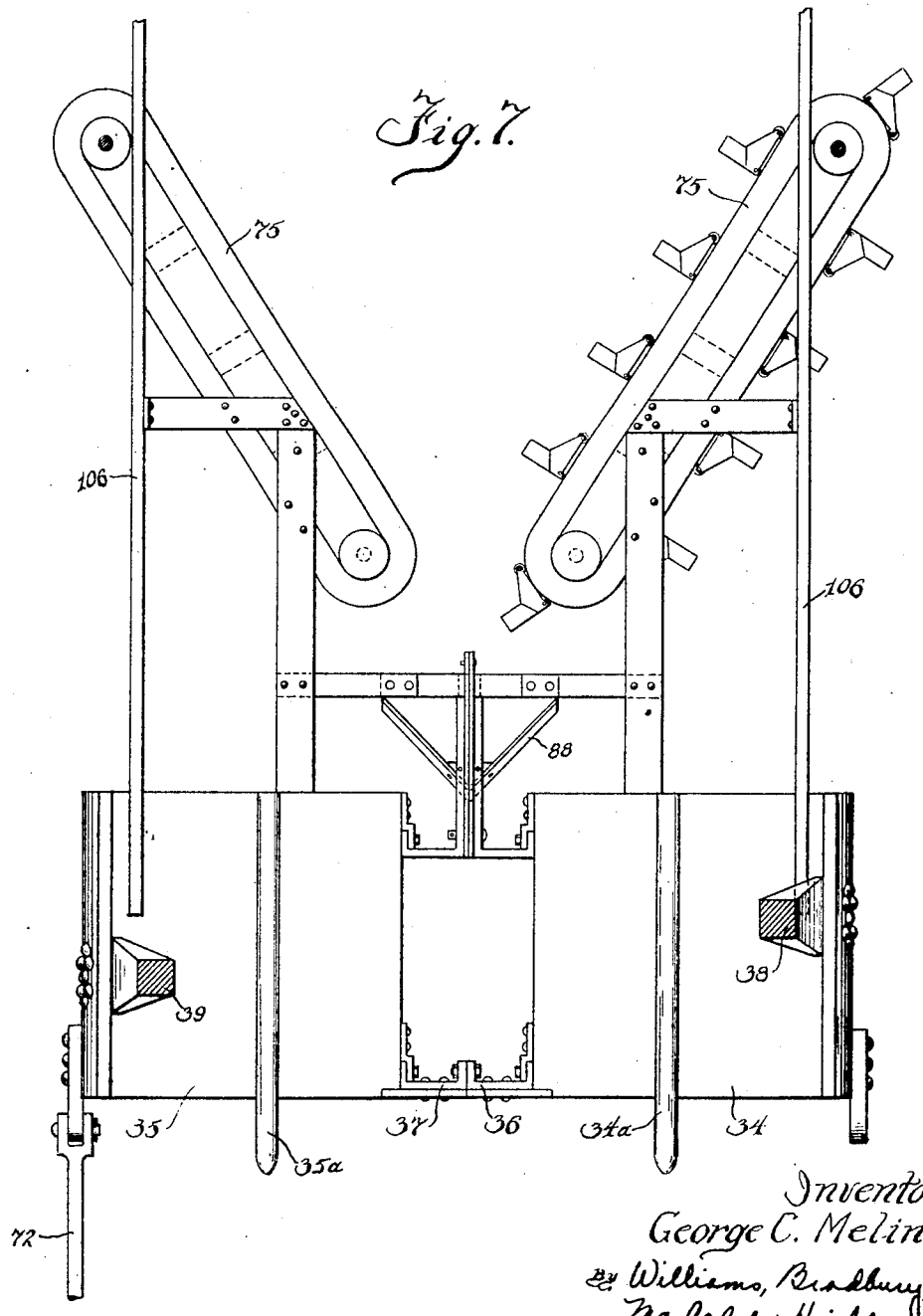
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G. C. MELIN

BALLAST DIGGING AND CLEANING MACHINE

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Fig. 7.



Inventor
George C. Melin.
By Williams, Bradbury, McCaleb & Hinkle
Attorneys.

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G. C. MELIN

BALLAST DIGGING AND CLEANING MACHINE

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Fig. 8.

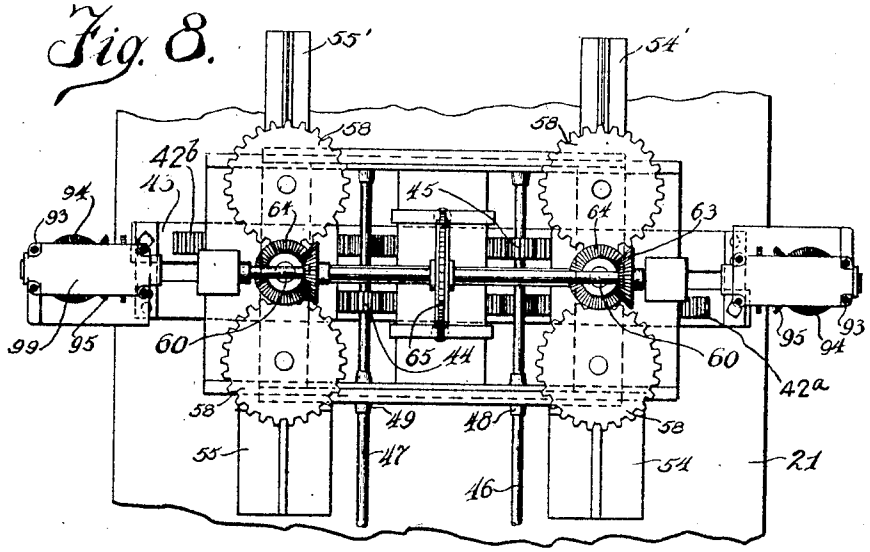
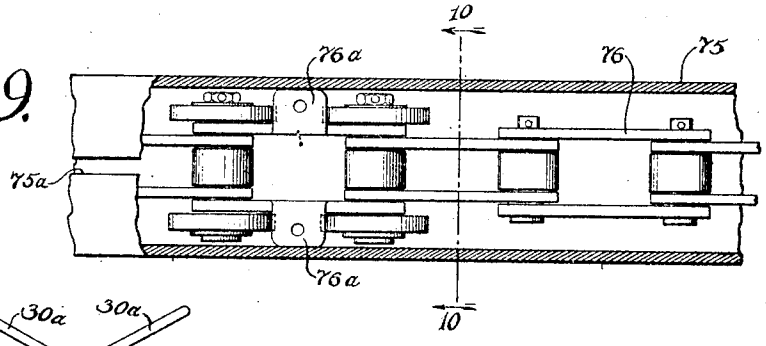


Fig. 9.



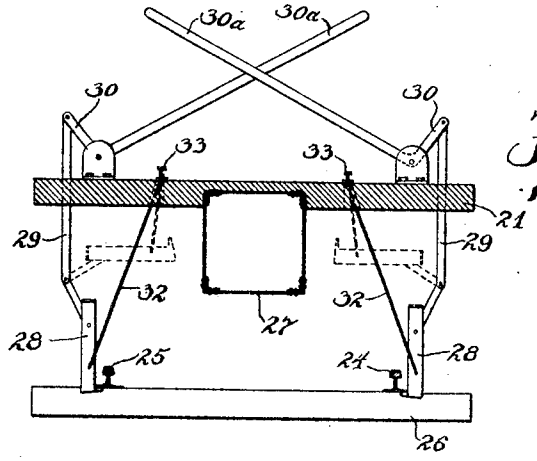
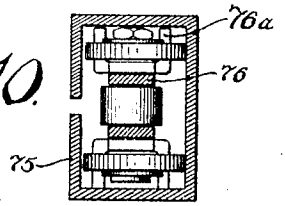


Fig. 11.

Fig. 10.



Inventor.
George C. Melin
By Williams, Bradbury, McCaleb & Hinkle
Attorneys.

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G. C. MELIN

BALLAST DIGGING AND CLEANING MACHINE

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Fig. 12.

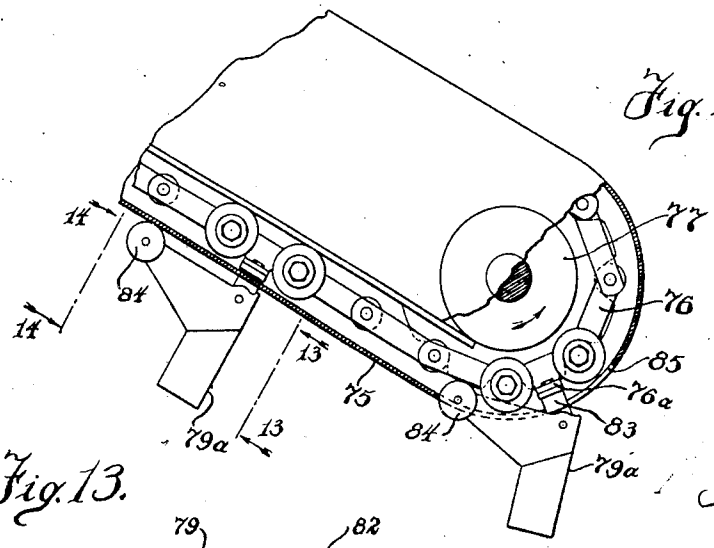


Fig. 13.

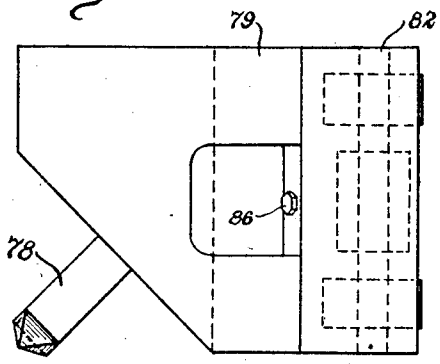


Fig. 14.

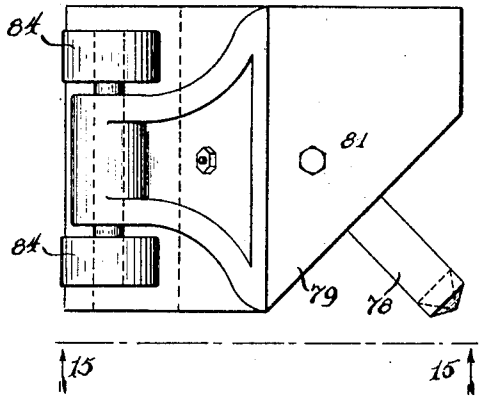
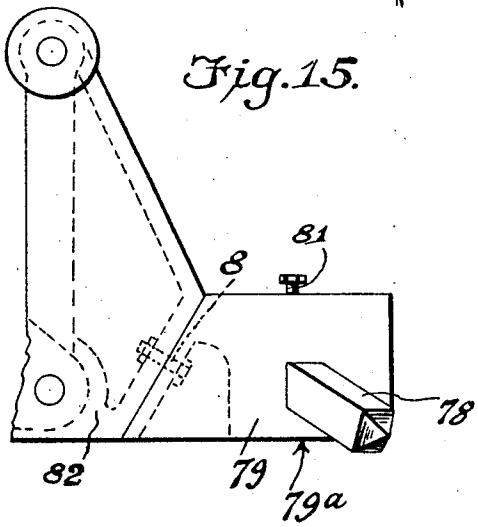


Fig. 15.



Inventor
George C. Melin
By Williams, Bradbury, McCaleb & Hinkle

Attorneys

Patented Apr. 26, 1927. 1,625,864

UNITED STATES PATENT OFFICE.

GEORGE C. MELIN, OF GALESBURG, ILLINOIS.

BALLAST DIGGING AND CLEANING MACHINE.

Application filed July 9, 1926. Serial No. 121,304.

My invention relates to an improved machine for reballasting railroad tracks. More particularly it relates to a machine capable of raising the tracks and ties, removing a portion of the ballast, screening the ballast and replacing the screened material on the roadbed.

The operations which my machine is capable of performing have in the past usually been performed by hand, which are slow, laborious and expensive processes. The process of reballasting is necessary in order to extend the life of the ties, to realign the track, increase the bearing area on the subgrade, to provide elasticity to the track, to improve drainage of the roadbed and to minimize heaving.

I am aware that several machines embodying various principles of operation have been suggested in the past, but all of these have proved impractical in one respect or another due to a failure to comprehend some of the basic requirements of this type of machine.

It is an object of my invention to provide an improved machine for reballasting roadbeds which is effective and speedy in operation.

A further object is to provide an improved means for raising the rails and ties so that the ballast may be readily dug out from beneath them.

A further object is to provide an improved means for adjusting the tie raising devices so that the machine may be efficiently and effectively used in reballasting curved tracks.

A further object is to provide improved means for removing the track raising means from operative position to a position in which they will not interfere with the transportation of the machine from one job to another.

A further object is to provide an improved conveyor mechanism for raising the ballast from the roadbed to a screening device.

A further object is to provide an improved machine which will operate efficiently and speedily to remove the ballast from beneath the tracks, raise it to a screening device where the ballast may be cleaned, and return the cleaned ballast to the roadbed.

Other objects will appear from the following description, reference being had to the accompanying drawings in which:

Figure 1 is a side elevation of the complete machine shown more or less diagrammatically as mounted on a flat car.

Figure 2 is a plan view thereof.

Figure 3 is a side elevation of a portion of the machine taken on the line 3—3 of Figure 2.

Figure 4 is a similar view of the rear portion of the machine taken on the line 4—4 of Figure 2.

Figure 5 is a vertical transverse sectional view of the machine taken on the line 5—5 of Figure 3.

Figure 6 is a similar sectional view taken on the line 6—6 of Figure 3.

Figure 7 is a horizontal sectional view taken on the line 7—7 of Figure 3, showing particularly the means for digging the ballast from beneath the track.

Figure 8 is a plan view of the means by which the digger mechanism is elevated, taken on the line 8—8 of Figure 3.

Figure 9 is a longitudinal vertical sectional view of the chain and housing used to carry the digging teeth.

Figure 10 is a transverse vertical sectional view of the chain and housing taken on the line 10—10 of Figure 9.

Figure 11 is a transverse vertical sectional view showing somewhat diagrammatically the track raising jacks and their operating means, the view being taken on the plane represented by the line 11—11 in Figure 1.

Figure 12 is a detailed view of the digging means, shown partly in section.

Figure 13 is an elevation of one of the digger teeth and its mounting, taken on the plane represented by the line 13—13 in Figure 12.

Figure 14 is a similar view taken on the line 14—14 of Figure 12 and

Figure 15 is a third view of one of the digger teeth as seen from the line 15—15 in Figure 14.

A brief general description of the functions and purposes of the machine of my invention will be given so that the detailed description may be more readily understood.

The machine as a whole is mounted on a long flat car and comprises the following mechanism: A pair of jacks with means for operating the same are secured to the flat car and are adapted to raise the tracks so that track raising shoes may be placed beneath the ties. These shoes are transversely slidable so that they may be inserted beneath the track from the side. These track rais-

ing shoes are also vertically adjustable and are in the general form of a wedge so that the machine as it is pulled along by a locomotive will wedge the track upwardly. A digging mechanism is positioned directly behind the track raising shoes and is adapted to scrape out the old ballast and move it toward the side of the track, where suitable flight conveyors are provided to raise it to a chute by which it is guided to a rotatable screen. This screen serves to sift the dirt and débris from the ballast, the débris being conveyed to a following car or to one side of the track and the gravel and rock being replaced upon the roadbed. The digging means, as well as the flight conveyors, are adjustable so that they may be raised out of the way when the machine is to be transported from one place to another.

The flat car upon which the machine is mounted, and which comprises an essential part thereof, may be constructed according to well recognized car builders' practice, the only necessary difference being that it must be considerably longer than the usual flat car, thus providing a sufficient span to permit the track between its end trucks to be raised about 8 or 10 inches, so that the ballast directly beneath the tracks may be removed by means of a digging mechanism. The flat car top 21 is supported by the trucks 22 and 23, which are preferably placed as near the ends of the top as is compatible with good engineering construction. The wheels of the trucks, of course, travel upon the rails 24 and 25, which, as is customary, are spiked to ties 26. The top 21 is preferably made of sheet steel, and it is suitably reenforced by a box girder 27 (Figures 5 and 6) and other suitable well known bracing rods and reenforcing members (not shown).

In commencing the operation of the machine, the tracks must first be jacked up so as to permit the insertion of the track raising shoes. The jacks 28 which are diagrammatically shown in Figure 11 are adapted to be operated by links 29 pivoted to their handles, the links 29 being also pivoted to bell cranks 30 which are pivotally mounted on the top of the car. The long arms 30^a of the bell cranks serve as handles by which the jacks may be operated. The jacks are adapted to be raised into inoperative position by means of cables or chains 32, which extend upwardly through the floor of the car and are adapted to be wound up on small manually operated winding drums 33. When the tracks have been raised a sufficient distance to permit their insertion, a pair of track raising shoes 34 and 35 are swung downwardly beneath the ties, as will presently be described.

The shoes 34, 35 are preferably made of a heavy plate steel and are best shown in Figures 3, 5 and 7. The shoes are adapted to be bolted together by means of the connecting bars 36 and 37, which are suitably reenforced and bolted to the shoes 34 and 35 respectively. The shoes have longitudinal ridges 34^a and 35^a which extend beyond the front edges of the shoes forming wedge shaped toes which slide beneath the ties and support them at points a short distance inside the rails.

The outer edges of the shoes are curved upwardly and riveted to downwardly projecting arms 38 and 39, which arms are integral with, or secured to horizontal bars 42 and 43 respectively. These bars lie alongside one another, and are guided for sliding longitudinal movement by vertical rollers 40 and supported for sliding movement on the horizontal rollers 40^a. Racks 42^a and 42^b, fixed to the upper edges of these bars, are adapted to mesh with pinions 44 and 45 respectively. These pinions are secured to shafts 46 and 47 respectively, which are suitably journaled in bearings 48 and 49 respectively, which are secured to a sliding frame 50 of the machine. These shafts 46 and 47, as shown in Figure 3 extend rearwardly and serve other purposes, as will later be described. Each of these shafts has a socketed disc 52 (Figure 3) secured thereto by which the shaft may be rotated, the sockets being adapted to receive a suitable handle such as a pinch bar or similar rod. It will be apparent from this construction that the shoes 34 and 35 may be moved inwardly and outwardly by the rotation of the shafts 46 and 47, to place them beneath the ties, and to remove them from this position when the machine is not in operation.

The shoes are also arranged to be raised and lowered. For this purpose, a pair of brackets 54 and 55 (Figure 5) are mounted on the floor 24 of the flat car. Rotatably secured in these brackets are two pairs of screws 56 and 57 which thread into suitable nuts fixed relative to the frame 50 in which the bars 42 and 43 are guided, so that upon rotation of these screws the frame 50 and the bars 42 and 43, together with the shoes 34, 35 may be raised and lowered. Fixed relative to these screws 56 and 57 are gears 58. The pair of screws 56 are on the left hand side of the machine and the pair of screws 57 are on the right hand side of the machine (vice versa Fig. 5). The gears 58 secured to the screws 56 are inter-connected by a pinion 59 which is suitably mounted on stub shaft 60 bearing in the bracket 54. A similar pinion is provided to connect the gears 58 of the screws 57. The driving shaft 61 by means of which these screws are rotated is mounted in a pair of bearing brackets 62 and 62′, which are bolted to the brackets 54 and 55 respectively. This shaft 61 carries a pair of bevel gears

63 which mesh with the complementary bevel pinions 64 which are keyed to the stub shafts 60 and which, through the pinions 59, transmit the motion to the gears 58. A sprocket 65 is fixed to the central portion of the shaft 61 and is driven by a chain 66ª which may be either manually actuated or may be operated by any suitable power means.

A pair of counterweights 66 are supported by suitable cables 67 which pass over sheaves 68 and are secured to the bars 42 and 43 respectively, so as to facilitate the raising and lowering of the shoes. The sheaves 68 may be carried by shafts 69 supported in suitable bearings 71. As best shown in Figures 1 and 2, the shoes are held in position by a pair of truss rods 72 (Figures 1 and 7), which at one end are secured to the forward end of the car frame and at the other end are removably secured to the shoes 34 and 35 respectively. When the shoes are to be raised from their operative position these truss rods are disconnected from the shoes and are secured to supports 73 (Figure 5) which are carried by the vertically slidable frame 50 in which the bars 42 and 43 are supported. These supports 73 are slidably adjustable and may be secured in adjusted position by a pin 74.

Means for scraping and digging out the old ballast are provided. These means consist of a chain digger device which is mounted so that it may be placed beneath the ties and rails and be operated so as to carry the old ballast to the side of the track, where it is received by suitable elevating conveyors, as will hereinafter be described. This digging and scraping mechanism comprises a pair of frames 75 (Figure 7) which may be inserted beneath the ties. Each of these frames forms a housing and guide for a chain 76 (Figure 12), which is carried and driven by suitable sprockets 77, which are rotatably mounted in the ends of the frames 75. The roller chain 76 carries a pair of links 76ª which have flanges to which the digger teeth may be suitably secured.

As best shown in Figures 12 to 15 inclusive, the digger teeth 78 are secured to blocks 79 by means of set screws 81. These digger teeth may be made of hardened manganese steel or other suitable material and are removably secured in the blocks so that they may be easily replaced if necessary. The blocks 79 in which the digger teeth 78 are secured are bolted to a frame member 82, which is pivotally mounted at the ends of a suitable link 83 which is bolted to the flanges of the chain links 76ª. The frame member 82 carries a pair of rollers 84 which roll on the peripheral edge surface of the frame 75 which is suitably longitudinally slotted at 75ª to permit the passage of the connecting links 83. As shown in Figure 12, this edge surface which forms a track for the rollers is cut away near the rear end of the frame as at 85. As the rollers 84 of the digger teeth frames reach this cut away portion 85 the digger teeth tilt backward on their pivotal connecting links 83, and when the rollers reach the end of the cut away portion 85, they again engage the guide portion of the frame 75 and are given a sudden kick forwardly about their pivotal connection with the links 83 so as to free them from any dirt which may have had a tendency to stick to the tooth and to throw the ballast toward the receiving plate of the flight conveyor. The blocks 79 are secured to the frame member 82 by a bolt 86. This bolt is of small enough diameter so that should the tooth contact with some obstruction, such as an unusually large rock, this bolt will break before any of the other parts will give way, so that great injury to the mechanism is thus prevented.

From Figures 13, 14 and 15, it will be particularly noted that the digger tooth 78 extends at an angle downwardly, outwardly and forwardly with respect to its direction of motion. By thus positioning this tooth, a maximum digging effect is secured, and the firmly settled ballast lying directly beneath the ties is readily dug out and removed. The leading surface 79ª of the block 79 forms a scraping element by which the gravel and dirt which has been loosened by the digger teeth, is carried rearwardly to the flight conveyor, the operation of which will be hereinafter described.

A plow-like device 88 (Figure 7) is bolted to the shoes and also to the frame members 75 by a suitable structural steel construction and serves to scrape the central portion of the roadbed beneath the center of the ties and scrape the gravel into the path of the digging teeth. This plow-like device is removed when the shoes 34 and 35 are withdrawn from beneath the track. As best shown in Figure 3 and Figure 6, the digger sprocket 77 is driven by a shaft 91 which is rotatably secured in bearings which are mounted on a frame 93, which may be raised by means similar to those employed in raising the shoes. The upper end of the shaft 91 carries a bevel gear 94 which meshes with a similar pinion 95 which is keyed to a shaft 96. The shaft 96 is rotatable in the bearing bracket 97, and has a sprocket 98 fixed thereto, which sprocket may be integral with the bevel gear 95. The bracket 97 has a bridged portion 99 integral with its bearing caps for a purpose which will later be described. It is to be understood that the mechanism for digging which has been described constitutes only one-half of the digging mechanism of the machine, and that a similar complementary mechanism is provided for the right hand side of the ma-

chine. The sprockets 98 are driven by chains 101 (see Figure 3) which in turn are driven by sprockets 102 splined to a shaft 103. The shaft 103 is rotatable in bearings 104 carried by a frame 105 which is fixed to the sliding frame 93 and to the channel 106 which connects the shoes with the digger mechanism. The shaft 103 is driven by a chain 107 which engages a sprocket 108 carried by a shaft 109 which is rotatably mounted in a bearing bracket 110 supported by the main frame of the raising and lowering device. This shaft 109 carries a second sprocket (not shown) which is connected by a chain 112 to any suitable source of power, such as the engine 113.

The means for raising and lowering the frame 93 is in every respect similar to that employed in raising and lowering the shoes, and it is believed that it is therefore unnecessary to describe this mechanism in detail. The device is operated by means of the same chain 66 which is used to control the shoe raising mechanism, and it will therefore be apparent that the digger mechanism and the shoes will be raised concurrently. In Figure 8, a plan view of this mechanism is shown, similar reference characters having been employed to designate the parts which are similar to those described with reference to the shoe raising and lowering mechanism.

As has been shown, the digging mechanism will remove the ballast from beneath the ties and carry it outwardly to the edge of the track. Means for raising the ballast will now be described. This means consists of a flight conveyor which comprises a frame designated generally as 121 (Figures 3 and 4). Suitable sprockets 122 and 123 are rotatably mounted in this frame and carry the chain 124 to which the blades 125 are secured. The frame 121 includes a bottom plate 126 which is adapted to scrape up the loosened dirt and gravel. The sprockets 122 and 123, as shown in Figures 3 and 4, rotate counter-clockwise so that the blades 125 will scrape up the ballast upon the plate 126 and carry it upwardly along the trough which is formed along the inclined bottom of the frame 121. A side apron 127 formed of a plurality of plates, is pivotally secured to the side of the frame 121 and is held in adjusted position by means of a bar 128, which is slidable relative to the frame 121, and which may be secured in adjusted position by means of a wedge 129 or in any other suitable securing means. This side apron may be pivoted so as to lie close to the side of the frame 121 when the machine is being moved from job to job. The elevating or flight conveyor is driven by a chain 131 which engages a suitable sprocket on the shaft of the engine or motor 113 and also a suitable sprocket secured to the shaft 132 to which the sprocket 123 is splined. The flight conveyor may be raised from operative position by means of a cable 134 which may be secured to the frame 121 and be wound upon a winding drum 133. This winding drum is secured in the end of a shaft 135 which is rotatably mounted in suitable bearings and carries a worm wheel 136 (Figure 6) which is rotatable by means of a worm 137. This worm is operable by means of a handle 138 secured to its shaft. When elevating the frame 121, it may pivot around the shaft 132 and upon reaching a sufficient height, may be moved toward the center of the car so that the plate 126 will rest upon the horizontal portion 99 of the bearing 97 previously described. The sprocket 123, as has been said, is splined to the shaft 132, so that the conveyor frame as a whole may be readily moved inwardly. The flight conveyor discharges into a hopper 141 which empties into a rotary screen 142. This rotary screen is carried by a shaft 143 which is suitably journaled in bearings 144 and 145, and is driven through beveled gears 146 and 147. The beveled gear 146 is secured to a shaft 148 which is driven by a chain connection from the shaft 132. The gravel and dirt dumped into the hopper 141 is screened, the cleaned gravel discharging from the end of the screen into the hopper 149, which leads to a spout 151. The spout 151 is adjustable, so that the screened gravel may be directed to any desired portion of the road bed. The dirt falling through a screen 142 is conveyed upwardly by means of a suitable conveyor belt 152 which may be driven by chain from the shaft 132, and which will discharge the dirt into the elevating conveyor mechanism 153. This elevating conveyor may be driven by a chain or belt 154 from the shaft 132. The dirt from this elevating conveyor passes downwardly through a chute 155 and deposits upon the conveyor belt 156 which is carried on rollers 157 mounted in a jointed frame 158. This conveyor belt 156 may extend rearwardly sufficient to deposit the dirt and débris into a gondola car which may follow the flat car upon which my machine is mounted, or if desired, the conveyor may be so constructed so as to convey the dirt to the side of the road bed.

I claim—

1. In a machine of the class described, the combination of a flat car, a pair of shoes adapted to be inserted beneath the ties of the track, wedge-shaped ridges on said shoes adapted to engage the lower surface of the ties and raise them, means for shifting said shoes outwardly from said car, and means for raising said shoes above the level of the track.

2. In a machine of the class described, the combination of a flat car, a pair of shoes

adapted to be positioned beneath the ties of the track, said shoes being adapted upon forward movement of said car to raise the track, a pair of power actuated digging mechanisms, said mechanisms on one side of said machine being secured to the shoe on that side, means for concurrently shifting said shoe and associated mechanism outwardly, and means for raising both said shoes and both of said mechanisms simultaneously.

3. In a machine of the class described, the combination of a flat car, a pair of track raising shoes adapted to be positioned beneath the track, a wedge-shaped plow secured to said shoes, a pair of power actuated digging mechanisms secured behind said plow, means to secure said shoes, plow and said mechanisms in position beneath the track, means for moving said parts outwardly from beneath said track and means for elevating said shoes, digging mechanisms and plow above the level of said track.

4. In a machine of the class described, the combination of track raising means and digging mechanisms for moving the dirt and ballast from beneath the tracks, said digging mechanisms comprising a pair of adjustably positioned frames, a sprocket rotatably mounted in each end of said frame, a chain carried by said sprocket, a plurality of links secured to said chain and extending through a slot in said frame, a tooth block pivotally secured to each of said links, and a tooth inserted in each of said blocks, said tooth projecting outwardly, downwardly and forwardly with reference to its direction of motion.

5. In a machine of the class described, the combination of a flat car, means for raising the track upon which said car is adapted to travel, a pair of digging mechanisms adapted to be inserted beneath the ties of said track, said digging mechanisms each comprising a frame, a sprocket rotatably mounted in each end of said frame, an endless chain carried by said sprockets, a housing C-shaped in cross section extending the length of said chain, a plurality of links secured to said chain and extending outwardly from said housing through a longitudinal slot therein, a digging tooth supported by a block pivotally connected to each of said links, a pair of rollers carried by each of said blocks, and means on said frame adapted to be engaged by said rollers so as to cause said blocks to be given an accelerated motion near the end of the digging portion of their cycle.

6. In a machine of the class described, the combination of a flat car, track raising means adjustably secured to said car and adapted to progressively raise the track as said car is propelled along the track, means for moving said track raising means from operative position and means for raising said track raising means above the level of the rails of the track.

7. In a machine of the class described, the combination of a flat car, track raising means adjustably secured thereto, means for moving ballast from beneath the track to the side of the track, and means for elevating the ballast deposited at the sides of said track by said digging mechanism comprising a pair of elevating conveyors.

8. In a machine of the class described, in combination with a railroad flat car, a pair of wedge shaped shoes adapted to be positioned beneath the ties of the track upon which the car is adapted to rest, means for adjusting the position of said shoes relative to said car, and means including counterweights for raising said shoes to a position above the track.

In witness whereof, I hereunto subscribe my name this 15th day of June, 1926.

GEO. C. MELIN.