June 9, 1959 L. G. PLANT 2,889,943

MEANS FOR EVACUATING CARS OF THE HOPPER TYPE

Filed April 12, 1956 3 Sheets-Sheet 1

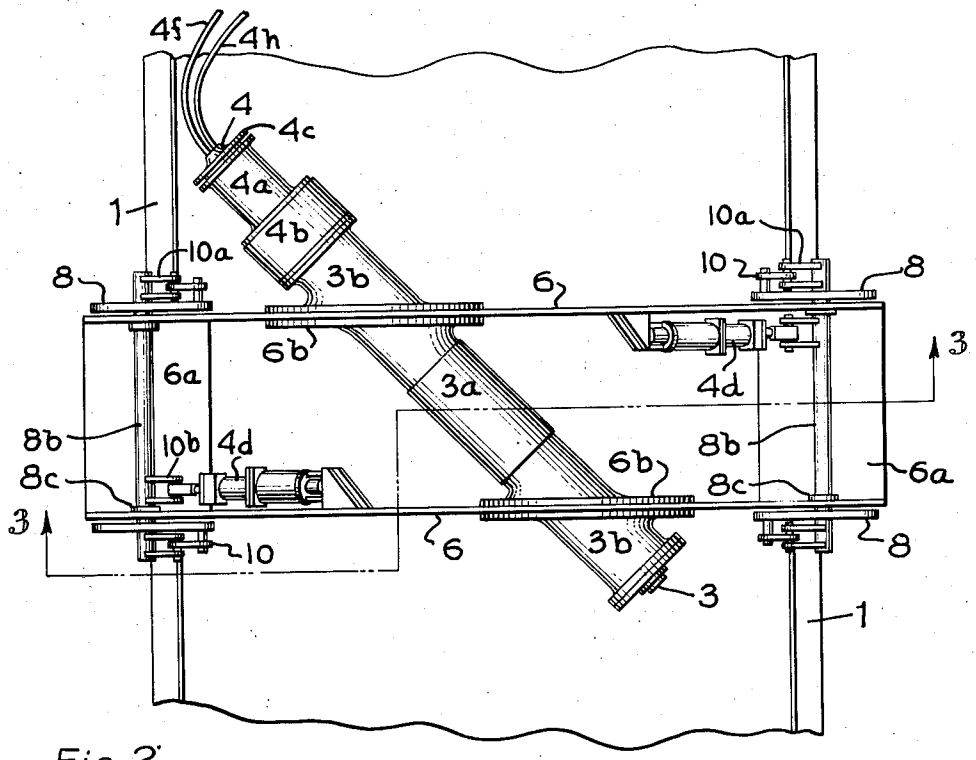


Fig. 2.

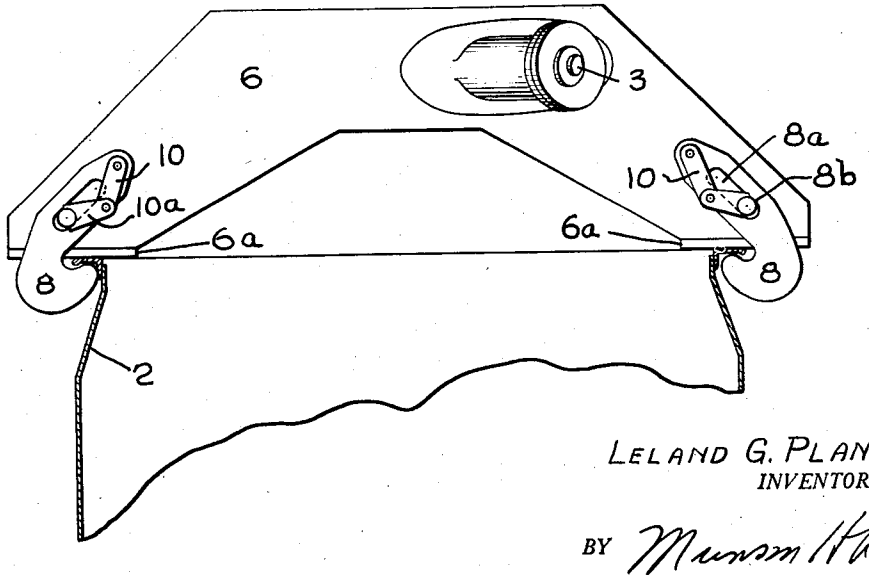


Fig. 1.

LELAND G. PLANT
INVENTOR.

BY Munson & Hans

June 9, 1959 L. G. PLANT 2,889,943

MEANS FOR EVACUATING CARS OF THE HOPPER TYPE

Filed April 12, 1956 3 Sheets-Sheet 2

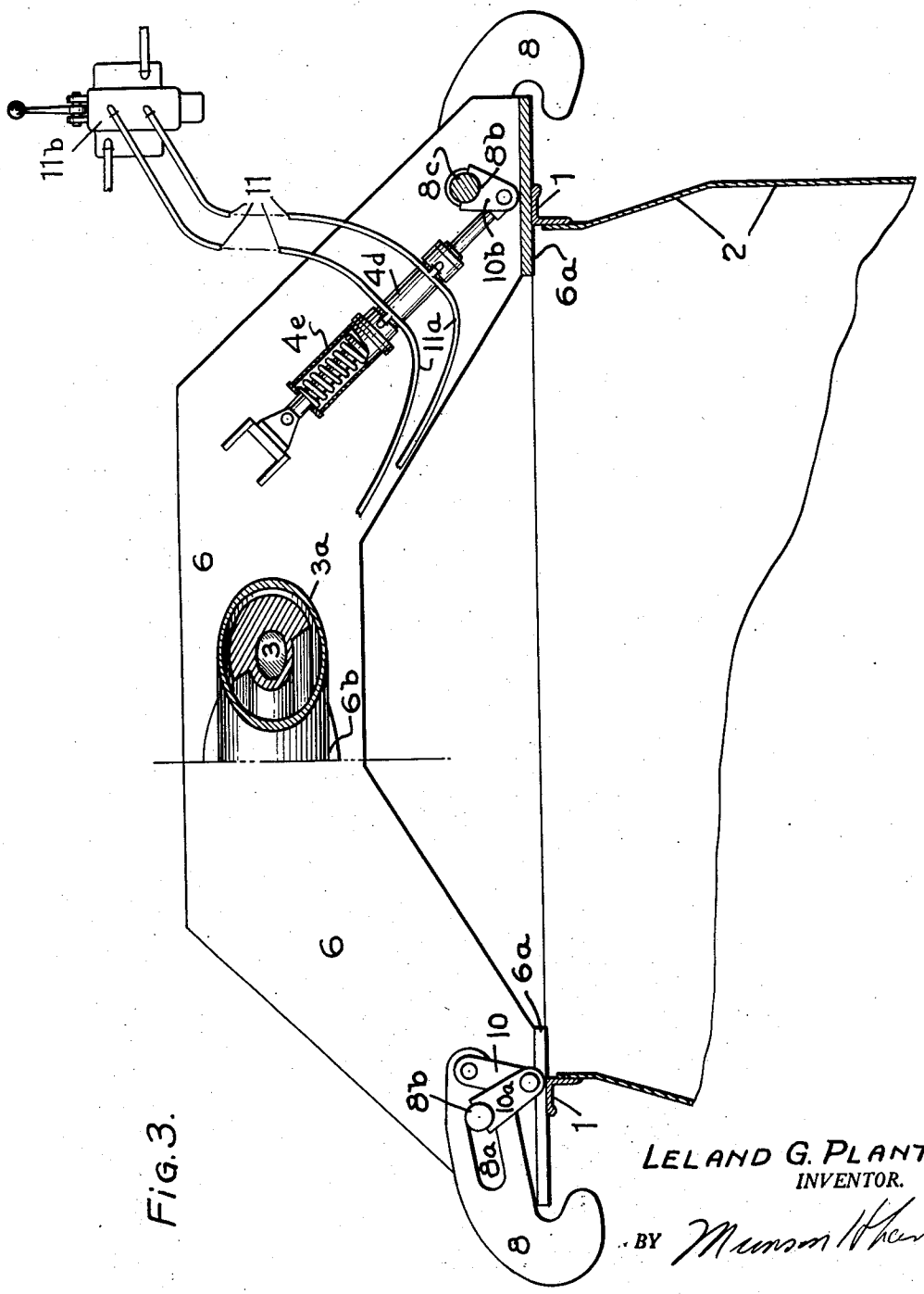


Fig. 3.

LELAND G. PLANT
INVENTOR.

BY Munson & Keene

June 9, 1959 L. G. PLANT 2,889,943

MEANS FOR EVACUATING CARS OF THE HOPPER TYPE

Filed April 12, 1956 3 Sheets-Sheet 3

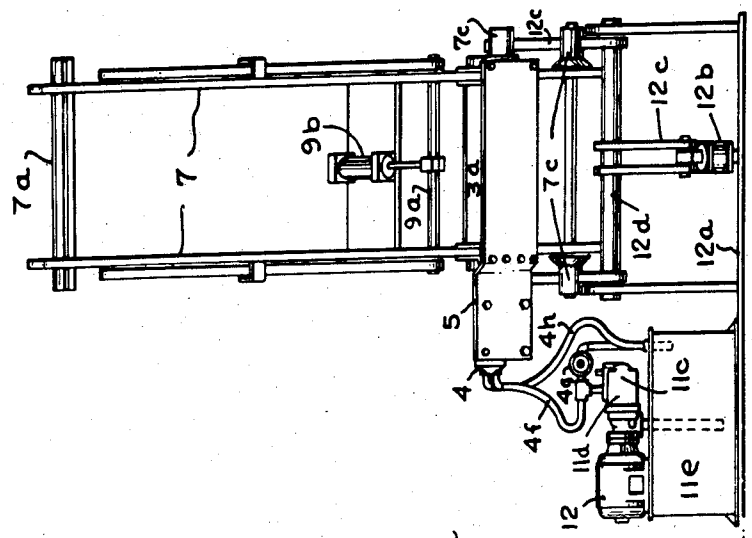


FIG. 6.

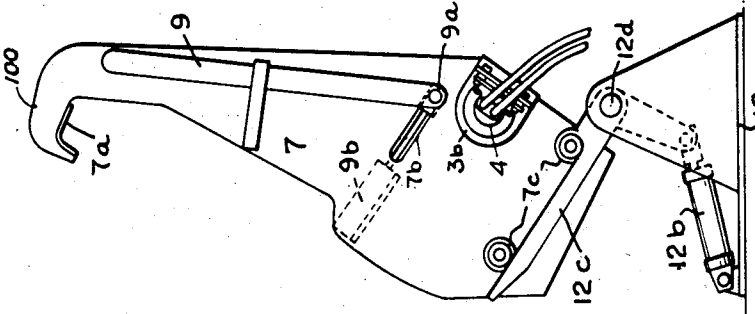


FIG. 5.

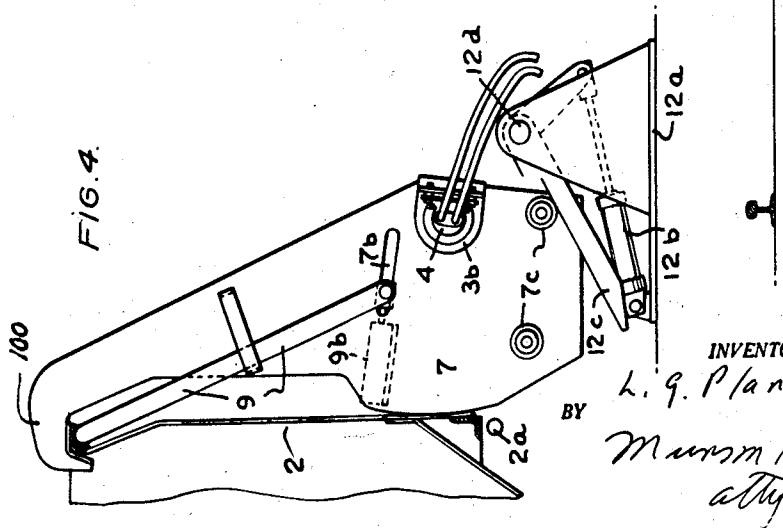


FIG. 4.

INVENTOR.
L. G. Plant
BY
Munn & Hare
atty.

United States Patent Office

2,889,943

Patented June 9, 1959

2,889,943

MEANS FOR EVACUATING CARS OF THE HOPPER TYPE

Leland G. Plant, Edenton, N.C.; Pattie Louise Moore Plant, executrix of said Leland G. Plant, deceased

Application April 12, 1956, Serial No. 577,820

2 Claims. (Cl. 214—64.2)

The invention relates to means for evacuating cars of the hopper type, and the present application is a continuation-in-part of my application Ser. No. 251,437, filed October 15, 1951, now Patent No. 2,748,959, which in turn is a continuation-in-part of my application Ser. No. 171,107, filed June 29, 1950, now Patent No. 2,673,651, dated March 30, 1954.

More particularly, my invention relates to the novel means I have devised in combination with car vibrating machines for delivering upwardly directed thrusts upon the underside of outwardly projecting flanges ordinarily provided along the top edges of hopper car side walls, alternating in vibrating sequence with downwardly directed thrusts upon the top side of said flanges, the purpose being to dislodge bulk materials packed in said car and to accelerate their discharge through drop doors in the floor of the car. The thrusts thus directed may originate in an eccentrically weighted shaft rapidly rotated by power means upon bearings mounted in a frame structure designed either to hang upon the top edge of one side of a hopper car or to span and rest upon opposite flanged edges at the top of both side walls.

In the application of this invention to machines of the type that operate against the side wall of hopper cars as disclosed in my Patents No. 2,673,651 and No. 2,748,959 the downwardly directed thrusts are intermittently imparted to the car through hook members of the machine resting upon a flange member at the top edge of the car side wall while upward thrusts are alternately delivered against the underside of said flanged member through bar members controllably applied and released at will. When combined with machines of the type having an eccentrically weighted rotor mounted in a frame designed to span the top of a hopper car so as to rest upon opposite edges thereof when in operation, the upwardly directed thrusts resulting from this mechanism are transmitted to the underside of both top edge angles by hook members pinned to the machine in a position to overhang the car sides as this machine is placed thereon and drawn up by power actuated toggle leverage so as clasp said flanges or be released therefrom, controllably at will.

The invention is adapted to machines of this latter type having an eccentrically weighted rotor shaft member mounted in a frame that spans the top of a car in such a position that this rotor member revolves about an axis either approximately parallel to the car sides or at right angles thereto, both types being in common use. It is preferably employed in combination with a rotor member supported by the frame in a position diagonal to the car sides and novel as compared to prior constructions of such machines. In this preferred embodiment of my invention as herein disclosed, the rotor bearings may be positioned more directly above the car side walls than where the rotor is mounted parallel thereto but without causing the machine to creep along the car toward one end when in operation, a tendency noted in machines having rotors mounted at right angles to the car side

walls when placed thereon. In whichever type of these machines used the result of my invention is to augment its dislodging effect upon bulk materials packed in the car by jolting the car structure upwardly as well as downwardly. Furthermore, the effect of this invention upon whatever type of machine applied is to mitigate objectionable noise, particularly as complained of in machines of the type that bounce loosely upon the top edges of cars on which they are placed when in use.

In the drawings one group of figures **1**, **2** and **3** illustrate my present application of the invention to a frame adapted to span the top edges of opposite car sides, with an unbalanced rotor supported by bearings in said frame in an axial position diagonal to the car sides. In the second group of figures **4**, **5** and **6**, corresponding to like numbered figures in Patent No. 2,748,959, the initial application of this invention to a frame is shown mounted on a stationary base in such manner that it can be hung upon the side of a hopper car placed opposite said base, or released therefrom and returned to said base support, controllably at will.

In the drawings:

Figure 1 is a side elevation of my car vibrating machine frame as designed to span opposite car sides, said frame supporting an unbalanced rotor in a position diagonal to said car sides and being equipped with means for clamping it to flanges projecting outwardly from the top edges of a hopper car, viewed sectionally in a plane transverse to the car sides.

Figure 2 is a plan view of the car vibrating machine with its frame, as shown in the preceding drawing, resting across the top of a hopper car to which it is clamped by means of the invention.

Figure 3 is a partially sectioned elevation of the above machine frame and its diagonally positioned rotor, viewed in plane **3—3** of Figure 2, showing the mechanism of this invention in the position assumed by power manipulation when placing the machine on the top of a car before clasping it thereto and, later, as released therefrom.

Figure 4 shows the end elevation of my machine in a form adapted to be attached to one side of a hopper car, from a stationary mounting by which it is disengaged when attached to the side of the car.

Figure 5 shows the end elevation of the same machine as in Figure 4, when retrieved from the car and supported on its stationary mounting at such a distance from the car track as to afford proper clearance for the movement of cars.

Figure 6 is a side elevation of the stationarily mounted machine in the same position as viewed in Figure 5, also illustrating a hydraulic pump, oil reservoir and controls apparatus for propelling the rotor and attaching or detaching the machine from the side of a hopper car placed opposite to position in which this machine is stationarily mounted.

In both embodiments of the invention the reference numeral **1** denotes a projecting flange angle as customarily constructed along the top edge of a hopper car side wall, and the reference numeral **2** denotes a hopper car side wall of conventional design with an air brake pipe line **2***a* as customarily located (shown only in Fig. 4). In both embodiments of the invention the reference numeral **3** denotes an eccentrically weighted rotor shaft mounted in housing **3***a*, supported by bearings in housings **3***b*, and reference numeral **4** denotes a suitable motor of the fluid pressure (hydraulic) type. **4***a* denotes a cylindrical casing for supporting the motor within a rubber bushing. The reference numeral **4***b* (Fig. 2) indicates a cylindrical bracket bolted upon the flanged end of one bearing housing **3***b*, for enclosing a coupling between the shaft **3** and motor **4** and for supporting the casing **4***a*, to which it is

bolted at its other end, to cushion the motor from vibration and maintain it in approximate alignment with said shaft. 4*c* indicates a packing gland bolted upon the flanged head of casing 4*a*. 4*d* represents hydraulic cylinders and 4*e* denotes an encased coil compression spring mounted in alignment upon the head of each cylinder. 4*f* denotes a hose (or pipe tubing) through which oil may be supplied to the motor 4 when by-pass valve 4*g* is closed, and 4*h* denotes a hose connection through which oil is released from the motor and returned to a suitable reservoir.

In Fig. 6 the reference numeral 5 denotes a bracket which is an alternate arrangement for resiliently supporting the motor 4 in substantial alignment with the rotor shaft 3. The reference numeral 6 denotes parallel side plates of a machine (Figs. 1–3) designed to span a hopper car of conventional design when resting on top edges of its opposite sides. The reference numeral 6*a* denotes pad plates upon the under edge of plates 6, in position to bear broadly upon flange angles 1 and, optionally, to serve as cross braces between said side plates, supplementing the bracketing effect of flanges 6*b*, projecting from bearing housings 3*b*, where these flanges are bolted to said side plates.

The reference numerals 7, 7 denote frame plates of a machine (Figs. 4, 5, 6) having hooked portions 100 by which they may be hung upon the top edge of a hopper car and bearing plates 7*a*, on which the hook arm portions 100 rest to distribute their weight upon the top edge of the car side wall when thus attached. 7*b* denotes guide slots in oppositely disposed frame plates and 7*c* denotes flanged rollers pinned rotatably upon the sides of said frame plates.

In Figs. 1, 2 and 3 the reference numerals 8, 8 denote hook members with slots 8*a*, slidably and rotatably mounted upon trunnion shafts 8*b*, said shafts being supported by bearings 8*c* in the oppositely disposed side plates 6.

In Figs. 4, 5 and 6 the reference numeral 9 denotes latch bars slidably positioned upon oppositely framed plates 7 and pinned at their lower ends to a cross bar 9*a*, resting slidably in the guide slots 7*b*. A hydraulic cylinder 9*b*, with its piston pinned to bar 9*a*, is bracketed between the frame plates 7.

In Figs. 1, 2 and 3 the reference numeral 10 denotes toggle links each pinned at one end to a hook member 8 and at its other end to a crank arm 10*a*, upon one of the trunnion shafts 8*b*. Another crank arm 10*b* is positioned on each of said shafts in alignment with and pinned to the piston of one of the hydraulic cylinders 4*d*, bracketed to side plates 6.

In Fig. 3 the reference numeral 11 denotes hydraulic hose lines from a remotely located valve 11*b*, to the cylinders 4*d*, interconnected in a parallel relation by hose lines 11*a*. In Fig. 6 the reference numeral 11*c* denotes a pump by which in either arrangement of the invention oil under high pressure may be supplied for actuating the several hydraulic cylinders by means of which the machines are attached to and detached from the hopper cars to which applied, and 11*d* denotes a pump of higher volume capacity by which oil may be supplied under high pressure through pipe 4*f* to the fluid motor 4. 11*g* denotes an oil reservoir on top of which the above pumps may be mounted, either remote from or adjacent to the machine, and 12 denotes an electric motor for driving pumps 11*c* and 11*d*, in an installation applicable to either arrangement of the invention but as shown in Figs. 4, 5 and 6 it is mounted on a base 12*a*, close to a machine that is manipulated in being attached to and detached from a hopper car by the hydraulic cylinder 12*b*, rotating arms 12*c*, through trunnion shaft 12*d*.

In the application of this invention to a machine of the type that is laid across the top of a hopper car (Figs. 1–3), the practice is to turn the hook members 8 outwardly in relation to the frame of the machine when applying or disengaging it from a car. When in this position the pistons of hydraulic cylinders 4*d* are extended by manipulation of the hydraulic control valve 11*b*. This turns the shafts 8*b*, through crank arms 10*b*, to which the pistons are pinned, and rotates crank arms 10*a*, actuating the toggle links 10, first in a direction causing the hook members 8 to slide outwardly upon shaft 8*b* in the guide slot 8*a*, then to rotate upwardly until these hooks are in the position illustrated by Figure 3. To clamp this machine upon flanges 1, after it has been laid across the top of the car, the pistons of hydraulic cylinders 4*d* are retracted by manipulation of valve 11*b*, first causing the hook members 8 to rotate downwardly and toward the car sides until they contact side walls 2. Then, as shaft 8*b* is turned further its crank arms 10*a*, acting upon links 10, force the hook members 8 to slide backwardly in the guide slot 8*a* and draw the hook tightly against the underside of flange 1.

Where the invention is applied to machines of a type that is hung from the top edge of one car side wall as illustrated in Fig. 4, latch bars 9 are used in the clamping device. To secure the hook arm extensions 100 of plates 7 and bearing plate 7*a*, upon the flanged top edge of a hopper car side wall 2, the piston of a hydraulic cylinder 9*b* is retracted by manipulation of its remotely positioned control valve, drawing the cross bar 9*a* in an upwardly inclined direction as guided by slots 7*b*. As the bars 9 are pinned at their lower ends to said cross bar this action forces the upper ends of these bars tightly against the under side of a flange projecting from the top edge of the car side wall in a wedging effect. To release this clamped contact the piston of cylinder 9*b* is extended by manipulating its control valve thus sliding the cross bar 9*a* in the guide slots 7*b* in a downwardly inclined direction and causing the upper ends of bars 9 to drop away from under side of the flange against which it has been wedged and allow the hook arm extensions 100 of plates 7 with bearing plate 7*a* to be drawn away from contact with said flange as the machine is tilted up and away from the car side wall 2, by rotating the arms 12*c* upward to engage rollers 7*c*.

As the piston of hydraulic cylinder 12*b* is further retracted and arms 12*c* raised to the position shown in Fig. 5, the machine frame plates 7 and bars 9, slidably guided upon the faces of said plates swing away from the car sufficiently to clear it for movement as illustrated in the above drawing. To again attach the machine to a car the arms 12*c* are allowed to rotate downwardly, shifting the upper hooked extensions of plates 7 and bearing plate 7*a* to a position first overhanging the car side wall 2 and then lowered until resting on the top edge of said wall. As thus shifted, the top ends of bars 9 fall toward the car until in contact with its side wall and then can be forced up against the underside of an outwardly projecting flange on the top edge of the car side wall in a clamping position as above described.

My invention may be modified in construction of its parts as required for clamping other forms of machines to a flange upon the top edge of a hopper car side wall in such manner that the vibrating forces set up in such other machines will also deliver upwardly directed thrusts alternating with downwardly directed thrusts upon this flanged top edge. With this invention it is not necessary to rely wholly on the weight of a machine to produce an effective downward thrust upon the car structure and the damaging effect of heavy blows upon the car structure is eliminated by clamping the machine to the car in such a way as to make the machine in which the vibrating forces originate, in effect, an integral part of the car structure. Machines equipped with this invention can conceivably be operated to produce vibration within the car of super-sonic intensity.

Where a fluid type motor 4 is used to rotate the eccentrically weighted shaft in machines to which my inven-

tion is applied, one pump **11***d* supplies the fluid power for the motor and another smaller pump **11***c* supplies oil at a lower rate for actuating the several hydraulic cylinders. Both pumps may rotate upon the same shaft actuated by a single electric motor and encased in the same housing as here indicated by Fig. 6. A by-pass valve **4***g* when open allows oil from the larger pump to flow freely back to a reservoir **11***e* from which drawn by the pump. By partially or fully closing valve **4***g*, a controlled volume of oil can be forced through the motor **4**, the speed of which is governed by said volume.

In its preferred form my invention relies upon a wedging or toggle effect for clamping the machine to a flange upon the top edge of a car rather than upon directly applying the thrust or pull from the piston of a hydraulic cylinder, thus subjecting it to direct impact from the vibrating forces. Also, I have devised means, as shown, in Fig. 3, for further cushioning the impact upon these cylinders and sustaining their clamping force despite oil seepage within or from the cylinders that would allow the clamped hook members to slack unless frequently recharged from the pump. This is accomplished by mounting a compression coil spring **4***e* in a casing aligned upon the head end of each hydraulic cylinder **4***d*. When the pistons in these cylinders are retracted under pressure to clamp the hook members **8** as above described, this spring is compressed so that as oil may seep from the cylinder or pass its piston packing this spring continues to exert only a slightly slackened pressure effecting its pull upon the piston.

The invention has been described in detail for the purpose of illustration but it will be obvious that numerous

modifications and variations may be resorted to without departing from the spirit of the invention as set forth in the accompanying claims.

I claim:

1. A hopper car evacuator comprising an eccentrically weighted power rotated shaft, a frame with side plate members supporting bearings in which said shaft can revolve about an axis diagonally positioned relative to said plate members, said frame having a structure adapted to rest its entire weight upon the outwardly projecting flanges of oppositely disposed car side walls when spanned by said plate members in a position substantially at right angles to said side walls; and mechanism attached to said frame for clamping it to said flanges in such manner that upwardly directed thrusts upon the frame plates caused by rotating said shaft are transmitted to the under side of said flanges.

2. A hopper car evacuator as in claim 1, in which its clamping mechanism may be applied to or withdrawn from proximity to the car flange by power means remotely controlled, at will.

References Cited in the file of this patent

UNITED STATES PATENTS

1,970,740	Day	Aug. 21, 1934
2,013,235	Collins	Sept. 3, 1935
2,342,440	Whitsitt	Feb. 22, 1944
2,507,749	Bacheldor	May 16, 1950
2,573,164	Scheinker	Oct. 30, 1951
2,621,813	Bauerle et al.	Dec. 16, 1952
2,624,479	Musschoot et al.	Jan. 6, 1953
2,626,720	Woody	Jan. 27, 1953