W. FERRIS.

BALLAST UNLOADER.

APPLICATION FILED JULY 17, 1909.

972,070.

Patented Oct. 4, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

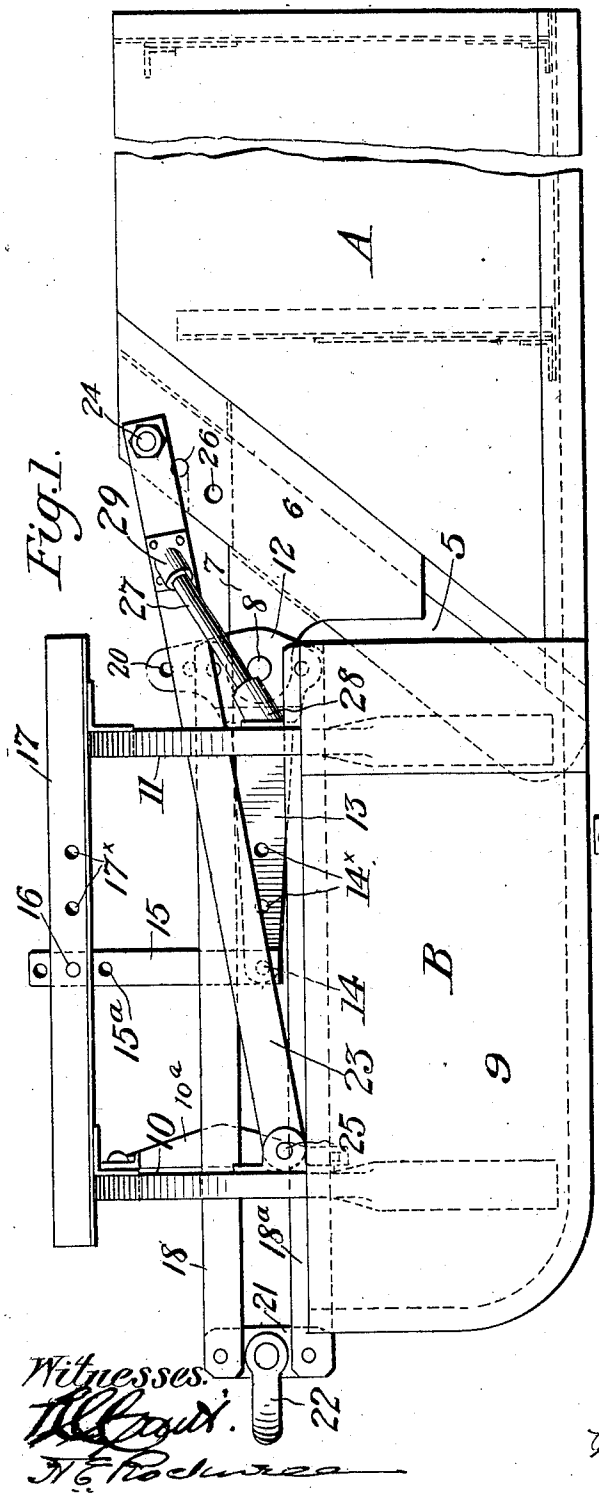
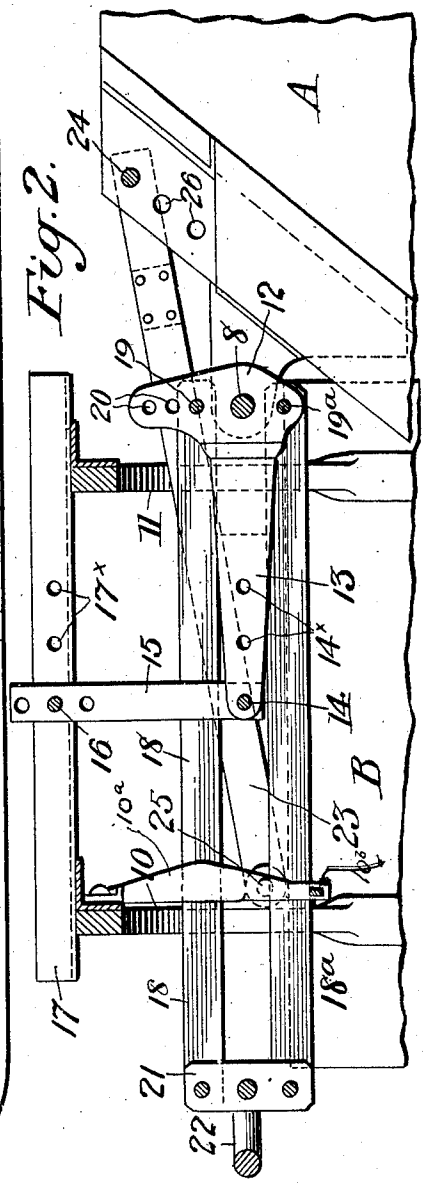


Fig. 2.



Witnesses.

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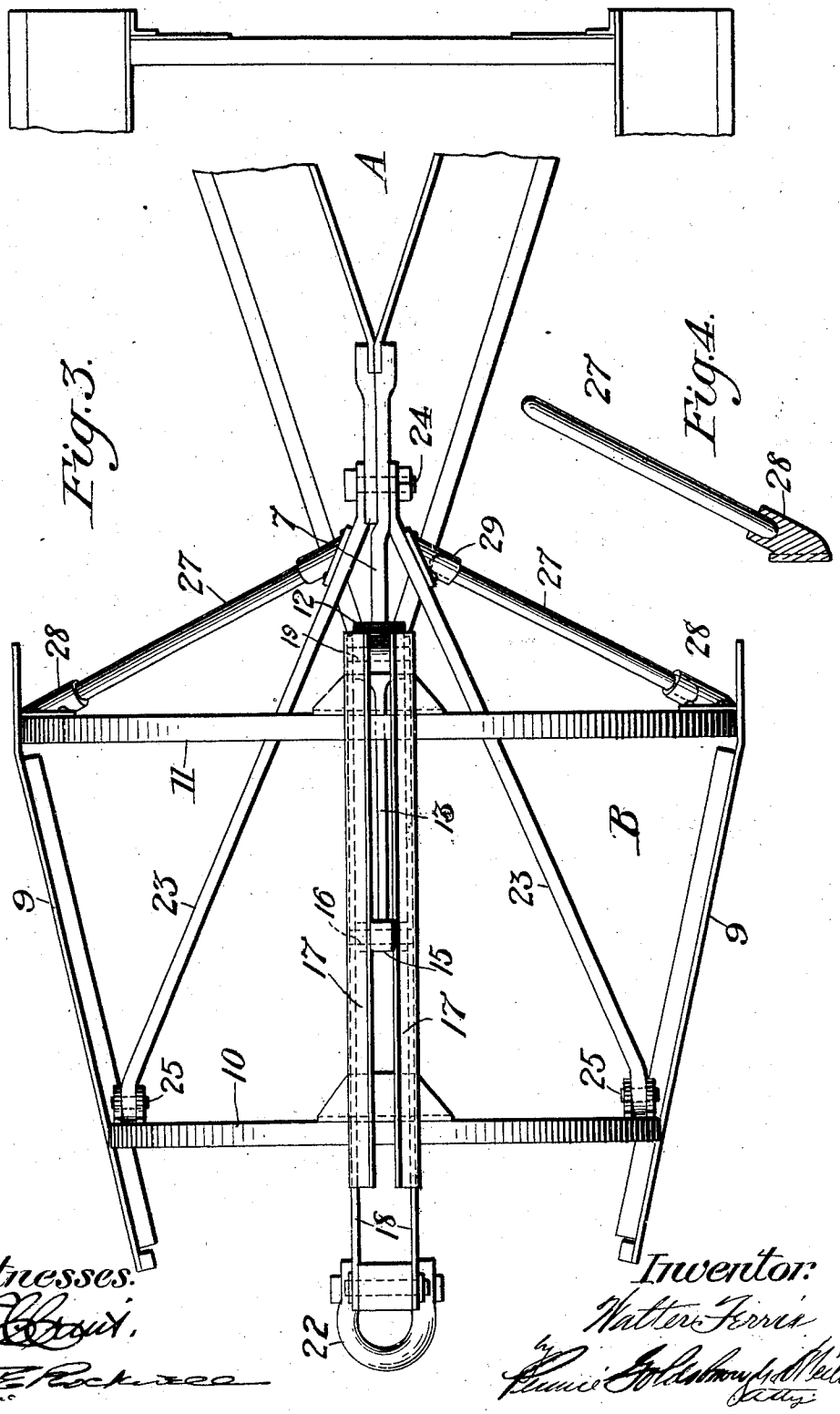

Fig. 3.

Fig. 4.

Witnesses.

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UNITED STATES PATENT OFFICE.

WALTER FERRIS, OF SOUTH MILWAUKEE, WISCONSIN, ASSIGNOR TO THE BUCYRUS COMPANY, OF SOUTH MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

BALLAST-UNLOADER.

972,070. Specification of Letters Patent. **Patented Oct. 4, 1910.**

Application filed July 17, 1909. Serial No. 508,228.

To all whom it may concern:

Be it known that I, WALTER FERRIS, a citizen of the United States, residing at South Milwaukee, county of Milwaukee, and State of Wisconsin, have invented certain new and useful Improvements in Ballast-Unloaders; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to ballast unloaders, and more particularly to the devices for this purpose which consist essentially of a main or rear plow and a pilot plow or fender connected therewith at the front, the device being moved along the floors of the flat cars of a train in order to discharge the ballast or other load at opposite sides of each car. The main plow and the pilot plow are usually capable of relative vertical movement in order that the unloader may adapt itself to the inequalities of the surface over which it is drawn. It is also customary to apply the tractive force directly to the nose of the main plow, the draft rope being connected to said nose in a suitable manner, and the forward or pilot plow being pushed along by means of devices interposed between this connection and the mold boards of the pilot plow.

It has been proposed to regulate the downward pressure of the front and rear plows of an unloader of this kind, in order to cause the plows to operate properly on the material to be unloaded, while avoiding unnecessary wear and tear on the floor of the car, by providing a counterbalancing connection between the plows of the unloader, which embodies a counter weighted lever, the adjustment of which regulates the degree to which the plows are forced downward against the floor. The effect of such an arrangement is to transmit a constant weight to the pilot plow for a given position of the counter weight on the lever without regard to how much force it takes to drag the plows along on the surface of the car. Consequently, if the load at a given point is very light, with very little dirt pressing against the forward portion of the main plow and tending to hold it down on the car, the counter weight may be too heavy and have too much tendency to raise the front end of the main plow, causing it to leave the surface of the car. A few moments later the main plow may run into material several feet deep, in which case the counter weight might not be sufficiently heavy to relieve the weight on the main plow as much as it should be relieved.

The primary object of the present invention is to avoid the draw backs just enumerated and to provide an unloader of the type specified in which the downward pressure of the plows is controlled by the tractive force exerted on the unloader. In other words, a construction is provided in which a constant fraction of the varying draft rope pull is converted into a downward pull on the forward plow and a corresponding upward pull on the rear plow. The weight transferred to the front plow is therefore not constant, irrespective of the pull in the draft rope, but varies with the tractive force exerted, whereby the downward force acting on the plows is automatically and effectively regulated to suit the conditions which exist at any particular moment. When the unloader runs through heavy material the front plow is depressed with considerable force and the rear plow raised at its forward portion to a corresponding extent, but when the unloader begins to pull more easily and runs out of the heavy material, the downward pull on the front plow will be automatically and immediately reduced. In this way, superior results, as regards the complete, effective, and rapid unloading of the ballast or other load, are obtained.

It is also an object of the invention to provide improved means for driving or pushing the forward or pilot plow from the forward end of the main plow. There is provided a very direct and strong connection between the nose of the main plow and the forward arch of the pilot plow, whereby the latter plow is driven forward without the liability of bending or breaking any of the parts embodied in the connection between the draft bar or bars and the rear plow.

I have also devised an improved arrangement for centering the plows with respect to each other, that is to say, for holding the center of the rear or main plow at a point midway between the sides of the pilot plow. The improved means consists essentially of direct braces which are loosely held in position, but are capable of withstanding a very heavy push, the loose connection of the

braces permitting them to accommodate themselves to the irregular up and down movements of the pilot plow.

In the accompanying drawing, Figure 1 is a side elevation of a ballast unloader constructed in accordance with the invention, part of the main or rear plow being broken away, Fig. 2 is a vertical longitudinal section of the upper forward portion of the unloader, Fig. 3 is a top plan view of the parts shown in Fig. 1, and Fig. 4 is a detail view showing how the centering braces are seated in their sockets.

The particular form of the main or rear plow and of the pilot plow or fender forms no part of the present invention, which is chiefly concerned with the connection existing between said plows, and by means of which the results enumerated above are obtained. The rear plow A is illustrated as being of the usual type, having an angular forward portion to which an upright cutting plate 5 of well known form is secured. Extending alongside said cutter plate at its upper portion is a draft plate 6, which can be of any preferred form, and said plate has formed thereon a forwardly extending draft lug 7 in which the draft pin 8 is secured. The forward or pilot plow B is provided with the usual mold boards 9 that are connected in the customary way by forward and rear arches 10 and 11 respectively.

The pilot plow and the rear plow are connected by the following mechanism:—The draft pin 8 in the draft lug 7 passes through the intermediate portion of an upright arm 12 which is thereby pivoted on the draft pin, said arm being connected with a forwardly extending arm 13 which forms in conjunction with the arm 12 an elbow lever, the substantially horizontal arm 13 being located above the mold boards 9 of the pilot plow and approximately at the medial line of said plow. The forward end of said arm 13 is adjustably connected by means of a detachable pivot pin 14 with an upright bar 15, the upper end of which is suspended by means of a removable pivot pin 16 from angle bars 17 extending parallel to each other and connecting the arches 10 and 11 at their upper portions, the bar 15 being preferably set in between the angle bars 17 in the manner illustrated. Said angle bars form a bridge between the arches of the pilot plow. The arm 13 of the elbow lever is provided with a number of perforations 14^{x} in which the pivot pin 14 may be inserted in order to connect the bar 15 with said arm at different points in the length of the latter; and the bar 15 is adjustably held between the angle bars 17 in substantially the same manner, said bar 15 being provided for this purpose with perforations 15^{a} for the introduction of the pivot pin 16, whereby the bar 15 may be raised or lowered as desired. The angle bars 17 are each provided with a longitudinal series of openings 17^{x} in which said pin 16 may be set, in order that the desired forward and rearward adjustment of the upper portion of bar 15 may be effected.

The tractive force is applied to the main or rear plow by means of traction bars 18, 18^{a}, the bars 18 being arranged as an upper pair and the bars 18^{a} as a lower pair, all of said bars extending in substantially horizontal direction through the open center portion of the pilot plow. The bars 18 are connected with the lever arm 12 at opposite faces and at a point above its pivot or fulcrum 8, whereas the bars 18^{a} are similarly connected with said arm at its lower end and below said fulcrum. The connection of the pairs of bars with said arm is preferably effected by means of pins 19, 19^{a}, as shown in Fig. 2. The pins 19^{a} are intended to be placed in position more or less permanently, but the pins 19 are readily removable from their openings or sockets in the traction bars 18 and in the lever arm 12, and may be placed within any of an upright series of openings or holes 20, with which the lever arm 12 is provided at its upper portion, for a purpose which will be presently explained. At their forward ends the bars 18, 18^{a} are connected by means of links 21, which connect the two pairs of bars, and to these links is applied a clevis 22 to which the draft rope (not shown) is connected.

From the foregoing description it will be apparent that the tractive force is applied directly to the nose of the main or rear plow and that the traction bars 18, 18^{a} pass through the pilot plow without any tendency to pull it along. Said pilot plow is driven forward or propelled by means of a direct and rigid connection interposed between the forward arch 10 and the nose or forward portion of the rear plow A. This connection preferably comprises brace bars 23 which are secured to the upper portion of the nose of the plow A by means of a nutted bolt 24, by means of which said braces are clamped together at their rear ends on the plates 5 and 6. At their forward ends said brace bars 23 are hingedly connected with the arch 10 of the pilot plow by means of pivot pins 25, which allow for the independent vertical movement of the two plows. The pivotal connection 25 is illustrated as being midway of the height of the arch 10, at a point just above the mold boards 9. This connection is intended to be more or less permanent, but the rear connection embodying the bolt 24, is capable of vertical adjustment, the nose of the plow being provided for this purpose with an inclined series of bolt openings 26. The effect of this arrangement is that when the main plow is pulled forward the tractive force will be transmitted directly from the nose of the main plow to the

forward arch of the pilot plow, so that the latter will be urged forward by strong and rigid devices, without affecting the draft connection between the traction bars and the rear plow.

The centering of the rear or main plow with respect to the front plow is produced by means of detachable braces 27. Said braces are interposed between sockets 28 carried by the rear arch 11 of the pilot plow, and preferably in line with the pivotal connection 25, and suitable sockets having a fixed relation with respect to the nose of the rear plow. In the embodiment illustrated these last named sockets are denoted by reference character 29 and are carried by the braces 23, at the rear portion of said braces. The ends of the braces 27 are preferably rounded off, as shown, and they may be set into and removed from the sockets 28, 29 with a certain amount of freedom which permits the relative vertical movement of the two plows while maintaining them in alinement in a vertical plane.

It will appear from the foregoing description that when the parts are in the position shown in Fig. 1, the pull of the draft rope is divided into equal parts in the traction bars 18 and 18ª. In other words, when these bars are attached at equal distances above and below the center of the draft pin 8, they will act as if the draft rope were directly attached to the draft pin and consequently there will be no downward pull on the bar or link 15. If it is desired, however, to transfer weight from the main plow to the pilot plow, it is only necessary to take out the pin 19 and raise the rear ends of the bars 18, said bars being then connected to the arm 12 of the elbow lever at a higher point by inserting the pin 19 in one of the upper openings or holes 20. This, of course, increases the leverage on the upper end of the elbow lever or bell crank, and causes a part of the draft pull to be converted into a downward pull in the link 15, as will be manifest, thereby tending to hold down the pilot plow against the floor of the car and also to lift the front end of the main plow.

By means of the openings 14ˣ and 17ˣ in the elbow lever and bridge respectively, the bar or link 15 may be adjusted rearwardly if desired, so that the rear end of the pilot plow will be held down more strongly than the front end. This adjustment can be readily effected by shifting the pins 14 and 16, as previously explained.

This arrangement of the draft mechanism has the result that the weight transferred to the front plow is not constant, irrespective of the pull in the draft rope, but is a constant fraction of the draft rope pull. For instance, instead of transferring two thousand pounds of weight under all conditions to the front plow, if the draft rope is pulling twenty thousand pounds at one time and one thousand pounds were being transferred to the front plow at that time, when the pull in the draft rope rises to one hundred thousand pounds, the downward pull on the front plow would be increased simultaneously to five thousand pounds. Of course this pull would be automatically reduced as soon as the plow ran out of heavy material and began to pull more easily. The advantages of such an arrangement with respect to efficiency of operation and economy of power, will be manifest.

So far as I am aware, the provision of means whereby a constant fraction of the varying draft rope pull is converted into a downward pull on the forward plow, and a corresponding upward pull on the rear plow, is entirely novel, and I desire to have my claims on this construction interpreted accordingly. The direct driving of the forward arch of the pilot plow by devices which are entirely independent of the rear arch of the pilot plow, and the centering of the nose of the rear plow in the manner described, are also important in providing a reliable and efficient ballast unloader.

In order to provide for the effective centering of the pilot plow at its forward end, I find it advisable to apply to the forward arch 10 a bracket 10ª which projects down between the bars 18, 18ª. Said bracket carries at its lower end a cross pin 10ᵇ upon which the bars 18ª rest, and in this way all of the bars are supported at the proper elevation and the forward end of the plow is prevented from lateral deflection.

What I claim is:—

1. In a ballast unloader, a main plow and a pilot plow having relative vertical movement, and means interposed in the draft connection to convert a constant fraction of the varying tractive force pulling on the unloader into opposite pulls on the respective plows in a vertical direction.

2. In a ballast unloader, a main plow and a pilot plow having a relative vertical movement, and means having connection with the draft to convert a constant fraction of the varying tractive force pulling on the unloader into a downward pressure on the pilot plow.

3. In a ballast unloader, front and rear plows connected for relative vertical movement, and means in connection with the draft to convert a constant fraction of the varying tractive force acting on the unloader as a whole into an upward pressure on the rear plow.

4. In a ballast unloader, front and rear plows connected together and capable of relative movement in a vertical plane, means to apply tractive force to the unloader at the forward end of the rear plow, and means interposed in the draft connection whereby

a constant fraction of the varying tractive force is converted into an upward pull on the front or nose portion of the rear plow, and a corresponding downward pull on the forward plow.

5. In a ballast unloader, a pilot plow, and means interposed in the draft connection to force the pilot plow in downward direction in correspondence with the draft pull on the unloader.

6. In a ballast unloader, a pilot plow, means to pull the unloader in a horizontal plane, and means associated with said pulling means to exert a downward pull on the pilot plow which increases and decreases in correspondence with the increase and decrease of the tractive force.

7. In a ballast unloader, the combination of a main or rear plow, a pilot plow, a connection between said plows which permits them to move independently and adapt themselves to the inequalities of the surface over which they are drawn, means to connect a draft rope with the forward end of the rear plow, and means in connection with the draft to press the pilot plow downward in proportion to the pull on the draft rope, and to move the rear plow upward to a corresponding extent.

8. In a ballast unloader, a pilot plow and a rear plow, and means to connect a draft rope with the unloader, which is capable of adjustment to impose vertically acting forces on the respective plows.

9. In a ballast unloader, a rear plow and a pilot plow, mechanism to connect the plows together and to which the draft rope is connected, and means to adjust said mechanism so that a constant fraction of the varying draft rope pull is converted into a downward pull on the pilot plow, and a corresponding upward pull on the rear plow.

10. In a ballast unloader, a rear plow and a pilot plow, and means interposed in the draft connection to automatically impose a heavy downward pull on the pilot plow and a corresponding upward pull on the rear plow when the unloader runs through heavy material, and to automatically reduce such pull as soon as the unloader runs out of such heavy material.

11. In a ballast unloader, a pilot plow and a rear plow, a device to convert a constant fraction of the varying tractive force acting on the unloader into a downward pull on the pilot plow and a corresponding upward pull on the rear plow, and means to adjust said device so that the downwardly acting force on the pilot plow can act at different points.

12. A ballast unloader embodying a pilot plow, a device to force said plow downward in correspondence with the tractive force acting on the unloader, and means to adjust said device in order that the downwardly directed force may act at different points in the length of the pilot plow.

13. In a ballast unloader, a pilot plow and a rear plow, means to exert a downward pull on the pilot plow and a corresponding upward pull on the rear plow in consonance with the varying tractive force acting on the unloader, and adjusting mechanism by which the amount of such pull is regulated.

14. In a ballast unloader, a pilot plow and a rear plow, a device to convert a constant fraction of the varying tractive force acting on the unloader into a downward pull on the pilot plow and a corresponding upward pull on the rear plow, means to adjust said device in order that the downwardly directed force may act at different points in the length of the pilot plow, and adjusting mechanism to regulate the oppositely directed pulling forces acting on the plows.

15. In a ballast unloader including a pilot plow and a rear plow, a lever arm fulcrumed on the rear plow and connected with the pilot plow, and draft mechanism including members connected with the lever arm at opposite sides of its fulcrum.

16. In a ballast unloader including a pilot plow and a rear plow, a lever arm fulcrumed on the rear plow and connected with the pilot plow, and draft mechanism including members connected with said lever arm at opposite sides of its fulcrum, the connection at one side of the fulcrum being adjustable.

17. In a ballast unloader including a pilot plow and a rear plow, a draft pin carried at the nose of the rear plow, an elbow lever having one arm fulcrumed on said draft pin, means to connect the other arm of the lever with the pilot plow, and draft members connected with said first named arm at opposite sides of the fulcrum.

18. In a ballast unloader including a pilot plow and a rear plow, an elbow lever having a substantially upright arm fulcrumed at the forward end of the rear plow, and a substantially horizontal forwardly extending arm, draft members connected with said upright arm at opposite sides of the fulcrum, and means to connect the other arm of the lever to the upper part of the pilot plow at different points in the length of said plow.

19. In a ballast unloader, a rear plow, a pilot plow having front and rear arches, a bridge connecting said arches at their upper part, a bar or link suspended from said bridge, an elbow lever fulcrumed on the forward part of the rear plow and having one arm connected with said bar or link, and draft members connected with the other arm of said elbow lever at opposite sides of the fulcrum.

20. In a ballast unloader, a rear plow, a pilot plow having front and rear arches, a bridge connecting said arches at their upper part, a bar or link suspended from said

bridge, an elbow lever fulcrumed on the forward part of the rear plow and having one arm connected with said bar or link, draft members connected with the other arm of said elbow lever at opposite sides of the fulcrum, and means for adjusting said bar or link longitudinally of the bridge and of the elbow lever.

21. In a ballast unloader, a pilot plow, a rear plow, draft mechanism acting on the forward end of the rear plow, and a connection independent of said draft mechanism by which the pilot plow is pushed forward by the rear plow.

22. In a ballast unloader including a pilot plow and a rear plow, draft mechanism acting on the forward end or nose of the rear plow, and a rigid connection independent of said draft mechanism and extending between the nose of the rear plow and the forward portion of the pilot plow.

23. In a ballast unloader including a pilot plow and a rear plow, rigid braces attached to the nose of the rear plow at opposite sides and extending forward to the front portion of the pilot plow.

24. A ballast unloader including a rear plow, a pilot plow having an arch at the front thereof, and rigid braces applied at opposite sides to the nose of the rear plow and connected with opposite sides of said arch.

25. In a ballast unloader, the combination of a pilot plow, a rear plow connected therewith, and centering braces interposed between the rear portion of the pilot plow and the nose of the rear plow.

26. In a ballast unloader, the combination of a pilot plow having a rear arch, a rear plow, and centering braces interposed between the sides of said arch and a part having a fixed relation with the nose of the rear plow.

27. In a ballast unloader, the combination of a pilot plow having a rear arch, a rear plow, centering braces interposed between the sides of said arch and a part having a fixed relation with the nose of the rear plow, and sockets in which the ends of said centering braces are detachably received.

28. In a ballast unloader, the combination of a pilot plow having front and rear arches, a rear plow connected with the pilot plow, braces interposed between the sides of the front arch and the nose of the rear plow, sockets carried by said braces adjacent said nose, sockets carried by the rear arch of the pilot plow, and braces detachably fitting at their ends in said last named sockets and those on the first named braces.

In testimony whereof I affix my signature, in presence of two witnesses.

WALTER FERRIS.

Witnesses:

H. B. HAYDEN,

FLORENCE F. BUEHLER.