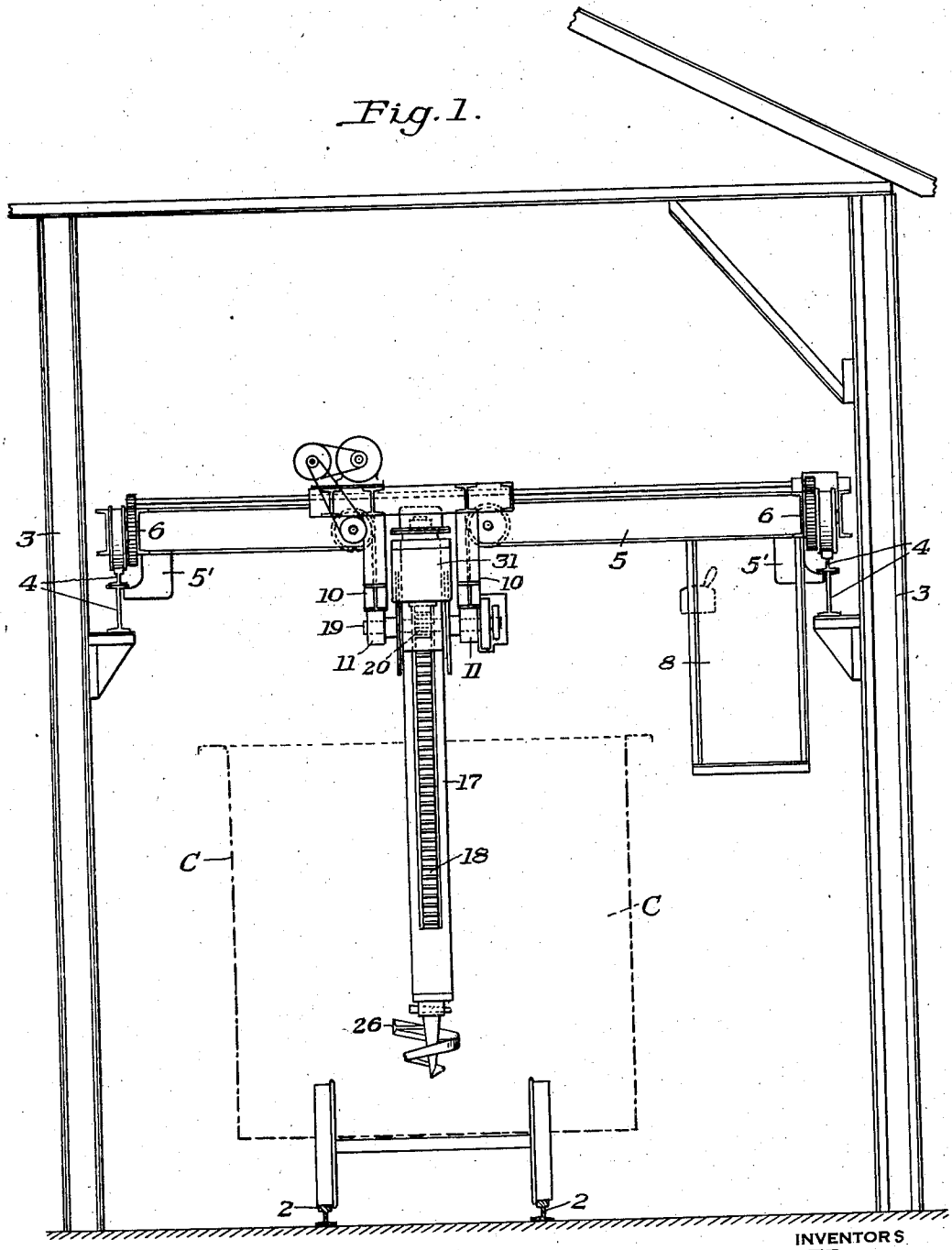
Aug. 27, 1946. S. P. KINNEY ET AL 2,406,546

CAR UNLOADING DEVICE

Filed Jan. 5, 1944 7 Sheets-Sheet 1

Fig. 1.



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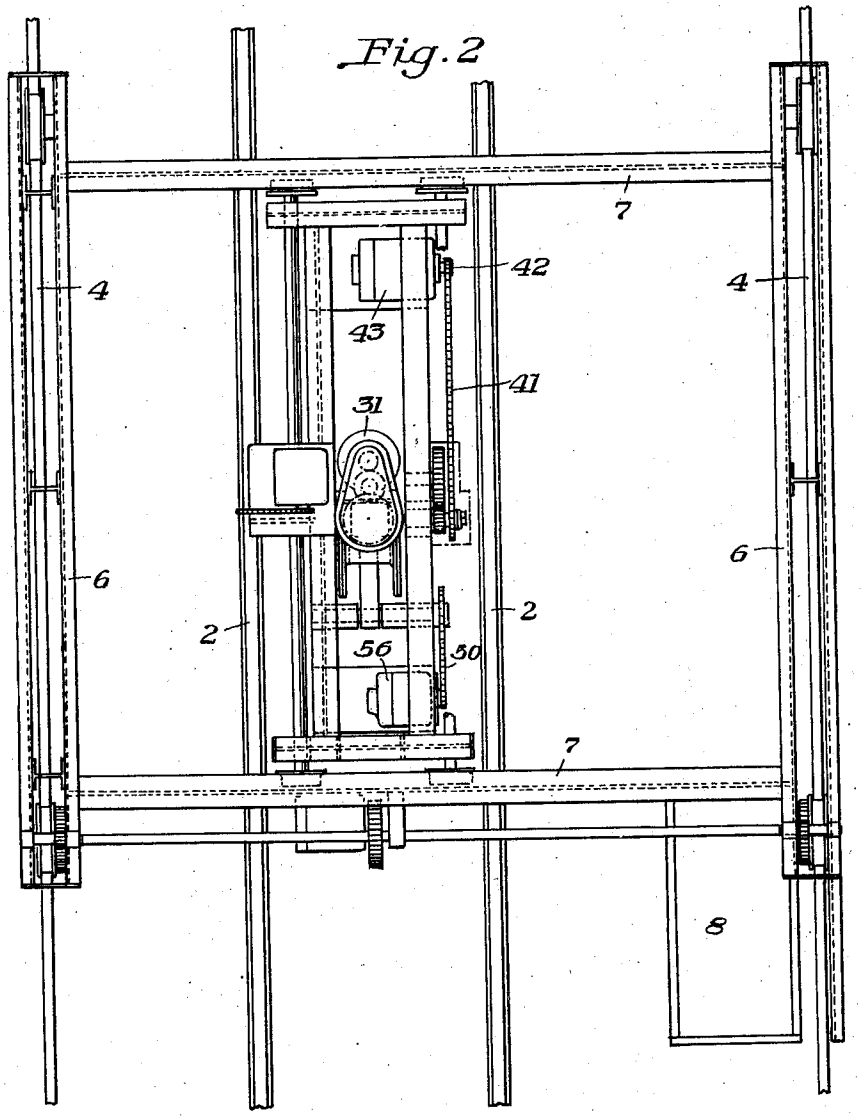
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CAR UNLOADING DEVICE

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Fig. 2



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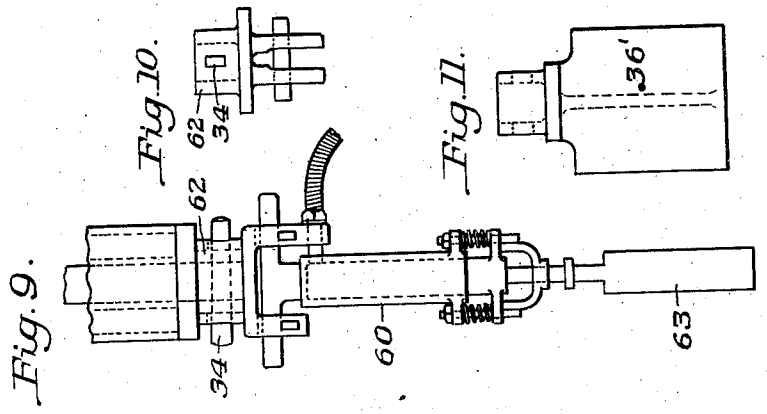
by their attorneys

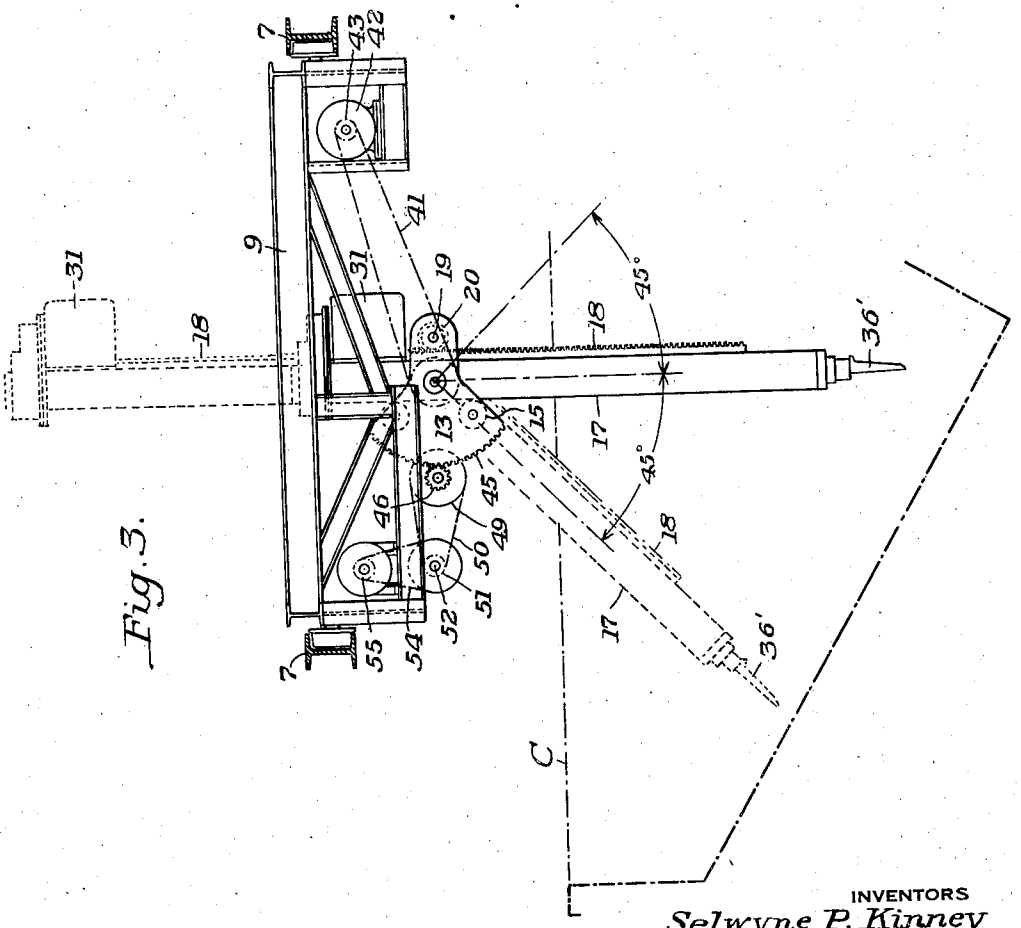
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CAR UNLOADING DEVICE

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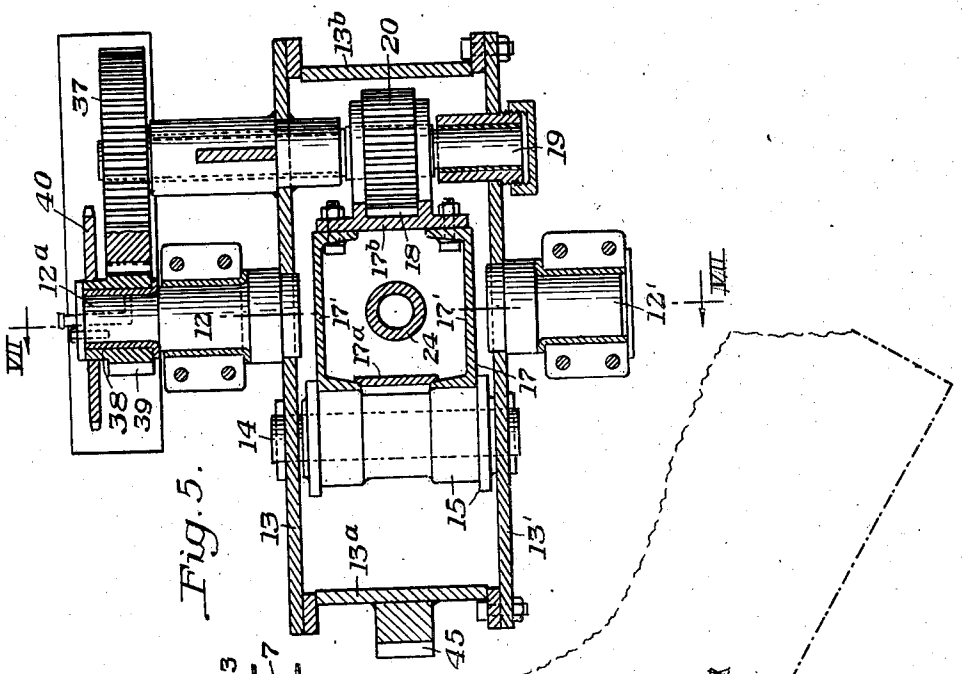


Fig. 5.

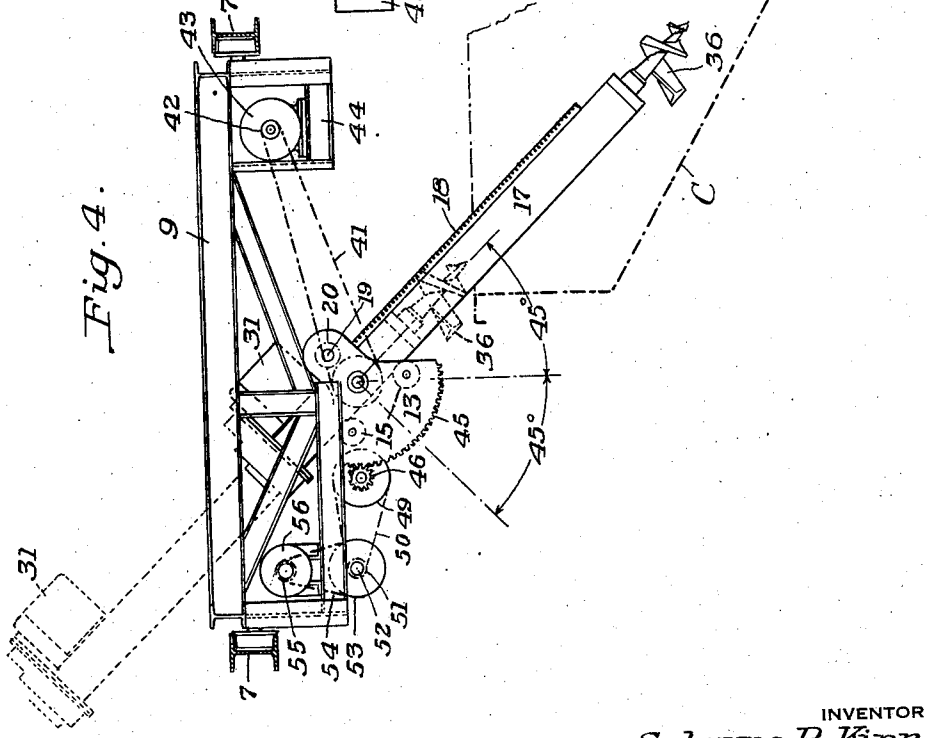


Fig. 4.

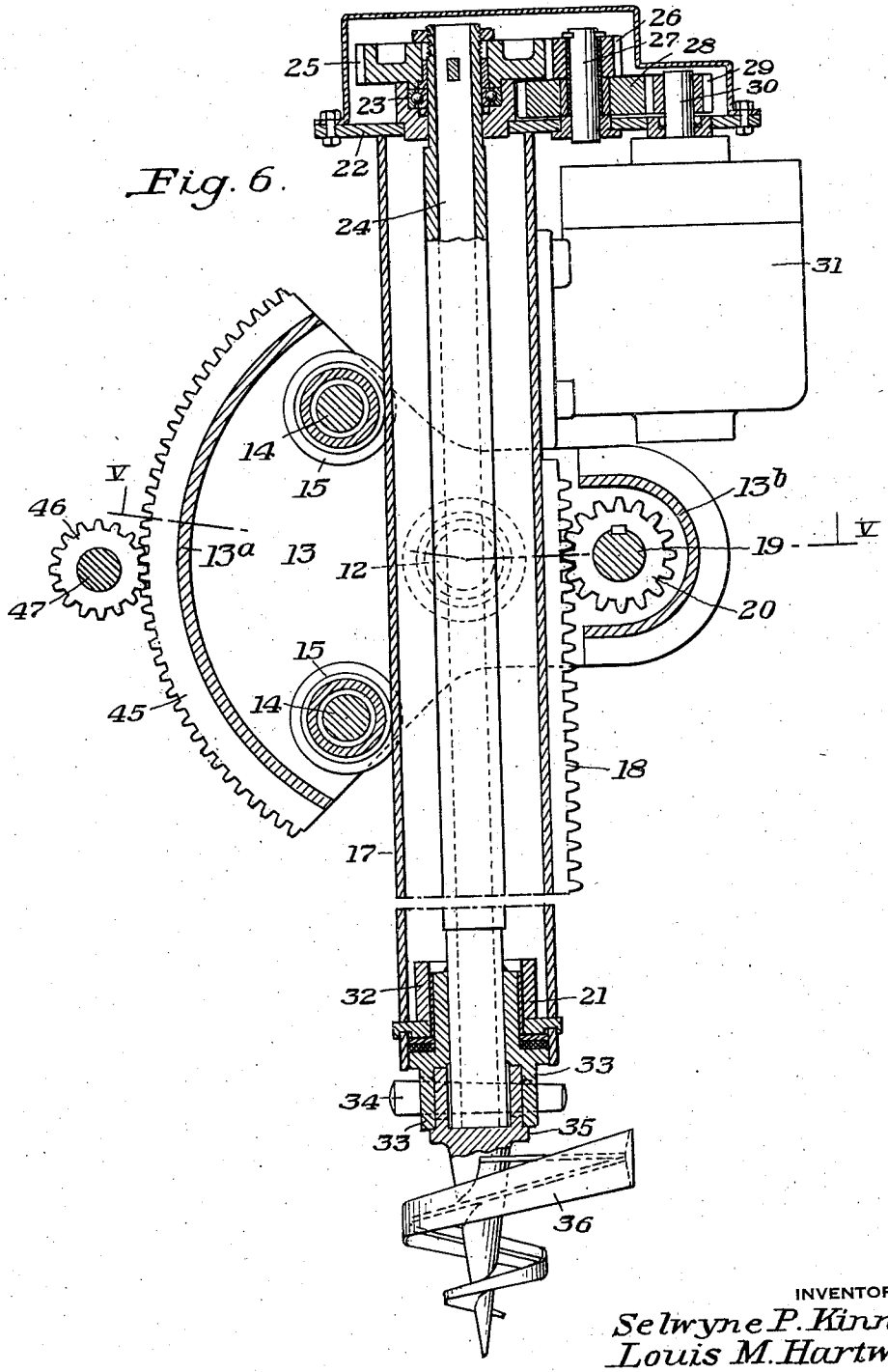
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CAR UNLOADING DEVICE

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Fig. 6.



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CAR UNLOADING DEVICE

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Fig. 7.

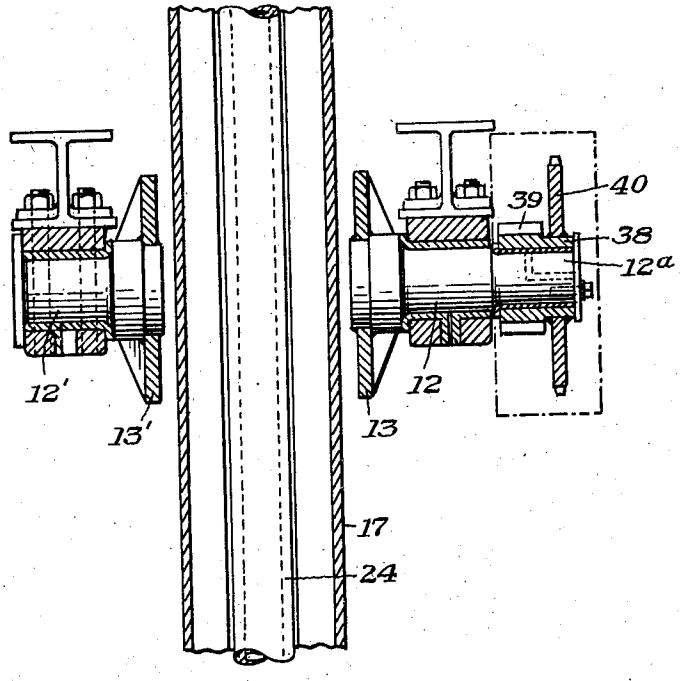
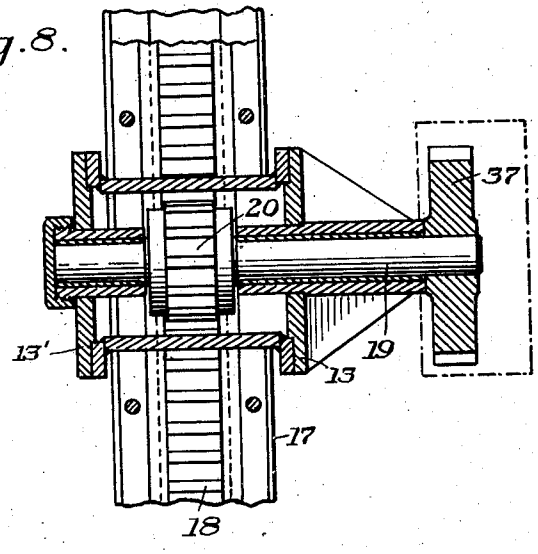


Fig. 8.



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CAR UNLOADING DEVICE

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Fig. 12.

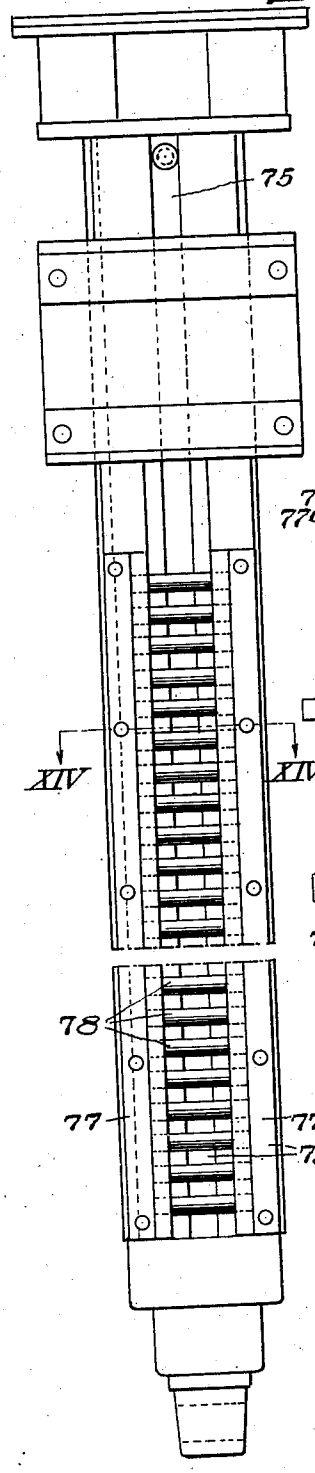


Fig. 14.

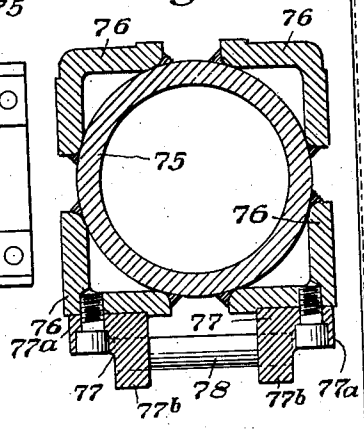


Fig. 15.

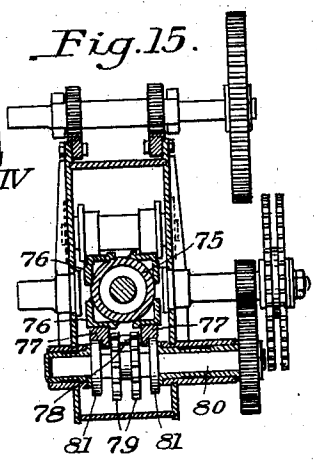
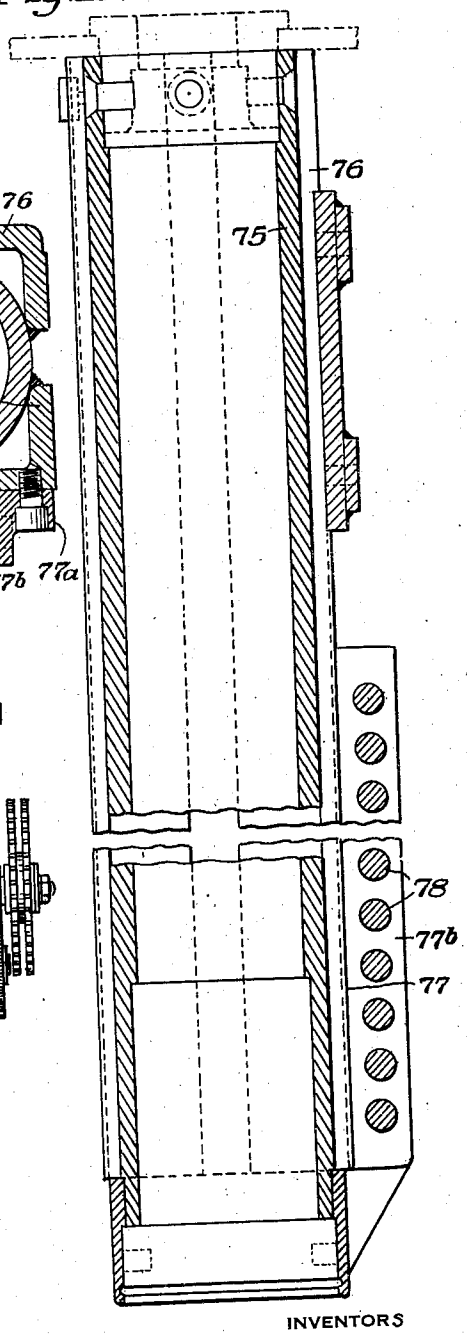


Fig. 13.



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Patented Aug. 27, 1946 2,406,546

UNITED STATES PATENT OFFICE

2,406,546

CAR UNLOADING DEVICE

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Application January 5, 1944, Serial No. 517,040

9 Claims. (Cl. 262—8)

1

This invention pertains to a car unloading device and is for an apparatus for the unloading of bulk material from hopper cars or like containers. It has been especially developed for the unloading of iron ore from hopper cars, and it will be hereinafter described in that connection, but it may be likewise used for the unloading of other materials where similar conditions are encountered.

Iron ore is usually in a finely divided condition. It tends to pack into a very dense mass, and this packing is aggravated in the long hauling of the ore in a railroad car from the place where it is loaded to the place where it is to be unloaded. The packing is also aggravated by the presence of moisture, and this is especially so in cold weather when the moisture freezes.

As a result of this packing and the extreme reluctance of the material to flow, it is difficult to discharge it from the hopper cars in which it is shipped. The present methods require the services of a crew of laborers who have to get into the car and work with picks and crowbars to dislodge the ore. This is not only very hard work, and disagreeable work, but consumes considerable time and is expensive.

The present invention provides an implement carried from an overhead crane which may be manipulated to all the necessary angles and conditions in the car to accomplish the unloading of the ore or other material. The unloading operation can, with the use of this mechanism, be substantially entirely performed by one operator, conserving both man power and time.

According to the present invention, there is provided along the trackway where the car is to be unloaded, which is usually an elevated trackway or trestle, an overhead crane, the runway for which is parallel with the tracks along which the car moves. Movable back and forth on the traveling crane is a trolley or carriage. This trolley or carriage supports a ram or like implement, and mechanism on the carriage is provided for moving the ram up and down, i. e., longitudinally of its axis. Other mechanism is provided for swinging the implement in a direction fore and aft of the car from a vertical position. Thus the implement can be operated vertically or inclined in either a fore or aft direction. It may be elevated and rammed down into the material in the car. By movement of the trolley crosswise of the track, the implement can be moved transversely across the full width of the car. Thus the body of material in the car can be attacked from all necessary angles and at all

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positions in the car. Additionally, the ram device is preferably provided with a rotatable working end with mechanism for rotating the working end so as to drill or dig down into the material in the car. Moreover, the present invention contemplates that the implement in the working end may from time to time be changed according to the material in the car.

The implement is under the control of an operator, positioned in a cage on the crane. Thus the operator can move the crane and manipulate the unloading device and because of his elevated vantage point, is enabled to see and plan the operation of the implement.

In the accompanying drawings which illustrate one embodiment of my invention,

Figure 1 is an end view showing more or less schematically the trackway, the position of the car to be unloaded, the runway for the crane, and the unloading device depending from the trolley of the crane. The implement is shown in a position where it is projected well down into the car;

Figure 2 is a top plan view of the arrangement shown in Figure 1;

Figure 3 is a side elevation, the view being at right angles to Figure 2;

Figure 4 is a detail view similar to Figure 1, showing a lesser portion of the crane and showing in dotted lines the retracted position of the implement where it is clear of the car;

Figure 5 is a detail view showing the drive through which the axial movement is imparted to the implement and also showing a portion of the implement through which the tilting of the implement is effected, the view being a transverse plane of line 5—5 of Figure 6;

Figure 6 is a longitudinal section on a larger scale of the implement showing a portion of the gearing through which the implement is raised and lowered, and also showing the gearing through which the tilting is accomplished, the view also showing the drive by means of which the operating element at the end of the implement may be rotated;

Figure 7 is a vertical transverse section at right angles to Figure 6, the view being in the plane of line 7—7 of Figure 5;

Figure 8 is a fragmentary view showing the rack and pinion drive for extending and retracting the implement;

Figure 9 is a fragmentary view of the lower end of the unloading device showing the use of an air hammer at the end of the ram in lieu of the spiral tool shown, for example, in Figure 6;

Figure 10 is a detail view at right angles to Figure 9, showing the connection at the lower end of the ram device for securing the digging tool in place, and

Figure 11 is a side elevation of a space-like digging tool which can be substituted in lieu of the tool shown in Figures 6 and 9;

Figure 12 is an elevation of a modified form of ram;

Figure 13 is a longitudinal section through the ram of Figure 12.

Figure 14 is a transverse section in the plane of line XIV—XIV of Figure 12;

Figure 15 is a transverse section similar to Figure 5, showing the drive for the modified form of ram.

In the drawings, 2 designates a railroad track, along which the car diagrammatically indicated at C travels. Normally, this trackway is elevated, or is a trestle, so that the material which is unloaded can fall to a receiving space below. According to the present invention, there is provided a structure 3 having rails 4 extending parallel with the trackway along which is movable a crane 5. This crane is in general similar to a usual traveling crane structure, being provided with longitudinal frame members 6 and transverse frame members 7. It is provided with a depending operator's cab 8. The cross members 7 provide a runway for a trolley 9.

Suspended from the trolley is a structural frame 10 (see Figure 1), having bearings 11 thereon, which bearings, as shown in Figure 7, provide supports for trunnions 12 and 12'. Trunnion 12 is provided with a plate 13, and trunnion 12' is carried on a plate 13'. These two plates are of the shape shown in Figure 6 and they are joined together by a transverse member 13a (see Figure 6), and by a housing structure 13b. The plates 13 and 13' are provided with two pins 14, on which are flanged rollers 15. The flanged rollers 15 provide guides for a reciprocable ram 17, which ram is of tubular construction of squared cross section, as best shown in Figure 5, and which is assembled from two channels 17' turned toward each other and connected by plates 17a and 17b. The plate 17b opposite the rollers 15 is provided with a longitudinally extending rack 18. Transverse shaft 19, supported in the plates 13 and 13', is provided with a pinion 20 that meshes with the rack 18, and the pinion 20 serves to hold the ram in position against the guide rollers 15, in addition to providing a means for an effecting longitudinal movement of the ram.

At the lower end of the tube 17 is a bearing structure 21, and at the top of the tube 17 is a plate 22 that carries a bearing structure 23. A longitudinally extending shaft 24 concentrically positioned in the tube 17 is engaged in the bearings 21 and 23. At the upper end of the shaft 24 is a gear 25 which meshes with a smaller pinion 26, which pinion is on a stud shaft 27 and is coupled with a larger pinion 28 which, in turn, is engaged by pinion 29 on the end of the shaft 30 of a driving motor 31. Operation of the driving motor 31 serves to rotate the shaft 24, the train of gearing constituting a reducing gear. The lower end of the shaft 24, where it passes through the bearing 21, is provided with a sleeve 32, which sleeve has a downwardly extending flange forming a socket 33. The walls of this socket are provided with key slots so that by means of a removable transverse key 34, the shank 35 of an appropriate tool or implement 36 can be attached to the lower end of the rotatable

shaft 24. In Figure 6, the tool 36 is illustrated as comprising an auger-like implement. To disconnect the implement 36 and substitute another tool, it is merely necessary to remove the drive key 34.

The pinion 20 is keyed to the shaft 19. As shown in Figure 8, the outer end of the shaft 19 is provided with a gear 37. The trunnion 12 has a reduced extension 12a on which is a sleeve 38, which sleeve is provided with a gear 39 that meshes with the pinion 37. The sleeve 38 is also provided with a sprocket wheel 40. The sprocket wheel 40, as best shown in Figures 2 and 4, is engaged by a chain 41, which chain also passes around a sprocket wheel 42 on the end of the shaft of driving motor 43, which motor is hung in a frame 44 on the trolley of the crane. The motor 43 is a reversible motor, and by driving it in one direction or the other, motion is transmitted to the gear wheel 20 that engages the rack on the ram 17 for moving the rack in one direction longitudinally, or the other.

It will be noted that because the plates 13 and 13' which carry the ram are supported on trunnions, that the ram can swing the direction fore and aft of the car C away from a vertical position. As shown in Figures 3 and 4, the ram can swing to a position 45° more or less each side of vertical. Because of the fact that the sprocket 39 is concentric about the axis on which the ram swings and the gear 37 is in the relation of a blanket to the gear 39 associated with the sprocket, it is possible to have the driving motor, which is preferably a motor capable of developing considerable power, fixed on the trolley, notwithstanding the fact that the ram itself can swing to different angular positions. In other words, the arrangement of the gear which has been described enables the motor for moving the rack back and forth, to be in a fixed location while the ram itself is capable of swinging in an arc.

As shown in Figures 5 and 6, the plate 13a which connects the two segment shaped plates 13 and 13' is provided with an arcuate rack 45. This rack is engaged by a pinion 46 on a shaft 47. As shown in Figure 3, the shaft 47 is hung from a bracket 48 on the trolley, and it is provided with a sprocket wheel 49. A sprocket chain 50, passing around the wheel 49, also passes around sprocket wheel 51 on a shaft 52 mounted on a depending part of the trolley frame. Shaft 52 in turn is provided with a second sprocket wheel 53 of larger diameter, around which passes a sprocket chain 54 that engages also a sprocket gear 55 on the shaft of the driving motor 56. The driving motor 56 is also fixed on the trolley frame and it is also a reversible motor. By driving it in one direction or the other, the pinion 46 can be turned in one direction or the other to move the rack 45 up or down, and thereby tilt or rock the ram one direction or the other from a vertical position. With the parts in the position shown in Figure 6, the ram is vertical, and the gear 46 is engaged in the central point of the arcuate rack 45.

Thus it will be seen that the motor which serves to tilt the ram, as well as the motor which serves to move the ram up and down, is in a fixed position on the trolley frame. The only motor which is movable with the ram is the motor 31 that serves to rotate the tool at the lower end of the ram.

In the operation of the unloading device, the car C is brought to the position on the track where it is to be unloaded. The ram is run back to its uppermost position, which is approximately

the dotted line position shown in Figure 4. The crane is then maneuvered into position over the car. The operator in the cage **8** is able to clearly see the ram and follow its operations. When the crane has been moved into the desired position and the doors on the hopper car have been opened, the motor **31** may be set into operation and the ram may be driven at slow or high speed, as conditions may dictate, and as the operator may determine upon, into the ore in the car. It will serve to push the ore out of the car and to drill through the ore, loosening it up. It can be projected into the ore at various angles and by moving the trolley back and forth on the carriage of the train, it can work at the middle of the car or at any other place across the full width of the car. After it unloads the ore at one end of the car, the crane can be moved along to work upon the ore at the other end or at any intermediate position, and the slope at which the ram works can be constantly varied. A skillful operator can quickly learn to shift the ram and manipulate the crane to good advantage to rapidly unload the car. The ram may be moved with considerable rapidity in order to strike a blow, or it may be moved slowly, this all being under control of the motor **43**.

In many instances, it may be desirable, in place of using an auger-like bit on the end of the ram to use a spade or a chisel-like bit such as shown in Figures 3 and 11. In these views, the bit is designated **36'**. It can be substituted for the bit **36**, as previously indicated, merely by removing the drive key **34**. Also, particularly when the ore is frozen, it may be desirable to use a pneumatic hammer on the lower end of the ram. This is illustrated in Figure 9 where the pneumatic hammer **60** is provided at its upper end with an adapter **61** having a portion **62** that fits in the socket **33** and is engaged by the drive key **34**. The lower end of the air hammer may have a suitable bit **63**. The bit **63**, forced by the air hammer, may be forced down into the ore under heavy pressure by the hammer, and at the same time the air hammer **31** may be driven to slowly turn the entire air hammer to different positions, and of course the slope of the ram may be changed from time to time, as required.

It should be noted in connection with Figure 1 that the crane is provided with keeper elements **5'** that engage under the top flanges of the I-beam rails **4**. These are for the purpose of preventing the crane carriage from lifting off the rails when the ram encounters considerable resistance.

Usually there is a string of several cars to be unloaded and after one car has been finished, the crane can move to the next. It is also contemplated that the operator, by astute use of the ram, may actually move an empty car along the trackway, should this be necessary. It will be noted from Figure 2 that the cage is located forwardly of the carriage as well as being at one side of the carriage. The purpose of this is to enable the trolley which carries the ram to move clear over to one side of the carriage of the crane where it will be in line with the operator's cage, and where it will be entirely out of the way of any locomotive that has to pass under the crane in the operation of bringing cars into place, or removing them.

The unloading device as herein described, provides a powerful and effective means for unloading material such as ore. As above indicated, it can operate at various angles from a vertical position in a fore and aft direction, and it can

be moved back and forth crosswise of the car, as well as back and forth lengthwise of the car. The construction of the ram is such as to withstand abusive use, and considerable advantage is gained from the fact that of the three motors used for manipulating the ram and turning the bit, only one of them is on the ram itself. The arrangement whereby the motor **43** can be at a fixed location on the trolley while the pinion which it drives to engage the rack can move about in various positions, is particularly advantageous.

In some cases, the teeth of the rack may tend to clog with ore or other material being worked upon. To avoid this, and assure of the smooth operation of the ram, the modification shown in Figures 12 to 15 may be employed.

In this modification, the body of the ram comprises a metal tube **75** of heavy wall thickness with corner angles **76** welded thereto and extending therealong throughout substantially the entire length thereof, these angles being positioned 90° apart. (See Figure 14.) Secured to two of these angles **76** are angular rails **77** having a base flange **77***a* and an upstanding rib or flange **77***b*. Equally spaced round bars or rungs **78** passing through the flanges **77***b* provide a rack of ladder-like construction.

The ram is mounted, guided, and operated in a manner generally similar to Figure 5, except that two sprocket wheels **79** on a shaft **80** engage the rungs or rounds of the rack. The shaft **80** also has rollers **81** thereon which roll on the flanges **77***a* of the bars **77** to take the thrust, so that the sprocket wheels work freely and without transverse thrust on the ladder-like rack. Shaft **80** corresponds otherwise to shaft **19** of Figure 5, and the other parts are substantially the same.

Any material that packs in the rack may be dislodged and fall out of the rack or escape between the two sprocket wheels **79**, so that this mechanism is substantially self-cleaning.

It will be understood that my invention provides various other features of novelty which have not been herein specifically mentioned, and that the drawings illustrate one embodiment of my invention, but that the inventions may be otherwise embodied and that various changes and modifications may be made within the construction of my invention and under the scope of the following claims.

We claim:

1. A car unloader comprising an overhead trackway and a traveling crane structure movable along the trackway in a direction parallel with the longitudinal axis of the car to be unloaded, a trolley on the traveling crane structure movable crossways thereof, and a ram on the trolley movable in an axial direction, means for so moving the ram, and means for swinging the ram in an arc generally lengthwise of the car, the ram being carried in a rocking frame hung from the trolley, said means for operating the ram comprising a gear on the frame, the axis of rotation of which coincides with the axis about which the ram pivots, a pinion driven by said gear, there being a rack element on the ram with which the pinion engages.

2. A car unloader comprising an overhead trackway and a traveling crane structure movable along the trackway in a direction parallel with the longitudinal axis of the car to be unloaded, a trolley on the traveling crane structure movable crossways thereof, and a ram on the trolley movable in an axial direction, means for so moving the ram, and means for swinging the

ram in an arc generally lengthwise of the car, the ram being carried in a rocking frame hung from the trolley, said means for operating the ram comprising a gear on the frame, the axis of rotation of which coincides with the axis about which the ram pivots, a pinion driven by said gear, there being a rack element on the ram with which the pinion engages, said rack comprising a ladder-like series of spaced rungs on the ram, the pinion having sprocket teeth to mesh with said rungs.

3. A car unloader comprising an overhead trackway and a traveling crane structure movable along the trackway in a direction parallel with the longitudinal axis of the car to be unloaded, a trolley on the traveling crane structure movable crossways thereof, and a ram on the trolley movable in an axial direction, means for so moving the ram, and means for swinging the ram in an arc generally lengthwise of the car, the ram being carried in a rocking frame hung from the trolley, said means for operating the ram comprising a gear on the frame, the axis of rotation of which coincides with the axis about which the ram pivots, a pinion driven by said gear, there being a rack element on the ram with which the pinion engages, said rack comprising a ladder-like series of spaced rungs on the ram, the pinion having sprocket teeth to mesh with said rungs, said pinion comprising spaced teeth with sprocket teeth thereon that engage the rungs.

4. In a car unloader of the class described, a ram comprising a tubular body having longitudinally extending angle bars secured thereto at 90° intervals thereabout with the apexes of the angles turned outwardly, two of said angle bars having ribs thereon, there being spaced rungs forming a ladder-like rack carried by the ribs, a frame structure through which the ram passes, a pinion and roller element in the structure engaging said rack, a shaft for the pinion and roller element, means constituting trunnions for the frame structure, a roller in the structure opposite the pinion engaging bars on the ram opposite those which carry the rack, a trolley in which said trunnions are supported, means for tilting said structure, and means for driving said shaft including a gear, the axis of which coincides with the axis of the trunnions.

5. Car unloading apparatus of the class described comprising a traveling crane structure movable longitudinally of the car to be unloaded, a trolley on the crane movable transversely of the car, a frame on the trolley pivotally supported to rock in a plane parallel with the direction of travel of the crane, motor means for rocking the frame, a ram with a digger thereon carried by the frame, and means for moving the ram in an axial direction, said means for moving the digger including a drive gear coincident with the axis about which the frame swings.

6. Car unloading apparatus of the class described comprising a traveling crane structure movable longitudinally of the car to be unloaded, a trolley on the crane movable transversely of the car, a frame on the trolley pivotally supported to rock in a plane parallel with the direction of travel of the crane, motor means for rocking the frame, a ram carried by the frame, means for moving the ram in an axial direction, an adapter on the lower end of the ram, and a digger releasably held in the adapter, said digger including an air hammer.

7. A car unloader of the class described comprising a ram having a digging tool on the lower end thereof, means from which the ram is suspended and in which the ram is axially movable but fixed against rotation, said means being movable longitudinally of the car to be unloaded and also transversely thereof, means for positively driving the ram up and down with reference to the means from which it is suspended, and separate power driven means for forcefully swinging the ram in an arc in a direction fore and aft of the car for shoveling the contents thereof either simultaneously with or separately from said positively driven ram driving member.

8. Car unloading apparatus of the class described comprising a traveling crane structure movable longitudinally of the car to be unloaded, a trolley on the crane movable transversely of the car, a frame on the trolley pivotally supported on the trolley to rock on an axis transverse to the direction of travel of the trolley whereby the frame may swing in the direction of the longitudinal axis of the car, motor-driven means and gearing for rocking the frame in an arc fore and aft of the car for shoveling the contents thereof, an agitator movable axially in the frame and comprising an elongated rigid ram element, and other reversible power driven means for operating the agitator to move axially in the frame either simultaneously with or separately from said rocking movement of said frame.

9. Car unloading apparatus of the class described comprising a traveling crane structure movable longitudinally of the car to be unloaded, a trolley on the crane movable transversely of the car, a frame on the trolley pivotally supported to rock in a plane parallel with the direction of travel of the crane, motor means and gearing for rocking the frame, a ram carried by the frame, reversible power-driven means for positively moving the ram in an axial direction either up or down, whereby the ram may be simultaneously reciprocated and swung in an arc to simultaneously penetrate the material to be unloaded and shove such material longitudinally, an adapter on the lower end of the ram, and a digger releasably held in the adapter.

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