

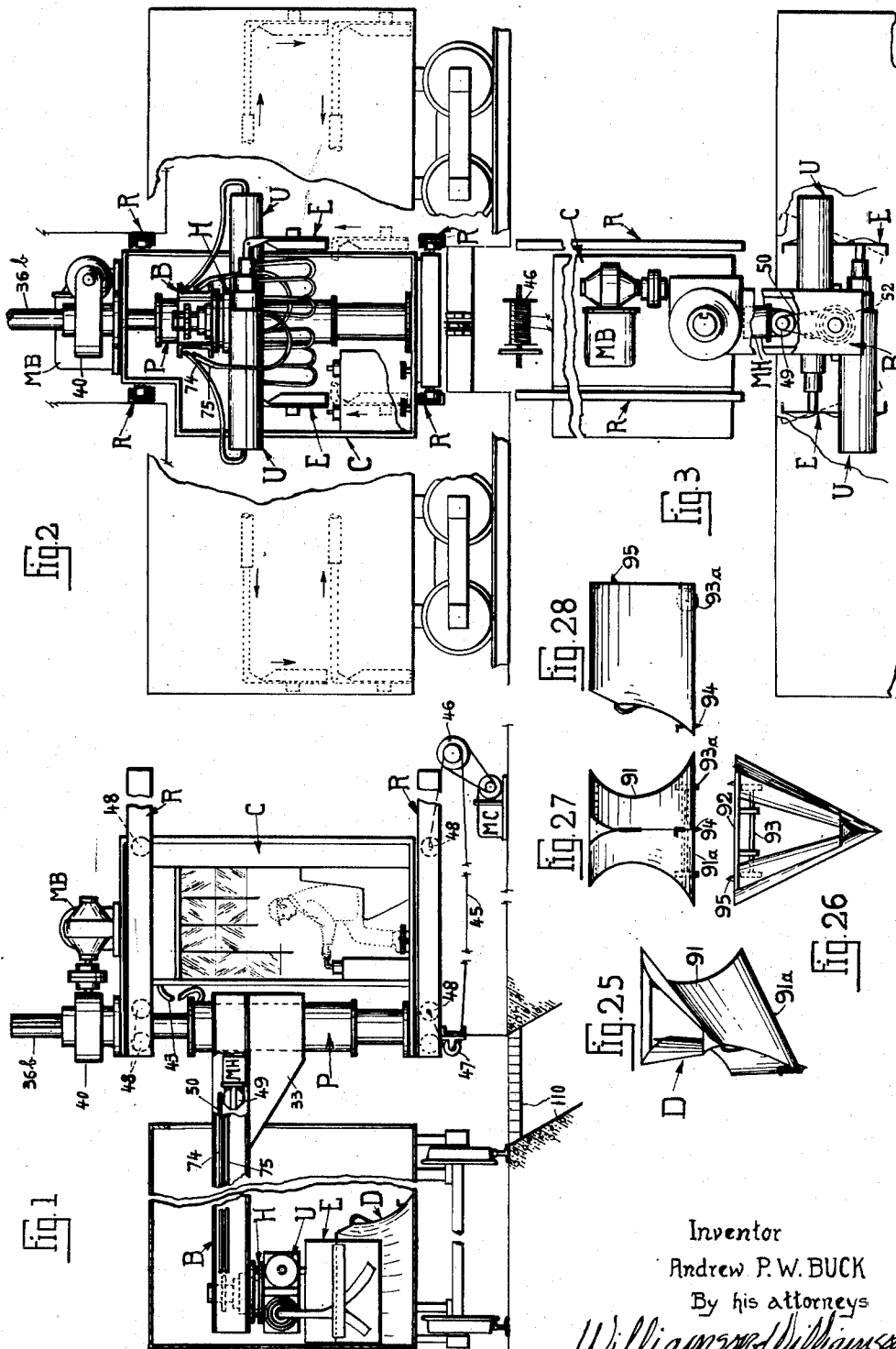
Oct. 7, 1952

A. P. W. BUCK
GRAIN UNLOADING MACHINE

2,613,003

Filed Jan. 21, 1946

7 Sheets-Sheet 1



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Oct. 7, 1952

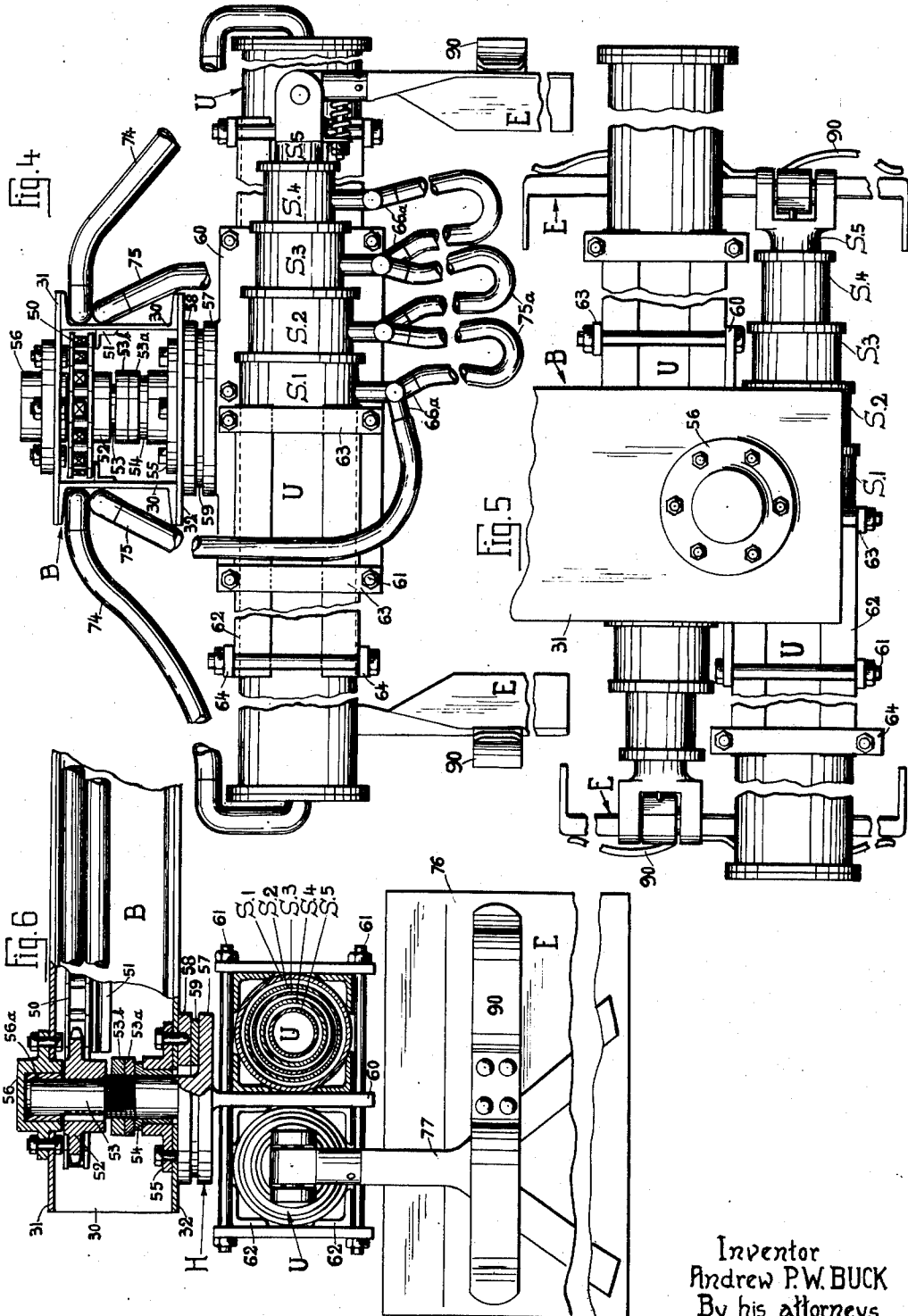
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Filed Jan. 21, 1946

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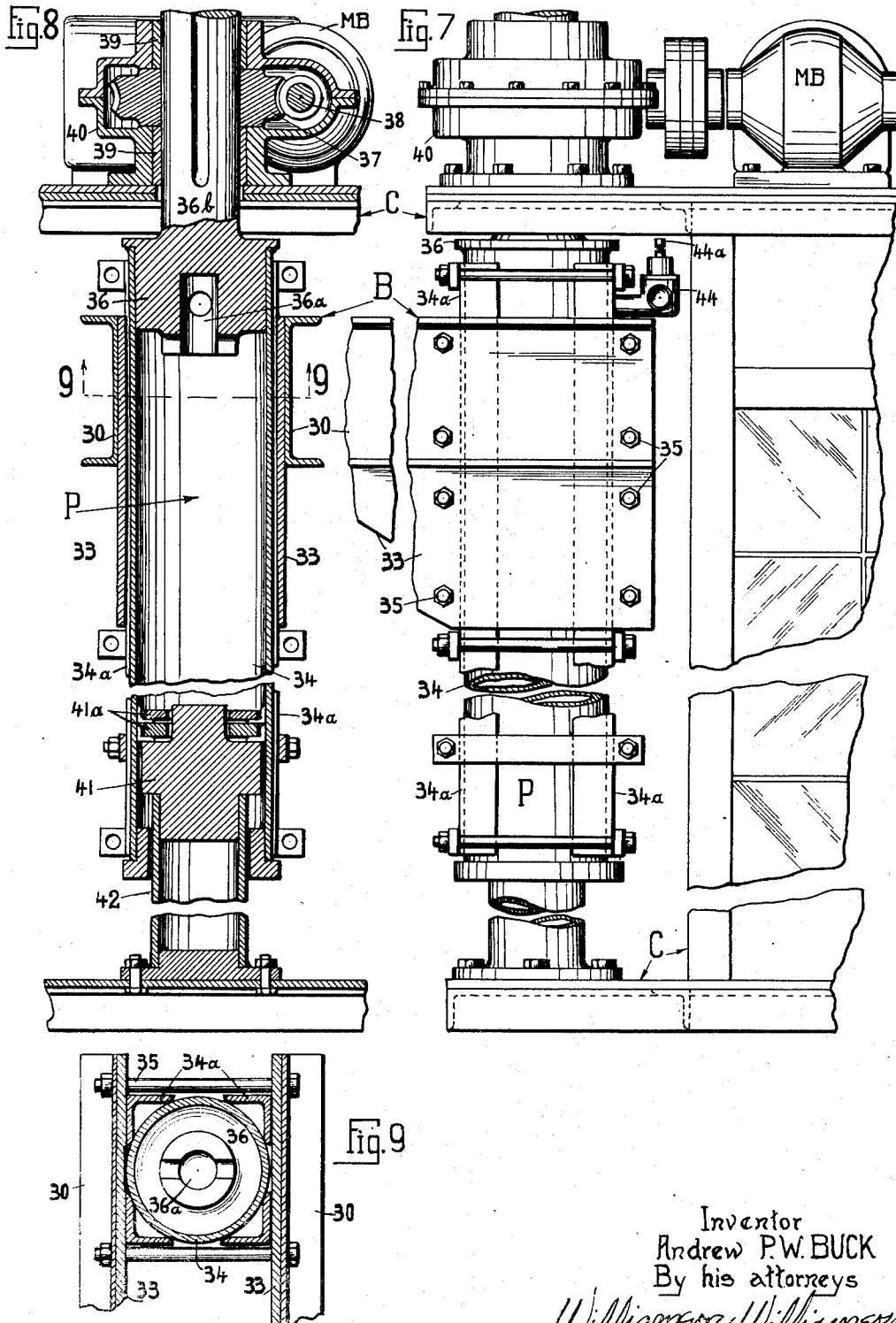
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Filed Jan. 21, 1946

7 Sheets-Sheet 3



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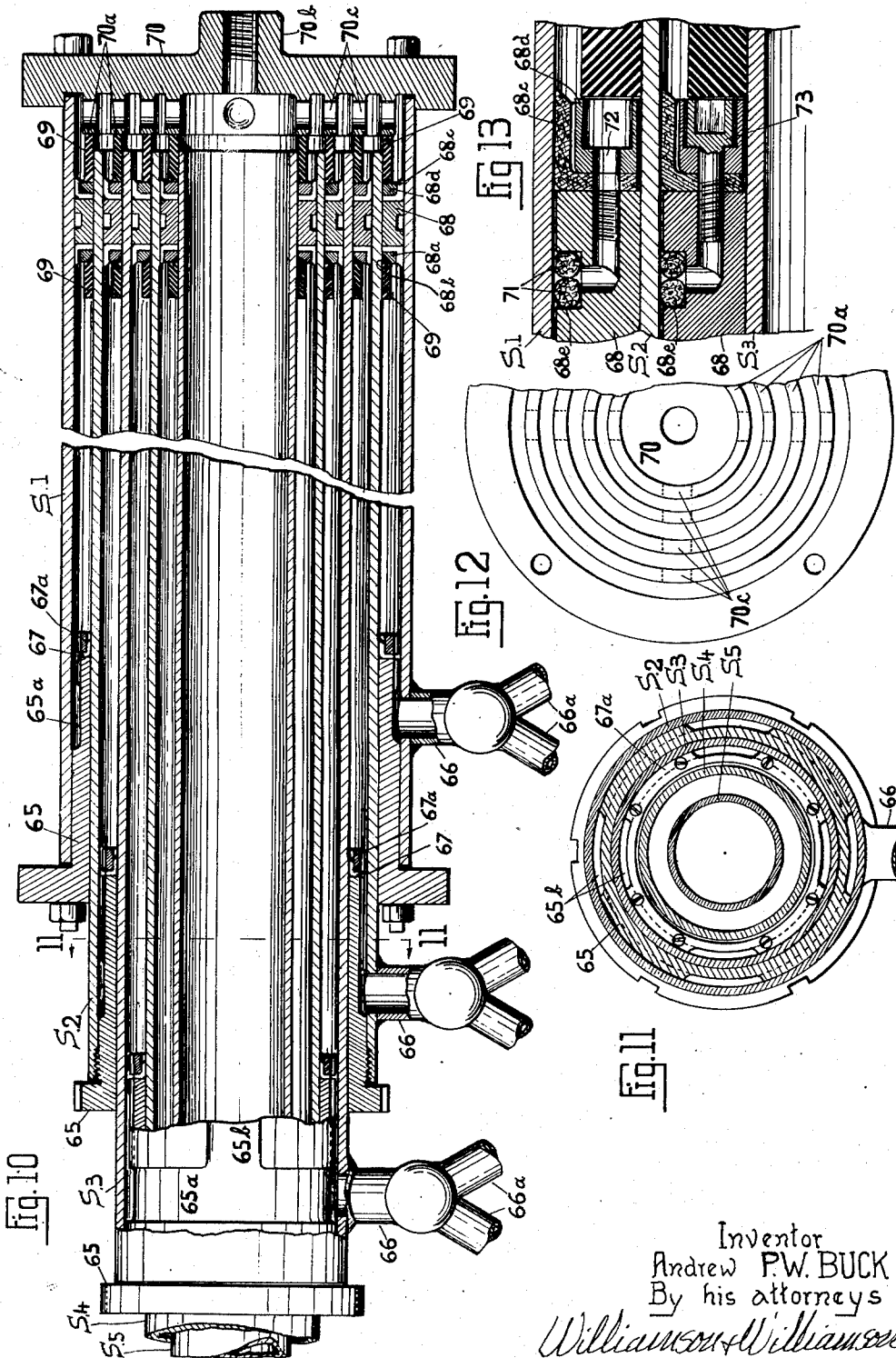
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2,613,003

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Filed Jan. 21, 1946

7 Sheets-Sheet 4



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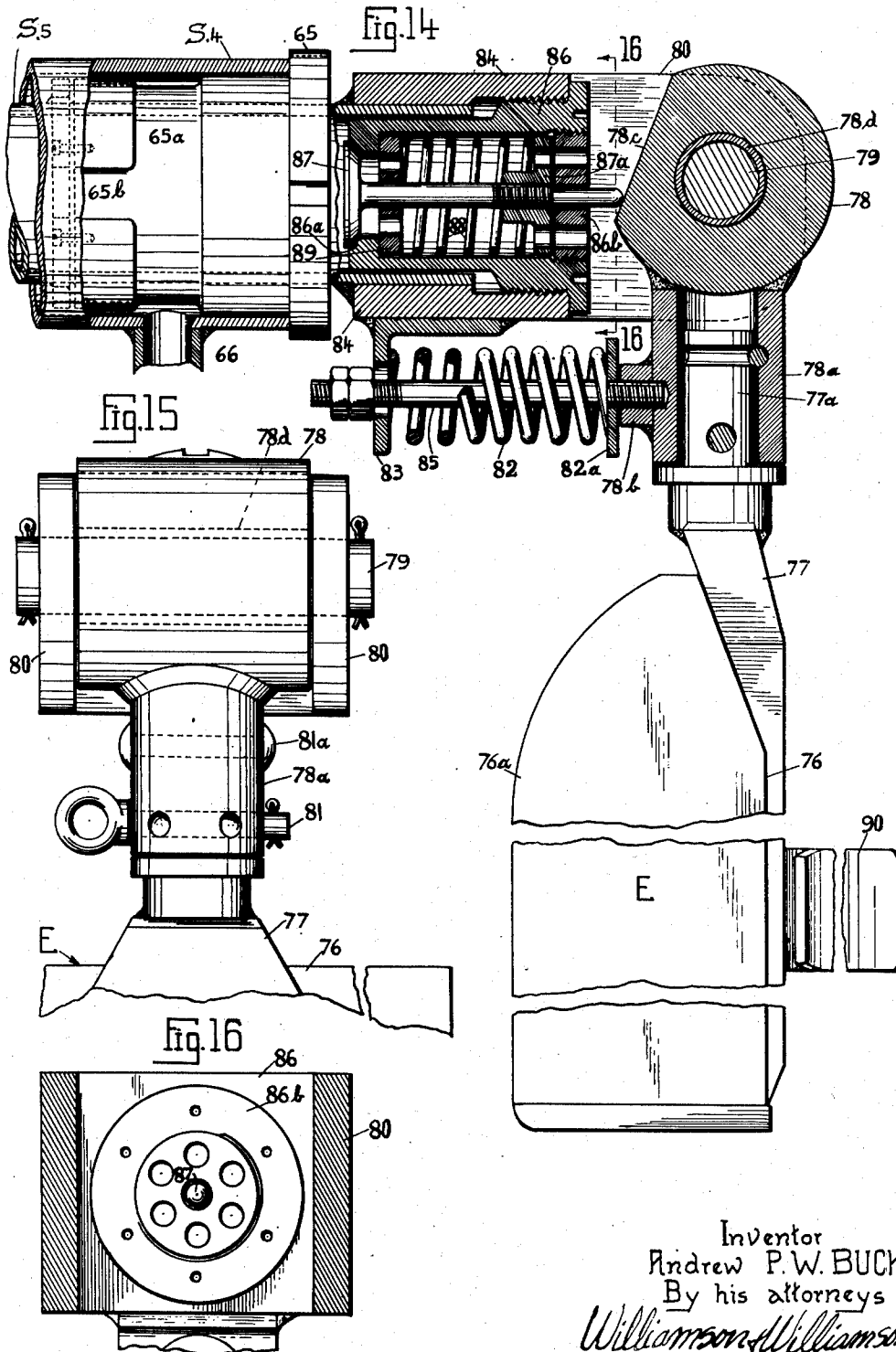
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2,613,003

GRAIN UNLOADING MACHINE

Filed Jan. 21, 1946

7 Sheets-Sheet 5



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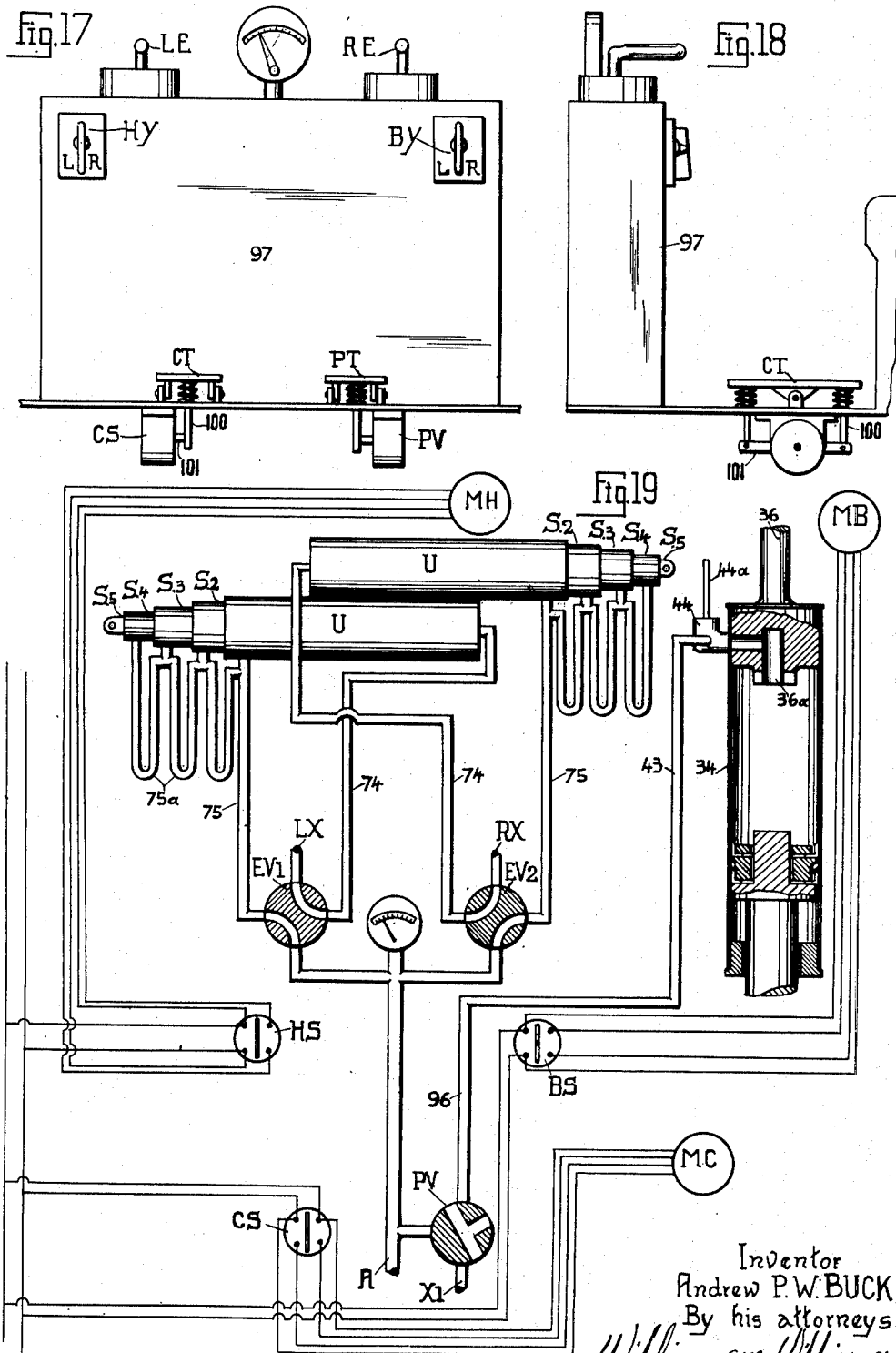
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2,613,003

GRAIN UNLOADING MACHINE

Filed Jan. 21, 1946

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2,613,003

GRAIN UNLOADING MACHINE

Filed Jan. 21, 1946

7 Sheets-Sheet 7

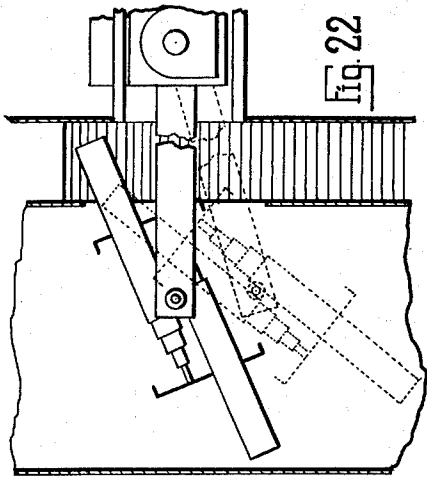


Fig. 22

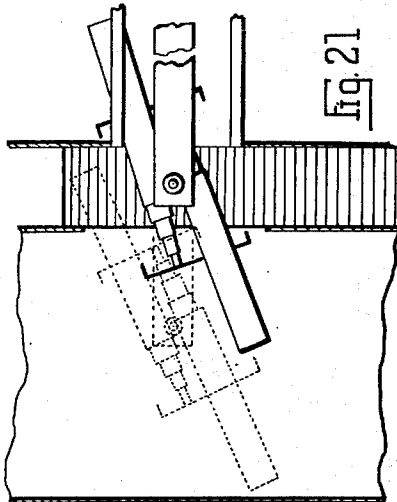


Fig. 21

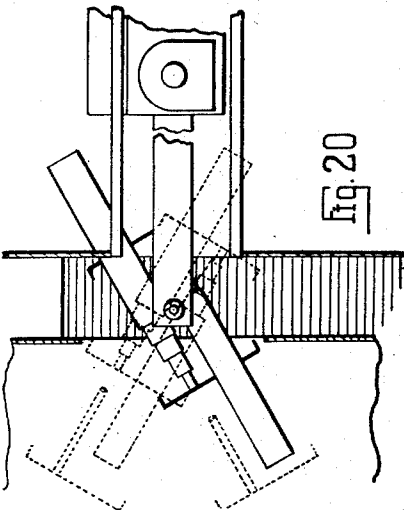


Fig. 20

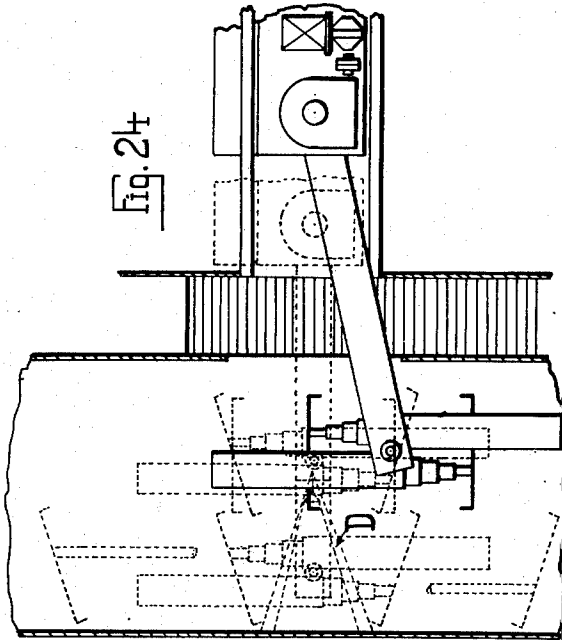


Fig. 24

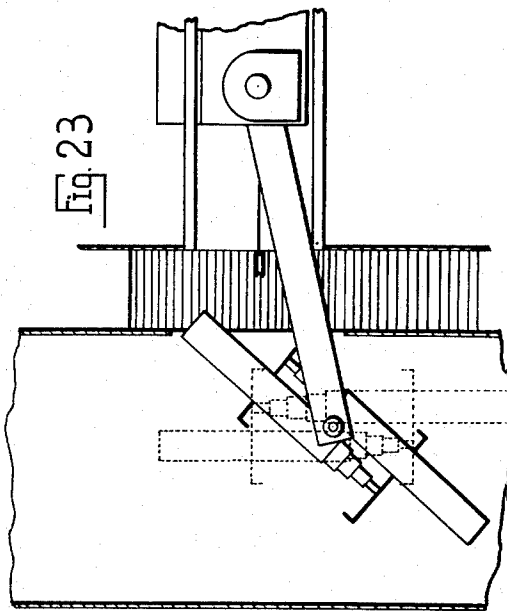


Fig. 23

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UNITED STATES PATENT OFFICE

2,613,003

GRAIN UNLOADING MACHINE

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Application January 21, 1946, Serial No. 642,546

6 Claims. (Cl. 214—44)

1

This invention relates to a power operated machine or apparatus for unloading grain cars and analogous transportation vehicles, loaded with material in particle form.

The unloading of grain and other material in particle form from railroad boxcars and other elongated transportation vehicles, has presented many difficult problems. To begin with, the relatively great length of the cars with the doorway disposed centrally thereof makes impossible the natural flow of grain or other particles through gravity and pressure when the doors are open beyond only a small percentage of the contents of the car. When the grain door in the side of a boxcar is opened, the pressure of the grain and weight thereof causes the central portion of the contents to flow through the doorway, leaving for manual or power shovel removal, up to eighty per cent of the contents of the car. The balance of the grain must be removed by operators within the boxcar either manually or by assisting in the operation of power shovels which are pulled towards the doorway by cables or other endless, flexible means. Most power shovels require the operator to manually position the shovel itself in the grain before each unloading pull. A few power shovel mechanisms have included a cable means for retracting the shovel for the next stroke, the cables being guided over pulleys or other means which must be attached to the ends of the car before unloading is begun. In such instances, the shovel must be properly positioned by the operators and the cables often pushed to one side or distorted to enable the corners of the car and the grain adjacent the longitudinal sides, to be engaged by the shovel. In any event, the unloading means and apparatus heretofore utilized for railroad boxcars, requires one or more operators within the car and at least one attendant outside of the car. The time required for unloading the average sized railroad boxcar loaded with grain or other light particle material, utilizing two power shovels, two operators in the car and a third outside of the car, ordinarily exceeds twenty-five minutes. Utilizing only one power shovel and two or three men an hour if often required for complete unloading. The labor cost is therefore, very high, not to mention the financial loss to mills, elevators and railroad companies because the cars are "tied up" for such long periods during unloading. Furthermore, the cars are filled with dust during the movement and unloading of grain or other particle material, seriously menacing the health of the unloading operators.

2

Very few men can consistently work at unloading grain or analogous material for any lengthy period.

It is an object of my invention to provide a highly efficient, commercially practical machine which will very quickly remove grain and other particle material through the central, vertical doorway of a railroad boxcar or analogous transportation vehicle without requiring the assistance or presence of an operator within the car during the entire unloading.

A further object is the provision of an efficient machine of the class described, which will simultaneously remove granular material from both ends of a boxcar, the operation, various adjustments and positioning of the unloading elements of my machine being power actuated and readily controlled by a single operator positioned outside of the car.

Another object is the provision of a pair of balanced, extensible supporting units adapted to operate simultaneously upon opposite ends of the contents of a car for quickly moving the granular material to the center of the car and through the open doorway.

More specifically, it is an object to provide a grain unloading machine comprising a head supported to be protracted into the interior of a boxcar or the like and carrying longitudinally extensible, supporting units which carry unloading elements, all in combination with means for supporting and adjusting said head, preferably by application of power to oscillate said head as desired, to change its position longitudinally and transversely of the car and to adjust it vertically within the car, for unloading operations.

Another object is to provide in a machine of the type described, a very efficient application of mechanical power to operate the unloading elements.

A still further object is the provision of highly efficient supporting mechanism with power adjustments for the operating mechanism, preferably in the form of a carriage mounted in close relation to the track or roadbed for the cars and movable transversely to the track and carrying a vertically adjustable, supporting beam from which the head is suspended with power mechanism for oscillating the beam and oscillating the supporting head upon the outer end of the beam.

Another object is the provision of a simplified and highly efficient control system for enabling a single operator to control application of power to all working mechanisms of the machine whereby the head carrying the extensible sup-

3

porting units may be projected into the boxcar through the doorway, positioned as desired longitudinally and transversely of the car and the unloading elements simultaneously or independently operated.

Another object is the provision of certain safety mechanisms to eliminate danger of damage to the car and power mechanism during operation.

These and other objects and advantages of my invention will be more apparent from the following description made in conjunction with the accompanying drawings, wherein like reference characters refer to similar parts throughout the several views and in which:

Fig. 1 is a side elevation with some portions broken away, showing an embodiment of my machine positioned for operation in a railroad boxcar;

Fig. 2 is an end elevation of the machine with the central portion of the boxcar broken away;

Fig. 3 is a fragmentary top plan view with some portions broken away;

Fig. 4 is a detailed end elevation showing the adjustable head or hub and the longitudinally extensible supporting mechanism for the unloading elements;

Fig. 5 is a top plan view of the same;

Fig. 6 is a fragmentary side elevation with some portions broken away, showing the outer end of the supporting beam with the head swivelly mounted thereon and showing one of the unloading elements in rear elevation and the extensible supporting structure for the other, in vertical section;

Fig. 7 is a fragmentary side elevation showing a part of the supporting carriage and the heavy adjustable king post structure mounted thereon;

Fig. 8 is a vertical section taken substantially axially of the king post;

Fig. 9 is a cross section taken on the line 9—9 of Fig. 8;

Fig. 10 is a detail, fragmentary, vertical section showing a preferred construction of the telescoping, longitudinally extensible, supporting units for one of the unloading shovels;

Fig. 11 is a cross section taken on the line 11—11 of Fig. 10 with the outermost sleeve removed;

Fig. 12 is a detail, plan view of the cap or closure member of the unit, removed;

Fig. 13 is a detail, vertical section on a larger scale, showing the lubricating ports for the plungers and cylinders;

Fig. 14 is a side elevation with some portions broken away, showing the structure and mounting of one of the unloading shovels and a safety valve structure associated therewith;

Fig. 15 is a rear elevation of the same;

Fig. 16 is a detail cross section taken on the line 16—16 of Fig. 14;

Fig. 17 is a somewhat diagrammatical view illustrating the front of a suitable control panel and floor for controlling the various working mechanisms;

Fig. 18 is a side elevation of the same;

Fig. 19 is a diagram illustrating the control system;

Figs. 20 to 24 inclusive are diagrammatical, top plan views illustrating the several steps in projecting my unloading mechanism into a boxcar and also, illustrating the operation and adjustment of the mechanisms during unloading of the car.

Fig. 25 is a top, perspective view illustrating a

4

plow-like deflector which is preferably a part of my apparatus;

Fig. 26 is a top plan view of the same;

Fig. 27 is a front elevation of the same; and

Fig. 28 is a side elevation of the same.

Generally stated, my unloading machine, comprises a variously adjustable, supporting head designated as an entirety by the letter H from which is suspended or otherwise supported, in side by side relation, a pair of oppositely working, longitudinally extensible shovel-supporting and actuating units U, each of said units in the form of the invention illustrated, comprising a series of horizontally disposed, telescoping sleeves or cylinders, S-1, S-2, S-3, S-4 etc., actuated in both directions for protraction and retraction, as shown, by pressure fluid means, preferably pneumatic and carrying at their outer ends, depending unloading elements E in the form of shovels or plows. The head H is supported for vertical adjustment; for movement or adjustment transversely and substantially longitudinally of a car to be unloaded and is also mounted for oscillatory adjustment on a vertical axis, as shown, being swivelly supported from the outer end of a large, horizontal beam B which, as shown, is supported from a heavy king post structure P mounted upon a horizontally movable carriage C which, as shown, is supported upon upper and lower sets of channel rails R.

The supporting beam B, in the embodiment illustrated is constructed from a pair of horizontally spaced metal channel members 30 disposed with their intermediate webs vertical and having horizontal top and bottom plates 31 and 32 welded or otherwise rigidly secured thereto. The attached inner end of beam B as shown, is reinforced by heavy truss bases 33 and said bases and the inner end of the beam are rigidly secured to a large, vertical cylinder 34 forming the adjustable part of a king post structure which is supported from the forward end of the carriage C. The cylinder 34 in the form illustrated is heavily reinforced by four, longitudinally extending angle irons 34a spot welded or otherwise rigidly secured to the external periphery of the cylinder and extending the full height thereof. Beam B and its associated truss bases 33 are secured to the king post by two series of heavy clamping bolts 35 which extend through the vertical webs of beam channel members 30. The king post cylinder 34 is closed at its upper end by a fixed plug member 36 having an axially recessed lower chamber 36a therein and carrying a heavy, solid, upstanding torque-receiving shaft 38b, which, as shown, is splined to a power driven worm gear 37 meshed with the worm 38 of an electrical beam-adjusting motor MB. The shaft 38b passes through the top of carriage C and is journaled in suitable bearings 39 mounted axially in a gear casing 40 which is mounted, as is the motor, upon the frame work of the top of carriage C. The king post cylinder 34 is vertically slidable upon a heavy, stationary piston 41 rigidly attached to the upper end of a heavy, upstanding sleeve 42 which is rigidly affixed to the frame work of the bottom of carriage C. Piston 41 is preferably reduced at its upper end and there carries a pair of rings 41a having pump washers or suitable sealing rings applied to the peripheries thereof.

The cylinder 34, as shown, is vertically adjustable through fluid pressure means, preferably by a pneumatic medium supplied through an air line connected with a source of air under pressure.

5

Airline 43 (see Fig. 1) connects with the plug 36 of the cylinder and with the passage 36a therein. A safety release valve 44 also connects with plug member 36 and the recessed chamber 36a, said valve embodying, as shown, an elbow with a valve rod 44a disposed at the upper end thereof in position to abut against one of the top frame members of carriage C to open the valve and discharge air before the upper end of the cylinder can be elevated into abutment with the top of the carriage.

Any suitable means for adjustably moving carriage C back and forth along its upper and lower supporting rails R may be supplied. As shown, a strong cable 45 (see Fig. 1) is trained about a power take-off reel 46 driven at very low speed by a carriage adjusting motor MC and also about an idler pulley 47 at the forward end of the carriage and extending below the carriage with the ends of the cable secured to the transverse shafts upon which the supporting wheels 48 of the carriage are journaled. I prefer to wrap the cable 45 around pulley 46 in the manner of a steering wheel windless to make adjustment of the carriage more positive.

Power means are provided for adjusting, by oscillation on a vertical axis, the head H. To this end, as shown, I provide an electric motor MH (see Fig. 1) mounted within the horizontal beam B as close to the king post as conveniently possible and having its rotor shaft driveably connected with a transmission mechanism 49, also mounted within the inner portion of beam B. Transmission mechanism 49 materially reduces the speed of motor MH and its power takeoff shaft extends vertically from the upper end thereof and has affixed thereto a sprocket about which is trained an endless roller chain 50 which extends longitudinally and outwardly through the hollow beam B suitably supported by underlying longitudinal, angle guides 51 (see Fig. 6) and is trained at its outer end about a second sprocket 52 rigidly affixed by key or other means to the heavy, upwardly extending stub shaft 53 of head H.

The several motors MC, MB and MH, previously described, are all of the reversible type and are electrically connected in the circuits as will hereafter more clearly appear for reversing for adjustment, the important parts with which they are associated. Electrical connections for such motors are clearly diagrammed in Fig. 19.

The stub shaft 53 of the head extends vertically through the beam B and is provided at its medial portion with a threadedly adjustable thrust collar 53a which is secured by a threaded lock collar 53b forced into abutment therewith. The stub shaft 53 and head H are supported upon a thrust bearing 54 which is mounted within an attachment collar 55 bolted or otherwise secured to the lower, horizontal plate 32 of beam B. The upper end of stub shaft 53 is journaled in a bearing 56a mounted in an attachment collar 56 which is bolted or otherwise secured in axial alignment with attachment collar 55 to the upper plate 31 of the large horizontal beam. Head H includes a large, horizontal disc element 57 fixed to the lower end of stub shaft 53 and underlying a flat annulus 58 disposed axially thereof and secured to the underside of the bottom beam plate 32. A bronze or other suitable flat friction ring 59 is interposed between the upper surface of disc 57 of the head and the annulus 58.

Head H includes a rigidly attached, depending, heavy vertical supporting plate 60 extending dia-

6

metrically of the disc 57 of the head and having supported therefrom, by suitable means such as the heavy, transverse bolts 61, the two longitudinally extensible, shovel-supporting and actuating units U. To this end, the stationary and larger cylinders or sleeves S-1 of the two units, disposed in side by side relation and opposite ended arrangement, are rigidly fixed to the supporting plate 60. To reinforce said stationary sleeves S-1, I prefer to employ the type of corner angle structure utilized in the attachment of beam B to my heavy king post. As shown, each of the stationary sleeves S-1 of the two units are provided with four longitudinally extending angle iron reinforcements 62, cross sectionally arranged in the four corners of a square and spot welded or otherwise properly positioned with regard to the periphery of sleeves S-1. A pair of vertical clamping bars 63 are disposed at the outer sides of each of the two sleeves S-1 and are clamped by four of the heavy bolts 61 against the reinforcing angle 62 of the sleeves S-1 and of course, against the heavy, supporting plate 60 of the head. Outwardly of the supporting plate 60 and adjacent the rear and closed ends of the stationary sleeves S-1, one or more pairs of horizontally disposed, clamping plates 64 are provided (see Figs. 4 and 5), bolted together by pairs of heavy bolts 61 and thus clamped against the horizontal webs of the angle iron reinforcements 62.

Fitted within the open end of each of the stationary cylinders or sleeves S-1, I provide a relatively short sleeve member 65 (see Fig. 10) which as hereafter will be more clearly shown, has several functions including the reinforcing of the outer and open end of stationary cylinder S-1, the provision of a packing gland between said stationary cylinder and the next, telescoped, extensible cylinder or sleeve S-2 as well as to provide an abutment and communication passages for supplying the air or other fluid medium against a shoulder of the immediately telescoped cylinder to retract the same. Sleeve member 65 is externally provided at a zone adjacent the inner end thereof with a circumferential air distribution passage 65a which communicates through the stationary sleeve S-1, with an air connecting fitting 66 rigidly secured to the under portion of sleeve S-1. The annular or circumferential air distribution passage 65a communicates with a series of circumferentially spaced passages 65b formed in the external periphery of sleeve member 65. Bolted or otherwise attached to the inner annular extremity of the sleeve member 65, is a suitable packing gland for providing a sealed joint, permissive of telescoping action, between the short sleeve member 65 and the periphery of the slidable cylinder S-2, telescoped therewithin. The said packing gland in the form shown, comprises a cross sectionally angular, pump washer 67 held in place against the said end of sleeve 65 by a clamping ring 67a bolted thereto. In its cooperative relationship with the stationary cylinder S-1, the slidable cylinder S-2 is provided adjacent its inner end with a suitable piston structure against which air under pressure reacts to retract the telescoped cylinder S-2. To this end, as shown, I provide a main piston or plunger ring 68 which is secured to an anchor ring 68a, welded or otherwise rigidly secured about the slidable cylinder S-2, with a pump leather or the like, 68b, interposed between the two. A second pump leather 68c is clamped against the inner annular face of ring 68 by means of a clamping ring 68d, bolts or other suit-

able means being provided in circumferentially spaced relationship (not shown) and passing through the clamping ring 68d and the angled flanges of the pump leathers and being secured into the anchor ring 68a. A rubber cushioning ring 69 is pressed upon the inner end of the sliding sleeve S-2 just rearwardly of the clamping ring 68d and is of a suitable width to protrude beyond the annular extremity of the cylinder S-2 to abut against an annular seat 70a provided by a heavy disc closure member 70 which is bolted or otherwise rigidly secured to the stationary cylinder or sleeve S-1. A second rubber cushioning ring is tightly fitted about the telescoping cylinder S-2 just forwardly of the anchor ring 68a and is adapted to abut against the clamping ring 67a of the packing gland, fixed to the inner extremity of the reinforcing and air communicating sleeve member 65 of the stationary cylinder S-1. In this connection, the said clamping ring 67a is circumferentially notched in accordance with the ends of the longitudinal air passages 65a so that air transmitted may react against the piston structure 68 mounted on the inner end of the telescoped cylinder S-2 to retract the same.

Each of the successively smaller telescoping sleeves S-3, S-4 and S-5 are similarly equipped with piston or plunger structures 68 adjacent the inner ends thereof and the parts of each of said plungers including the main ring 68, the anchor ring 68a, the pump leathers 68b and 68c respectively and the clamping rings 68d are similarly numbered throughout the drawings and refer to similar parts on the several telescoping sleeves. Likewise, each of the telescoping sleeves is provided with a short, reinforcing and air communicating sleeve member 65, fixed in the outer end thereof, and provided with a packing gland and air passages similar to the sleeve 65, first described in connection with the stationary cylinder S-1. Parts of the sleeve member 65 for the several telescoping cylinders and of the packing glands associated therewith are numbered similarly in each instance to the parts of the sleeve member 65 and packing gland associated with the outer or stationary sleeve S-1.

Referring again to the large disc closure member 70, an annular seat 70a analogous to the seat 70a first described for cooperation with the larger telescoping cylinder S-2, is provided for each of the successively smaller telescoping cylinders S-3 to S-5 inclusive. The closure member 70 has the dual capacity of constituting an air distributor head for protracting successively (smaller to larger) the several telescoping sleeves or cylinders. To this end, disc 70 is provided with a central boss 70b which is apertured and tapped to form an axial air passage, said passage communicating within the unit with a shallow, cylindrical passage, which in turn, communicates through several series of radially extending ports 70c with the annular grooves or channels defined between the respective annular seats 70a which cooperate with the piston structures of the respective telescoping sleeves.

Fig. 13, a detail vertical section on a larger scale, taken longitudinally of the inner end of one of the shovel actuating units, illustrates a suitable means for lubricating the pistons and internal walls of the associated cylinders or sleeves S-1 to S-5 inclusive. As shown, the main piston or plunger rings 68 are each provided with a circumferential channel 68e in which is mounted one or more annular lubricating wicks 71, lubricant being supplied thereto through suit-

able lubricant ports 72 provided through the adjacent pump leathers 68c at the top of the cylinder and main piston ring 68 and through clamping rings 68d. A plug member 73 is provided to close each of the ports 72 and in Fig. 13, one of said plug members is shown inserted, while in the larger telescoping cylinder, S-2, the plug is removed to illustrate how a grease gun may be screwed threaded into the passage 72 for application of lubricant. Although not shown in the drawings, I prefer to provide similar lubricating means at the forward portions of each of the reinforcing and air passage forming sleeve 65 for the respective cylinders S-1 to S-5 inclusive. Valved greased passages not shown in detail, are provided in this connection.

An air intake fitting 66 similar to the one described for the stationary cylinder S-1 is provided in the outer end of each of the telescoping cylinders S-2 to S-4 inclusive. This fitting has operatively connected therewith, a pair of angularly adjustable nipples 66a for connection with flexible conduits as shown in Fig. 4, to provide for supply of air to the several cylinders for retracting the telescoping ones thereof. Fluid, preferably air under pressure, is supplied to the closure disc 70 of each of the two shovel actuating units U by flexible conduits 74 which, as shown, extend along the respective side walls of the supporting beam B and are connected with a suitable source of fluid under pressure through control valves, all of which will be later described. The several fittings 66 for the cylinders S-1 to S-4 inclusive, of each of the two shovel actuating units, are supplied with air or other fluid for retracting the telescoping cylinders, by means of flexible conduits 75 (one for each unit), also supported from and extending along the respective sides of the beam B and interconnected at their delivery ends with a series of flexible conduit connections 75a between the appropriate nipples 66a of the successive fittings 66. The conduit extensions 75a are of sufficient length to provide for protraction of the telescoped cylinders S-2 to S-5 inclusive and when the cylinders are retracted or collapsed as shown in Fig. 4, are disposed in depending loops with the nipples 66a adjusted and fixed in the most advantageous angular relation for each fitting to facilitate folding and unfolding of the extensions during retraction and protraction of the telescoping sleeves.

The smallest and outermost telescoped cylinder S-5, of each of the units U has affixed to its outer end, a depending shovel and plowing element E which, as shown, see particularly Figs. 4 to 6 and Figs. 14 to 16, comprise a back plate or mold board 76 with narrow side wings 76a at the longitudinal edges thereof. Shovel element E is supported by an inverted Y-shank 77 having a vertical stem 77a which is received in a tubular socket 78a. Socket 78a as shown, is integrally formed with and depending from a horizontal cylinder 78 which is journaled on a stub shaft 79, a bronze bushing 78d being provided in the cylinder. Stub shaft 79 traverses and is journaled in a pair of supporting ears 80 which extend longitudinally from the outer end of the telescoping cylinder S-5. The stem 77a is retained rotatively in socket 78a and engages an annular groove in the shank stem 77a. The stem 77a and shovel supported thereby, are adjustable in a number of angular positions by connection of a heavy transverse anchor pin 81 which is inserted through a diametric passage through the lower portion of stem 77a and through corresponding, opposed,

circumferentially spaced holes formed through tubular socket 78a. The shovel may thus be adjusted at various angulations relative to the axis of its supporting telescoping sleeve S-5.

The shovel element E is mounted for inward swinging movement against the tension of a coil spring 82 which is interposed between an abutment plate 82a and an anchor lug 83 fixed to the bottom of a sleeve 84 comprising a portion of the outer tubular end of telescoping cylinder S-5. Spring 82 surrounds an adjustable bolt 85 which extends through a vertical slot in anchor lug 83 and which is threadedly or otherwise secured at its outer end to a boss 78b integrally formed with the depending tubular socket 78a. The bolt 85 thus limits the outward swinging movement of the shovel element E beyond substantially the vertical position shown in Fig. 14 while with its associated spring 82, it permits inward swinging of the shovel in the retracting movement of the shovel actuating unit.

An exhaust valve structure is provided for controlling discharge of air or other fluid under pressure from the outer end of the innermost telescoping cylinder S-5 when the shovel element E is swung inwardly. To this end, a valve sleeve 86 is threaded plug-wise into the outer end of the sleeve 84 and as shown, is provided with a beveled valve seat 86a at the inner end thereof wherein is mounted a beveled poppet valve 87 having its axial stem, screw-threaded into a piston member 87a and having its extremity projected beyond the closure 86b of sleeve 86 and rounded to engage a straight cam surface 78c of the mounting cylinder 78. Within the sleeve 86 a coil spring 88 surrounds the valve stem and is interposed between an apertured disc 89 and the piston 87a. Thus, it will be seen that when the shovel element E is swung inwardly against the tension of coil spring 82 the valve 87 will be moved from its seat, opening a communication passage between the outer end of the smaller and outermost telescoping sleeve S-5 and the exterior, through the plug member 86b which is provided with a series of airports therethrough.

To facilitate the compact arrangement of the two telescoping units U, the inverted Y-shank for each shovel is attached to the rear of the mold board at one side of the vertical center line thereof. It is to be understood that the mold board is weighted on the shorter side of the attachment shank to be properly balanced in its suspended relation.

A spring plate-cushioning strip 90 is attached centrally to the rear of each of the shovels having outwardly bent horizontally extending wing portions which are adapted to engage against the end of a freight car or other body to cushion the impact of the shovel element and to also cause the cushioned shovel to swing inwardly releasing the valve 87 and thereby stopping the outward telescoping action of the outermost cylinder S-5.

My apparatus preferably, but not necessarily, includes a double-faced deflector member, indicated as an entirety by the letter D, as clearly shown in Figs. 25 to 28 inclusive. The cooperating deflector D is preferably in the shape of a snow plow having the angularly arranged wings 91 joining in a concave vertex at their forward edges and defining a suitable triangulated base 91a. Suitable framework and reinforcing means 92 is provided for rigidly securing the wings together and for also furnishing a mounting for an axle 93 to the ends of which, as shown, are connected

wheels 93a positioned adjacent the sides and rear of the deflector. Preferably, a depending attachment point 94 is provided at the forward, lower tip of the double spaced deflector, adapted to engage and slightly penetrate the wooden or other floor of the transportation unit such as a freight car. Similarly, the back of the deflector may be provided with a pair of horizontally and rearwardly projecting positioning points 95 for engagement with the closed door or a wall of the transportation vehicle, to prevent lateral shifting of the deflector during operation of my apparatus. The said cooperating deflector D as illustrated in Figs. 1 and 24 of the drawings, is adapted to be wheeled into a car or other vehicle transversely thereof through the doorway and when properly positioned for cooperation, with the opposing shovel elements E, retained in the desired position by dropping the front end thereof and abutting the rear prongs or points 95 against the doorway or opposing walls. Cooperation of this double faced deflector materially expedites as will be later more fully shown, the moving and unloading of the grain or other material during a considerable portion of the unloading operation.

In Figs. 17 to 19 inclusive, suitable control devices and a control system is shown, which enables an operator to readily control, through manipulation of hands and feet, from the carriage, all of the power actuated adjustments of the king post P, the beam B and the oscillatory head H as well as the selective operation singly or in unison, of the shovel elements E. It is of course, to be understood that the controls and system illustrated, are merely exemplary.

As shown, the movement and adjustment of the carriage, is electrically controlled by a double acting treadle CT which as shown, is intermediately fulcrumed on the floor of the carriage and carries at its ends, depending rods 100, which are connected to a diametrical torque arm 101 fixed to a switch shaft 101a which is adapted to selectively close and open the forward or reversing circuits of the carriage switch CS shown in Fig. 19.

A similar treadle mechanism PT for operation by the right foot of the operator, is fulcrumed to the floor as shown in Fig. 17 and here, the torque arm oscillates the shaft 101a in either direction and the shaft, as diagrammatically illustrated in Fig. 19, is connected with an air valve for the king post, PV which in one position, connects the conduit or other source of air supply A under pressure with the air supply conduit 43 to the king post cylinder. When treadle member CT is depressed by the heel of the operator, the air valve PV is turned to connect the interior of the king post cylinder 34 with the exhaust air line X-1.

By further reference to Figs. 17 and 18, it will be noted that on the front panel of a box-like control mounting, 97 and adjacent the top thereof, I provide left and right hand oscillatory control handles HY and BY respectively. Control handle HY is normally maintained in the vertical position shown and may be selectively swung clockwise or counterclockwise to operate selectively the head switch HS (see Fig. 19) which controls the swinging of the supporting head H of my structure through power supplied by head motor MH. Control handle BY is also normally maintained in vertical position, as shown, and may be swung in clockwise or counterclockwise direction, to selectively oscillate the king post P

and to thus swing the supporting beam B in opposite directions. The said adjustment of the king post and swinging movement of beam B is accomplished through power supplied by the beam motor MB, the forward and reversing circuits for said motor being controlled by the switch BS diagrammed in Fig. 19 and which switch is directly actuated by the oscillation of the control handle BY.

As shown in Figs. 17 and 18, selective control for actuating (both protracting and retracting) the two oppositely movable shovel elements E, is obtained through left and right hand swingable handles LE and RE respectively, said handles controlling the pressure fluid systems to the shovel actuating units U. Handles LE and RE are, as shown, mounted on vertical axes at the top of the control mounting 97 and are normally maintained in the neutral position shown in Figs. 17 and 18. The stem of handle LE is connected with a dual passage, cylindrical valve EV-1 which as shown in Fig. 19, may be oscillated by swinging of the handle LE clockwise to connect the air or fluid supply pipe A with conduit 75 for supplying air to the several fittings 66 of the telescoped cylinders for retracting the slide cylinders S-2 to S-5 inclusive, of the left hand shovel actuating unit. In its opposite extreme position, when handle LE is swung counterclockwise, the valve EV-1 will connect the air supply pipe A with conduit 74 for supplying air to the inner and stationary end of the left hand unit U for protracting successively, the slide cylinders S-5, S-4, S-3 and S-2.

Similarly, the right hand control handle RE may selectively or simultaneously with manipulation of handle LE, oscillate a similar dual passage, air control valve EV-2 for controlling the right hand shovel actuating unit U, and in one position as shown in Fig. 19, connects the air supply pipe A, with the conduit 75 for supplying the outer ends of four of the respective cylinders S-1 to S-4 inclusive, for retracting the sliding cylinders S-2 to S-5 inclusive, while in its opposite extreme position, the valve EV-2 connects the source of air supply A with conduit 74 connected with the inner end of the right hand unit U for protracting successively, the several sliding cylinders S-5, S-4, S-3, and S-2. It is to be noted that both of the double passage valves EV-1 and EV-2 are associated with suitable exhaust passages LX and RX respectively to the end that when an inlet air connection is made with either of the supply conduits 74 and 75 of each of the shovel actuating units, the opposite end of the unit is connected to exhaust, thereby removing all opposition to the desired protraction or retraction of the sliding cylinders.

Referring again to the power control and air connection through conduit 43, to the movable cylinder 34 of the king post, it will be noted, see Figs. 19 and 7, that the air supply conduit 43 communicates with the valve containing fitting or housing 44 and through the stem of this housing, to the passage 36a in the heavy plug portion of the stub shaft 36.

Operation

In operation, my machine or apparatus is adapted to very quickly, through its selective power adjustments and manipulation and actuating of the shovel elements E, unload substantially the entire contents of a grain car or other analogous box-like vehicle containing granular material.

The carriage C is mounted for power adjustment on its tracks which extend at right angles to the rails or roadway as the case may be, of the transportation vehicle to be emptied. In grain elevators, it is convenient to mount the tracks R and the carriage C supported thereon, in juxtaposition and at one side of the elevator leg with the beam B overhanging the usual grate and grain-receiving pit 110, conventionally provided in grain elevators. In Figs. 20 to 24 inclusive, I diagrammatically illustrate several successive steps which are employed in the positioning of my apparatus as well as in the steps of unloading grain or other granular material from a box-like transportation vehicle.

The king post P is first elevated to the desirable extent, depending upon the height of the top of the side doorway of the grain car or other vehicle, which as previously described, is accomplished by the operator, depressing with his toe, the post adjusting treadle PT. The heavy supporting beam B is then if necessary, angularly adjusted, i. e., swung on the vertical axis of the king post by manipulating the right hand vertical handle BY which controls the reversing motor MB. Next, the carriage is advanced towards the doorway by manipulating treadle CT to preferably position the outer end of the beam approximately as is illustrated in Fig. 20. Simultaneously with the advance of the carriage, the operator manipulates the head oscillating hand lever HY at the left side of the vertical control panel to swing the head and units U to an acute angled position with reference to beam B for introduction of the units initially into the doorway and with the shovel E of one of the units disposed as shown in full lines, in Fig. 20.

The grain door of the car has of course, been previously removed and the grain or a portion thereof, pressing against this door, has flowed out of the car through the doorway into the pit. The left hand shovel E may now be actuated as indicated by the progressed dotted lines in Fig. 20 through manipulation of the left hand control handle LE at the top of the control mounting. Manipulation of this control handle successively protracts and retracts the shovel actuating mechanism. In the protraction of the shovel over the grain in the car, the shovel element E swings inwardly on its attachment axis against the resilient action of the spring 82 and in the retracting action, the shovel is disposed vertically for removing a quantity of the grain. In the successive initial operations of the shovel element E, the king post P should be successively lowered, which is readily accomplished by the operator through the foot manipulation of the treadle PT.

In the positions of the supporting head and shovel actuating units U, shown in full and dotted lines in Fig. 20, a considerable portion of the grain adjacent the center of the car is removed by action of one shovel only. It is usually desirable to oscillate the head H through manipulation by the operator of the control handle HY to the angulated dotted line positions shown in Fig. 20, whereupon the actuating handle LE is again manipulated to successively protract and retract the actuating mechanism for the left hand unit U, pulling grain from the right of the doorway.

I have described the usual initial operations of my apparatus by which a substantial quantity of the granular material is removed from the central part of the car. It now becomes desirable to bodily project the two shovel actuating units into the car and to then dispose the same longi-

tudinally thereof for simultaneous operation of the shovel elements E upon the end portions of the car. In Fig. 21, the dotted line position illustrates the usual next positioning of the supporting head and units mounted thereon. The dotted line position of Fig. 21 is attained by the operator through manipulation of the carriage treadle CT to advance the carriage a few feet (usually three or four) from the full line position shown in Figs. 20 and 21.

The next step in introducing the two shovel actuating units into the car, is illustrated in dotted lines in Fig. 22, wherein the supporting beam B is swung through a slight arc by manipulation of the hand lever BY and wherein it will be noted the stationary end of the right hand shovel unit U clears the doorway of the car and the left hand unit supported on head H is projected into the left portion of the grain car.

From this position, as illustrated in Fig. 23, the supporting head H may be turned by manipulation of handle HY to dispose the two actuating units U longitudinally of the car. The shovel elements E may then be simultaneously and oppositely actuated by manipulating the upper control handles LE and RE to successively protract and retract the telescoping units, thereby pulling grain in each successive retraction, with the shovels disposed vertically from the ends of the car towards the open doorway. Ordinarily, the units are first disposed when simultaneously operated, in the dotted line position shown in Fig. 23 and full line position in Fig. 24, pulling grain from the ends of the car to the center and operating upon the grain closest to the longitudinal side of the car having the open doorway. In operating the shovel simultaneously as indicated in the dotted and full line positions of Fig. 24, the double faced plow-like deflector D is preferably cooperatively associated with the shovels and their actuating mechanism although I do not wish to be limited to this operating combination as very effective results can be obtained without the use of the deflector although the time required is greater. In this connection (see Figs. 1 and 24) the deflector member D is wheeled into the car transversely thereof and positioned with its back against the outside longitudinal wall of the car and fixed upon the depending apex point 94 and the horizontal rear points or spikes 95. When so positioned, the grain pulled or shoveled towards the center of the car, is flung against the deflecting wings of member D and thereby is deflected towards the doorway.

Thereafter, the supporting structure for the head H may be by power, adjusted to the left hand dotted line position indicated in Fig. 24 for removing the grain simultaneously from opposite ends of the car and particularly, for operating upon the grain which remains close to the outer, longitudinal side of the car. In such operation, it is usually desirable to angularly adjust the shovel elements E as shown, in the dotted lines, by removing the anchoring pins 81 of each of the shovels and turning the supporting stems 77a of the supporting shank as desired, in their tubular sockets 73a and then resetting the anchoring pins.

It must be remembered that during all of the unloading operations, gravity and the natural flow of grain thereby, is a material factor, the grain pouring out from the open doorway into the receiving pit 110. It must also be remembered that as the top strata of the granular material are successively removed, the level of the supporting head H and the actuating units U is suc-

cively lowered through manipulation of the king post-controlling treadle PT.

The various controls are easily operated and coordinated by a trained operator, particularly since the adjustment of the carriage and vertical adjustment of the king post are controlled preferably by the feet of the operator while the oscillatory adjustment of the supporting head and the swingable adjustment of the horizontal beam are controlled by the hands of the operator. There is never occasion to manipulate the shovel actuating controls simultaneously with the manipulation of the power adjustment and positioning controls.

The structure of my extensible shovel actuating units and the application of fluid under pressure to the telescoping sleeves or cylinders thereof, is of high efficiency and provides for a very rapid reciprocation of the shovels under the fingertip control of the operator. In this connection, it will again be noted that if inadvertently, in the protracting operation of the telescoping cylinders, a shovel is thrust against the end or other wall of the car or against any impediment, its impact is cushioned by the spring clip 90 and immediately, the shovel is swung on its horizontal supporting stub shaft 79 and against the tension of coil spring 82, thereby in such swinging movement, through pressure of the cam surface 78c against the stem of poppet valve 87, opening said valve to exhaust air from the outermost telescoping cylinder S-5 and to thereby, prevent further protraction of the extensible unit. The described mechanism acts quickly to prevent injury to the ends or walls of the transportation vehicle.

It will further be seen that because of the very wide range of adjustability of the supporting head and the telescoping units carried thereby, that grain from all corners of the car as well as all other portions of the car, may be quickly and quite completely removed by power and with my improved structure, a trained operator can unload a large sized freight car with its average load of grain in from ten to twelve minutes. Only one operator is required in the power unloading and this operator is seated outside of the car. It is usually desirable to utilize a handyman for removing the grain door, applying the deflector member when utilized, and making such tilted adjustments on the shovels during some parts of the operation, as may be desired. This handyman, however, with the operator, remains outside of the car during all unloading operations.

From the foregoing description, it will be seen that I have invented a highly efficient, commercially practical machine for unloading grain and other material in particle form, from railroad cars and the like. The machine has a high capacity and while in its preferred form, embodies a number of working mechanisms, it is comparatively simplified when its many functions and advantages, including its several adjustments, are considered.

It will of course, be understood that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of my invention.

What I claim is:

1. A machine for unloading material in particle form from box cars and the like, comprising a shovel supporting and actuating unit having a series of horizontal, longitudinally telescoped cylinders, means for retaining and supporting the largest of said cylinders within a car, a depending unloading element supported from the small-

est of said cylinders, pressure fluid means for protracting and retracting said telescoped cylinders longitudinally from said telescoped cylinders longitudinally from said supported cylinder and an exhaust valve having an abutment element adapted to be engaged when said unloading element is thrust against a wall to discharge said pressure fluid means and thereby limit protraction of said telescoped cylinders.

2. A machine for unloading material in particle form from box cars and the like, having in combination a horizontally extensible, actuating unit adapted to be disposed in a car, power means for protracting and retracting said unit, a depending, unloading shovel supported from the outer end of said actuating unit with freedom for limited inward swinging in the protraction of said unit and retained in substantially vertical position when said unit is retracted and a cushioning member on the outer side or back of said shovel and an abutment element retractible by the inward swinging of said shovel to shut off application of protractive force applied to said unit.

3. In a machine for unloading material in particle form from boxcars and the like, a support mounting adapted to be positioned within the medial portion of a boxcar, a head journaled in said mounting in the manner of a turn-table for oscillatory adjustment on a vertical axis, a horizontally extensible supporting unit secured to said head and extending radially therefrom and wholly supported thereby, a depending, upstanding push shovel connected to the outer end of said horizontally extensible unit and wholly supported thereby, mechanism for rotatively adjusting said head from a point removed therefrom and power mechanism for protracting and retracting said extensible supporting unit for actuating said push shovel to intermittently convey material from various positions within a boxcar to a location substantially below said head, and control mechanism for said power mechanism including an abutment element actuated when said push shovel is thrust against a wall to shut off protracting power.

4. A machine for unloading material in particle form from boxcars and the like having in combination, a support mounting adapted to be positioned within the medial portion of a boxcar at a substantial height above the floor or the car, an adjustable head supported on said mounting, a pair of horizontally extensible supporting units each comprising a plurality of telescoped sections carried by said head and mounted in side by side relation and extensible oppositely and substantially diametrically of said head, a depending upstanding push shovel connected to the outer end of each of said extensible units and supported thereby, power mechanism for alternately protracting and retracting said extensible supporting units in unison and oppositely, thereby intermittently conveying material from opposite positions within a boxcar to a location below said head while balancing the operation of and power applied to said units and a cooperating, upstanding deflector member having a pair of converging deflector elements constructed for independent mounting in a transverse central

position within the car with the apex of said deflector elements directed to a side doorway of the car and with said elements opposed to the path of conveyed particles to deflect the same towards the doorway and whereby the simultaneous and opposite retraction of said two units balance the effect of particles pitched against said deflector elements.

5. In a machine for unloading material in particle form from boxcars and the like, a horizontally extensible actuating unit adapted to be disposed in a boxcar, power means for successively and intermittently protracting and retracting said unit, a depending, upstanding unloading shovel supported from the outer end of said actuating unit and mechanism for controlling the application of power for protracting said unit including an abutment element mounted adjacent the outer end of said unit and retracted when said unloading shovel is thrust against a wall to shut off protracting power.

6. In a machine for unloading material in particle form from boxcars and the like, a support mounting adapted to be positioned within the medial portion of a boxcar, a head journaled in said mounting in the manner of a turntable for adjustment on a vertical axis, a pair of horizontally extensible supporting and actuating units mounted in side by side relationship upon said head and telescopically extensible, oppositely substantially diametrically of said head, a depending upstanding push shovel connected to the outer end of each of said extensible units and wholly supported thereby, mechanism for rotatively adjusting said head from a point removed therefrom and power mechanism for alternately protracting and retracting said extensible supporting units in unison to actuate said push shovels, thereby intermittently conveying material from opposite positions within a boxcar to a location substantially below said head while balancing the operation of and power applied to said pair of extensible supporting units, and control mechanism for limiting the outward or protracted extension of said supporting units, comprising an abutment element mounted adjacent the outer end of each of said units actuated when the push shovel adjacent thereto is thrust against a wall to shut off protracting power.

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