A. WALLACE.

BOX CAR UNLOADING PLOW AND PROCESS OF UNLOADING CARS.

APPLICATION FILED JUNE 3, 1914.

1,201,005. Patented Oct. 10, 1916.

3 SHEETS—SHEET 1.

Fig. 1.

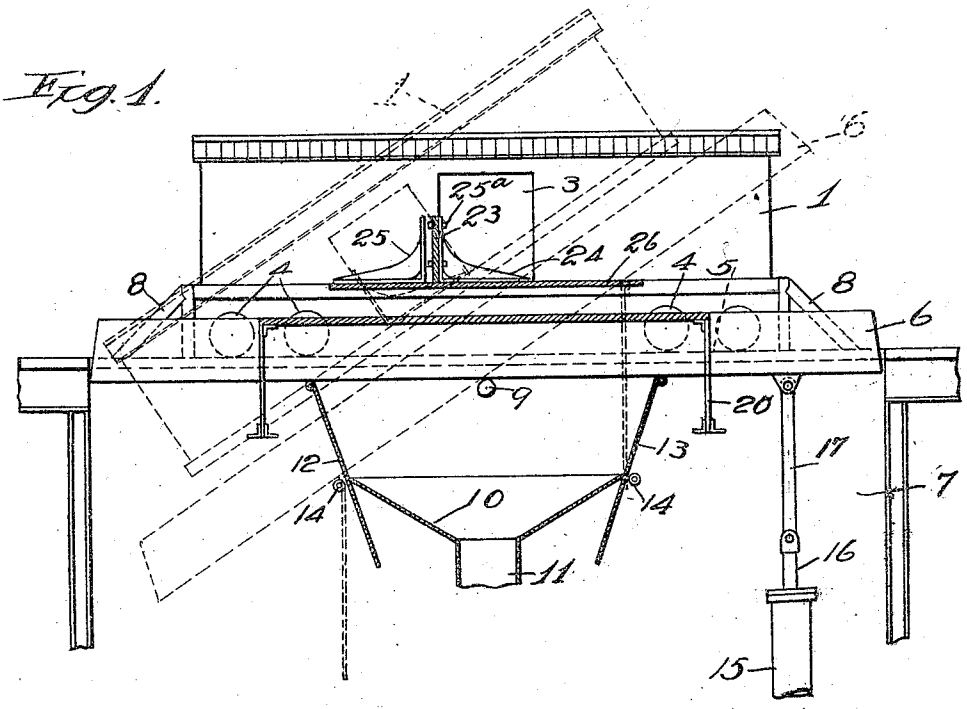
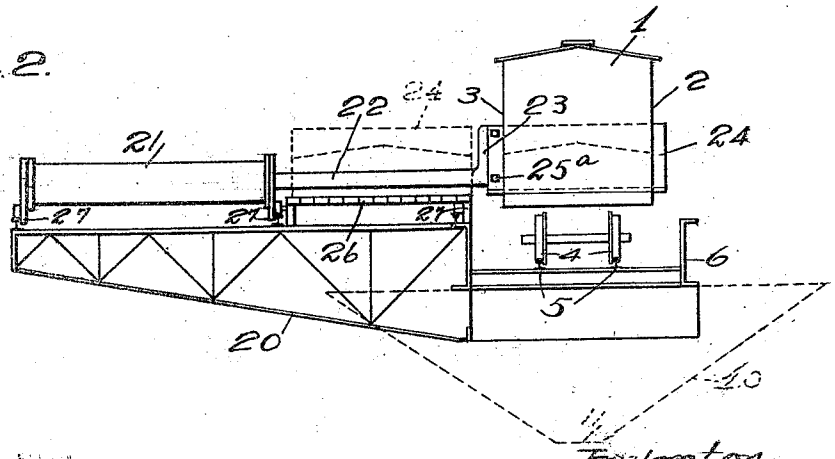


Fig. 2.



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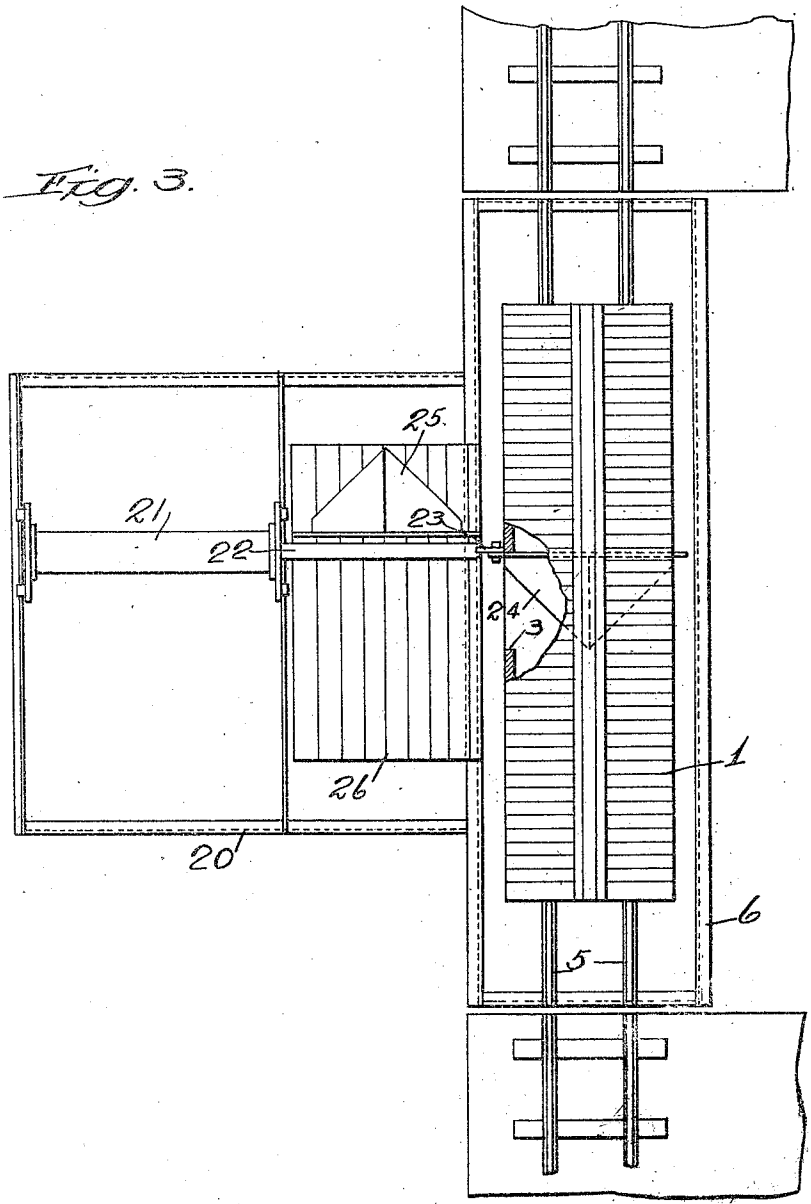
3 SHEETS—SHEET 2.

Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 4

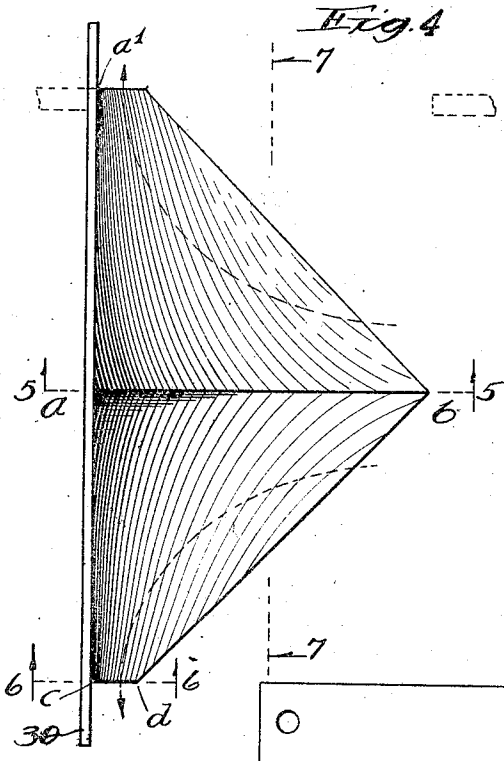


Fig. 5

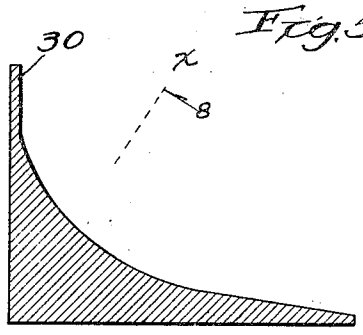


Fig. 6

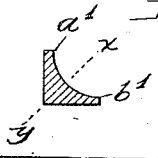


Fig. 7.

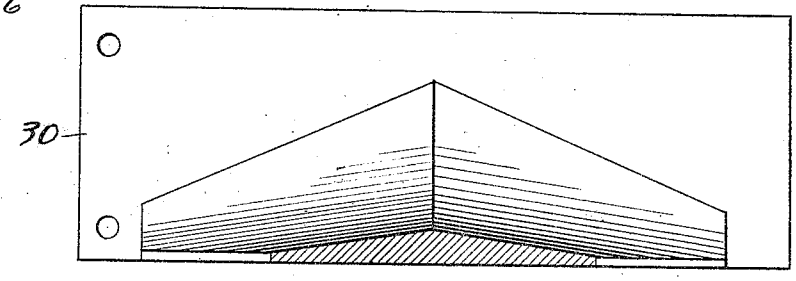
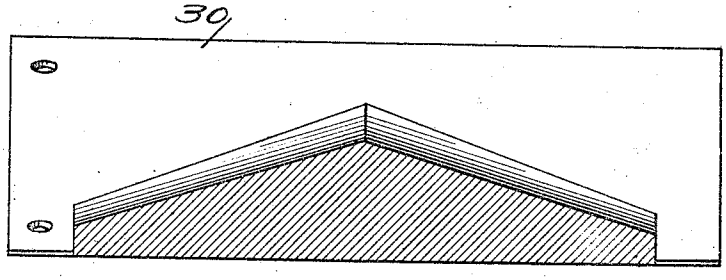


Fig. 8.



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UNITED STATES PATENT OFFICE.

ANDREW WALLACE, OF CHICAGO, ILLINOIS.

BOX-CAR-UNLOADING PLOW AND PROCESS OF UNLOADING CARS.

1,201,005. Specification of Letters Patent. Patented Oct. 10, 1916.

Application filed June 3, 1914. Serial No. 842,640.

To all whom it may concern:

Be it known that I, ANDREW WALLACE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Box-Car-Unloading Plows and Processes of Unloading Cars, of which the following is a specification.

When box cars are loaded with coal, ore and other such materials it is frequently necessary to provide means for unloading them by tilting the car bodily so as to permit the material to flow out through the doors. Since the angle of rest of coal on coal or ore on ore is upward of 30° it is necessary in order to cause the material to flow freely to tilt the car through an angle of more than 30° in a longitudinal plane and any considerable excess over 30° results in permitting the coal to flow past the door while it is necessary to insure any coal being discharged sidewise through the door. In order therefore to permit the discharge of a maximum amount of coal or ore with a minimum tilting excursion I propose to provide a plow which may be inserted transversely into and through the box car door so that when the car is tilted the plow will act as a guide or chute to deflect and feed the material and prevent its backing up and running down into the lower end of the car.

My invention therefore relates to a box car unloader of the tilting type and process of unloading cars and is illustrated more or less diagrammatically in one form in the accompanying drawings, wherein—

Figure 1 is a side elevation with parts in section of a box car unloader. Fig. 2 is an end elevation. Fig. 3 is a plan view in part section with a box car unloader. Fig. 4 is a plan view of the plow itself. Fig. 5 is a section on the line 5—5 of Fig. 4. Fig. 6 is a section on the line 6—6 of Fig. 4. Fig. 7 is a section on the line 7—7 of Fig. 4, and Fig. 8 is a section on the line 8—8 of Fig. 5.

Like parts are indicated by like letters throughout the several figures.

1 is a box car having doors 2, 3, supported on wheels 4 which rest on the track 5 on a cradle 6. This cradle is located in a pit 7.

8 are stops mounted on the cradle and engaging the ends of the car to prevent longitudinal movement of the car. The cradle is pivoted upon the shaft 9, and free to rotate thereon in a plane of the longitudinal axis of the car.

10 is a fixed collecting hopper or chute discharging through a passage 11.

12, 13 are aprons pivoted on the lower sides of the cradle 6 and slidable along the opposed side of the hopper 10, being kept in fixed relation thereto by rollers 14, so as to guide the material discharged from the car into the hopper.

15 is the hydraulic cylinder having a plunger 16 connected by means of a connecting rod 17 with the cradle 6 whereby the cradle may be rocked or rotated to tilt the car.

20 is a plow frame rigidly attached to the cradle 6.

21 is a controlling cylinder mounted on the plow frame 20 and provided with a hydraulically actuated plunger 22, and upon this plunger is mounted a plow back or stop 23.

24, 25 are right and left hand plows resting normally on the platform 26 on the plow frame 20. Each of these plows is adapted to be separately attached to the plow back or stop 23 by any suitable means, as for instance, the bolts 25^a, as shown. The platform 26 and the cylinder 21 are all mounted on the frame 27 which frame is free to move in a direction parallel with the axis of the box car, so as to permit either plow to be used at the will of the operator. The two plows are identical and a description of one will therefore suffice for both. The action of the plow is very similar to the action of the ordinary type of agricultural plow. In other words wherein plowing a field the material is at rest and the plow is forced into and toward it penetrating first underneath the ground and as the ground is guided up along the curved surface turning it over; in this case the plow is at rest and the material is fed to it. This material rides up along the gradually curving plow surface, and is finally turned over and discharged, its direction of movement having been meanwhile varied through an angle of 90°.

Figs. 4 to 8 show very clearly the shape and dimensions of the plow. 30 is a reinforcing plate adapted to be attached to the part 23. The plow itself is made up of two intersecting curved surfaces which intersect along a dividing line parallel with and located in the vertical axial plane of the car, so that material is deflected out of both doors

of the car. It is to be noted that the curvature of these surfaces increases progressively toward the rear until, as shown in Fig. 5, a point is reached at which when the car is inclined so that the line $x\ y$ is vertical, a curved chute is formed as at $a\ b$. This curved chute while it is of relatively slight width carries the major part of the material. This chute ends abruptly, as indicated in Fig. 5, and also tapers down from its relatively great width $a\ b$ to a comparatively narrow width at $a'\ b'$ where the discharge takes place. The coal as it flows down the car approaches the plow along the dotted line rides up on the plow being gradually deflected and turned over by the curved surface and finally discharged, as indicated by the arrow. The width of the plow from a to b is substantially equal to the width of the door and while as the material discharges a certain relative small amount flows out along the length of the door, experience shows that substantially all the material is as above suggested discharged between the points $c\ d$, and if the flow of material at that point is by any means arrested material will instantly cease flowing at all other points and no further discharge will take place until the flow again commences at a', b'.

I have illustrated this device in a more or less rough and general manner, and have not gone exhaustively into the details of construction, particularly those features other than my plow itself, and the controlling means therefor. It will of course, however, be obvious that many changes might be made and modifications introduced without departing in any material way from the spirit of my invention. I wish therefore that my drawings be regarded in a sense diagrammatic.

The use and operation of my invention are as follows: The box car is first moved into position on the tilting cradle and locked there by any suitable means shown. Any ordinary means which will raise the car will be used and such means are, of course, common. Either one of the plows is then attached to the ram and the cradle carrying ram and plow moved in the appropriate position. The ram is then operated to force the cradle into the box car. The cradle is then rocked or rotated to tilt the car into the position shown in dotted lines. The material runs down impinges upon the plow and is discharged on both sides or if it is desired to have the discharge on one side the one door will be closed. As shown the material runs along the curved surface of the plow and gradually makes the turn so that it is discharged at right angles to the plow. The shape of the plow is important. It must be curved as indicated so that when in operation a comparatively narrow stream of rapidly moving material is discharged across the plow surface. The plow surface is smooth and the movement concentrated at that point. Experience shows that the flat plow will not work, that the car must be tilted too far and even then the flow is sluggish and the material is broken and crushed and comes out in an irregular fashion, whereas by the use of my plow a very slight inclination sets up a current and the material is discharged smoothly and without irregularity. When one end of the car is emptied, the cradle is rocked, the car returned to its normal position and the plow withdrawn, disconnected from the ram and the other plow connected. The ram platform then is moved and the process repeated. It is obvious, however, that but one plow might be used for the plow could be easily turned around after one end is emptied and used for the other end. This can be done because the plows are exactly symmetrical. I prefer, however, to use two plows because of the saving of time and the greater ease with which the plow may be attached to the beam without turning.

It will be understood that the curved surfaces of the plow are substantially bowl-shaped, that is to say, they may be likened to segmental surfaces cut from a bowl, and they tend to form a bank or guide for the material and to turn it or deflect it from one direction to another just as the bank on a track does, that is to say, as the coal comes down the incline, it rides up on the bowl surface, and is gradually turned or deflected into the chute or channel surface, and is discharged at right angles from its previous path.

It will be noted that as my process is carried out, it operates when the car is tilted, to compensate the stream of slowly moving material, moving parallel with the axis of the car, by deflecting it about a gradually curved path into a thin close contracted rapidly moving stream substantially at right angles to the axis of the car. Of course this stream may not in total, including every particle, be at right angles to the car, but generally speaking its mass is traveling, when the operation is going on, at high speed, at a line substantially perpendicular to the car.

I claim:

1. The process of unloading cars which consists in first tilting the car about an axis perpendicular to the axial line of the car, and then guiding the material in the car along a curved path turning gradually from parallelism with the axis of the car to perpendicularity thereto and concentrating a broad stream of material moving slowly parallel with the car into a thin stream moving rapidly at right angles to the axis of the car.

2. The combination with a box car having open side doors, of means for tilting the car, and means comprising a plow for guiding the material in the car along a gradually curved path and discharging it from the car along a line substantially perpendicular to the axis of the car.

3. The process of unloading cars which consists in first tilting the car about an axis perpendicular to the axial line thereof until the inclination of the car floor is greater than the angle of rest of the material thereon, and then deflecting the material as it travels down the inclined floor under the influence of gravity from a path parallel with the axis of the car along a gradual curve to a path perpendicular to the axis of the car.

4. The process of unloading cars which consists in first tilting the car about an axis perpendicular to the axial line thereof until the inclination of the car floor is greater than the angle of rest of the material thereon and then deflecting the material as it travels down the inclined floor under the influence of gravity from its path of parallelism with the axis of the car into a path substantially at right angles to the axis of the car, and concentrating the stream of material thus deflected into a compact high speed stream, smaller in cross section than the sluggish stream moving within the car, and traveling along a line substantially at right angles to the axis of the car.

5. The process of unloading cars which consists in first tilting them about an axis perpendicular to the axial line thereof until the inclination of the car floor is greater than the angle of rest of the material thereon, and then deflecting the stream of material traveling downward along the car floor, guiding it into a path gradually approaching perpendicularity to the axis of the car, and increasing the velocity and decreasing the cross section of such stream.

6. The process of unloading cars which consists in first tilting the car about an axial perpendicular to the axial line thereof until the inclination of the car floor is greater than the angle of rest of the material thereon, and then guiding the material toward the center of the car upwardly above the floor thereof, splitting the stream of material and deflecting the two streams thus formed gradually in opposite directions into paths substantially perpendicular to the axis of the car and discharging such streams from the car.

7. The process of unloading cars which consists in first tilting the car about an axis perpendicular to the axial line thereof until the inclination of the car floor is greater than the angle of rest of the material thereon, and then gradually raising and deflecting the central portion of the stream as it reaches the upper side of the car doors and dividing such stream into two parts, deflecting said parts outwardly gradually raising and curving them about a path which terminates in a discharge at substantially right angles to the axis of the car.

8. The process of unloading cars which consists in first tilting the car about an axis perpendicular to the axial line thereof until the inclination of the car floor is greater than the angle of rest of the material thereon, and then deflecting the material as it reaches a line adjoining the upper sides of the two car doors and gradually curving it about a substantially circular path and discharging from the car at right angles to the axis of the car.

9. The combination with a box car having open side doors of means for tilting the car and means for guiding and concentrating the material in the car as it moves downwardly along the axis of the car into a concentrated thin rapidly moving stream and discharging such stream at right angles to the axis of the car.

In testimony whereof, I affix my signature in the presence of two witnesses this 25th day of May 1914.

ANDREW WALLACE.

Witnesses:
LAUREL M. DOREMUS,
BESSIE S. RICE.