March 20, 1934. F. SPENO 1,951,451

BALLAST CLEANING MACHINE

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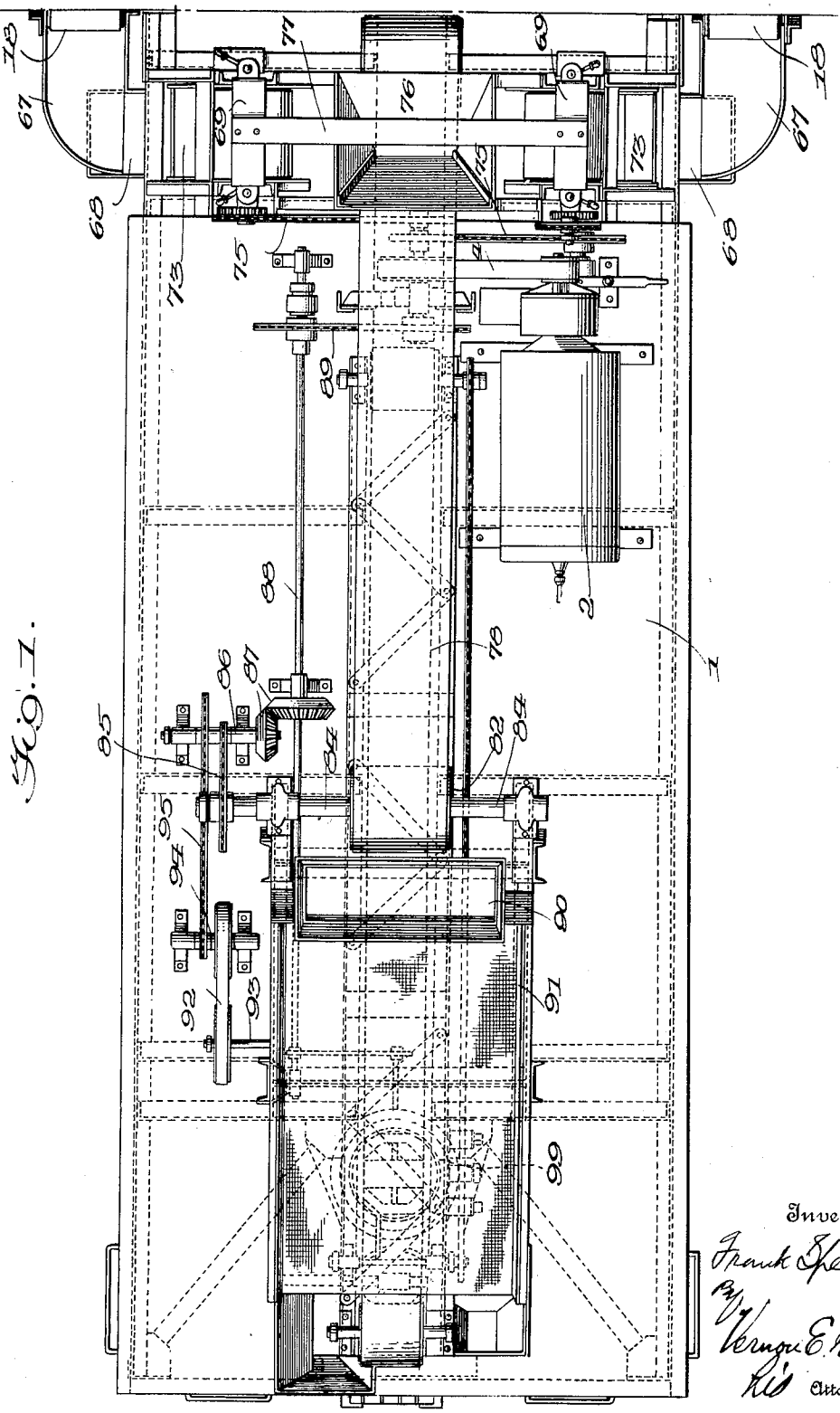

Fig. 1.

Inventor
Frank Speno
By Verne E. Hodges
Attorney

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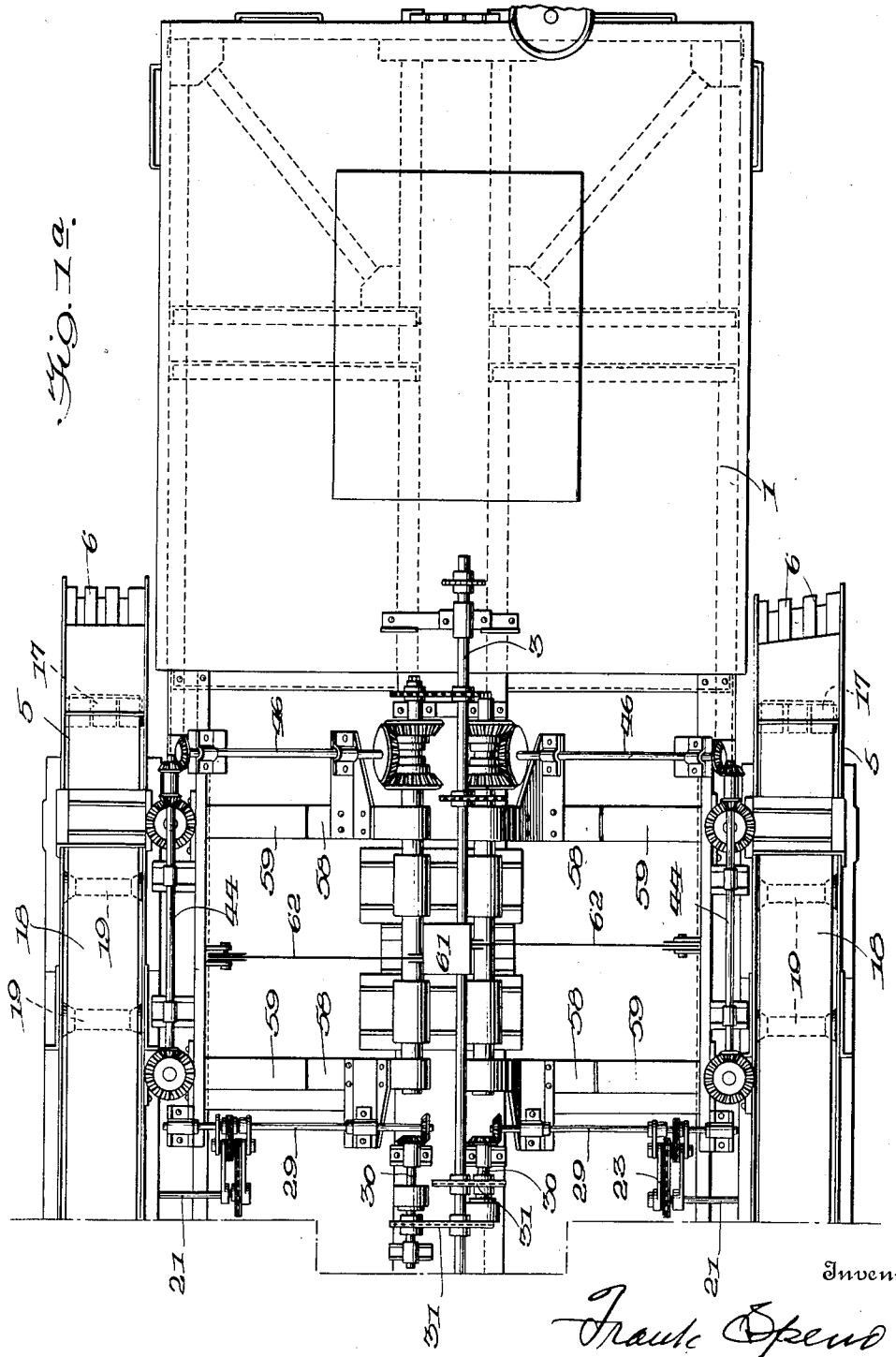
Fig. 1a.



Inventor
Frank Speno
By Vernon E. Hodges
his Attorney

March 20, 1934. F. SPENO 1,951,451

BALLAST CLEANING MACHINE

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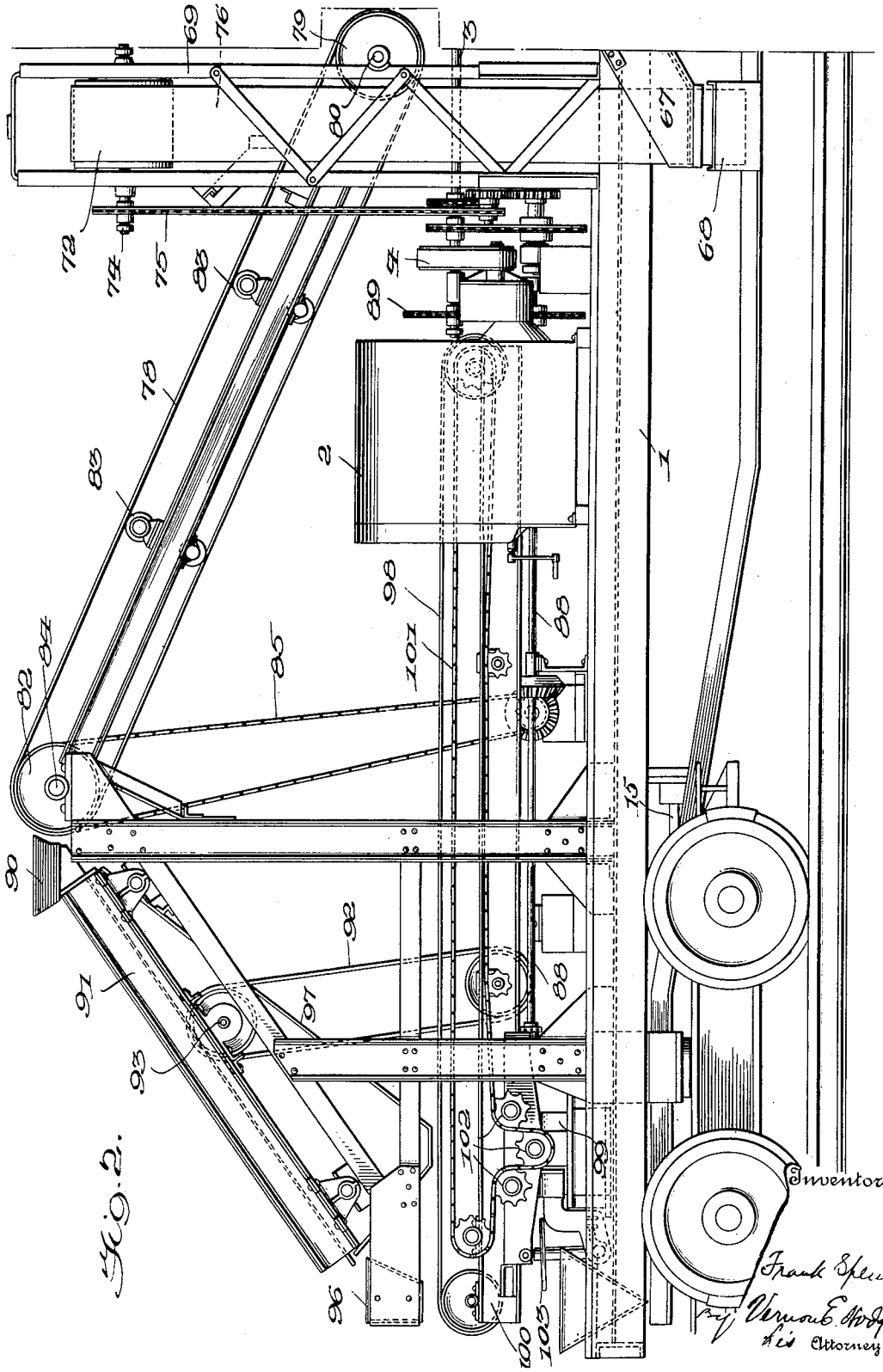

Fig. 2.

Inventor
Frank Speno
by Vernon E. Hodges
his Attorney

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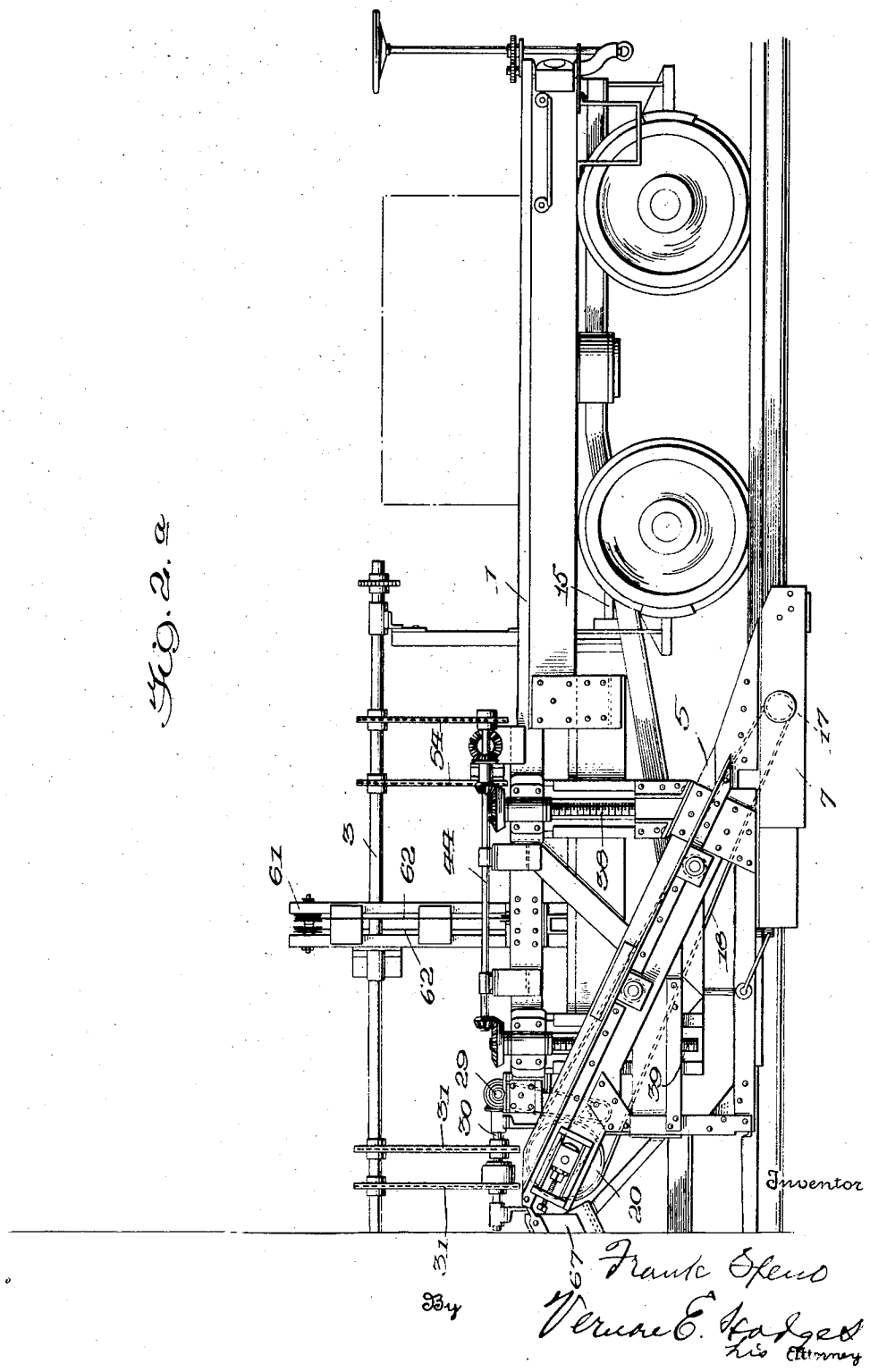
Fig. 2.



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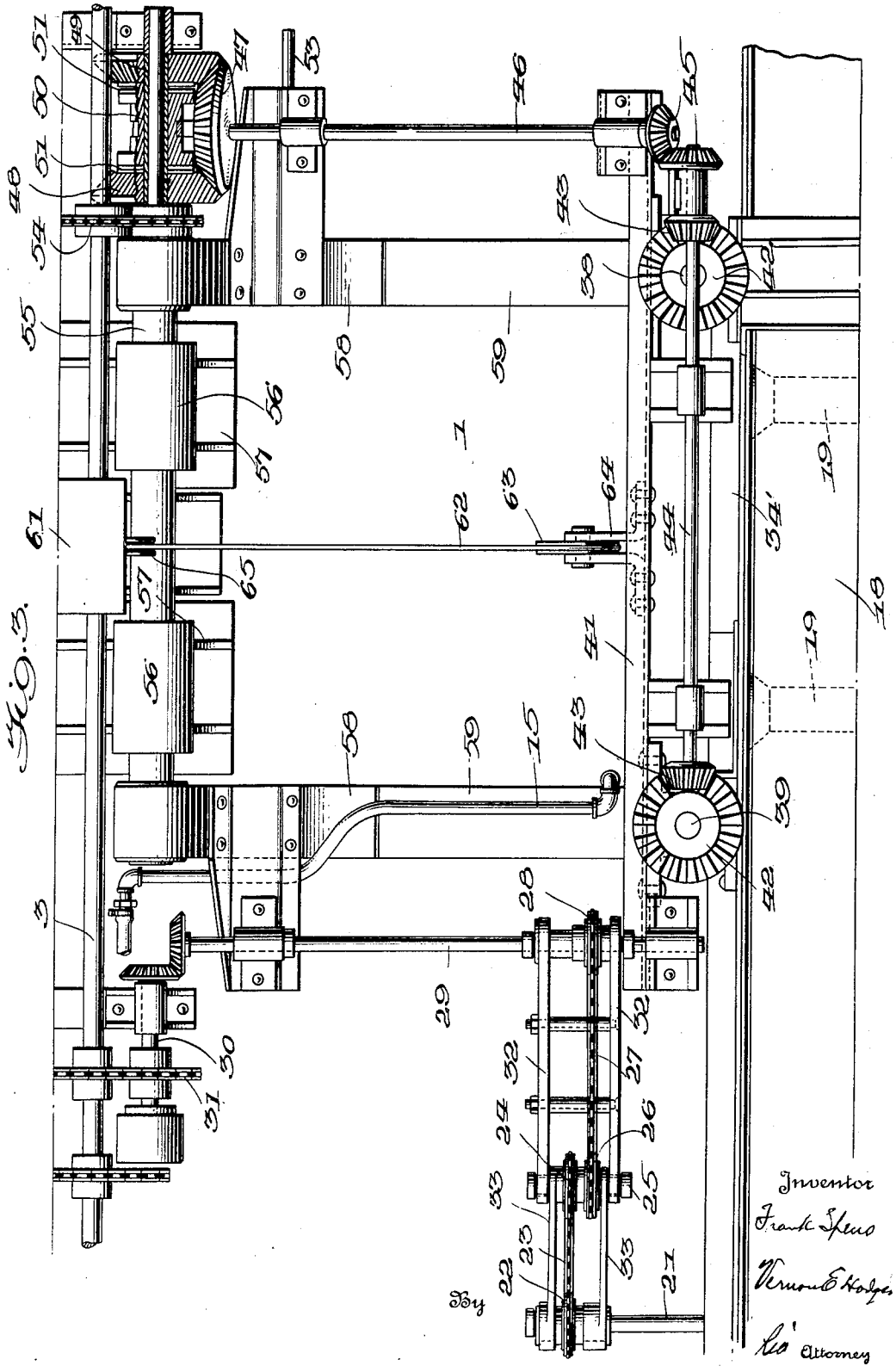

Fig. 3.

Inventor
Frank Speno
Vernon E. Hodge
Attorney

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Fig. 4

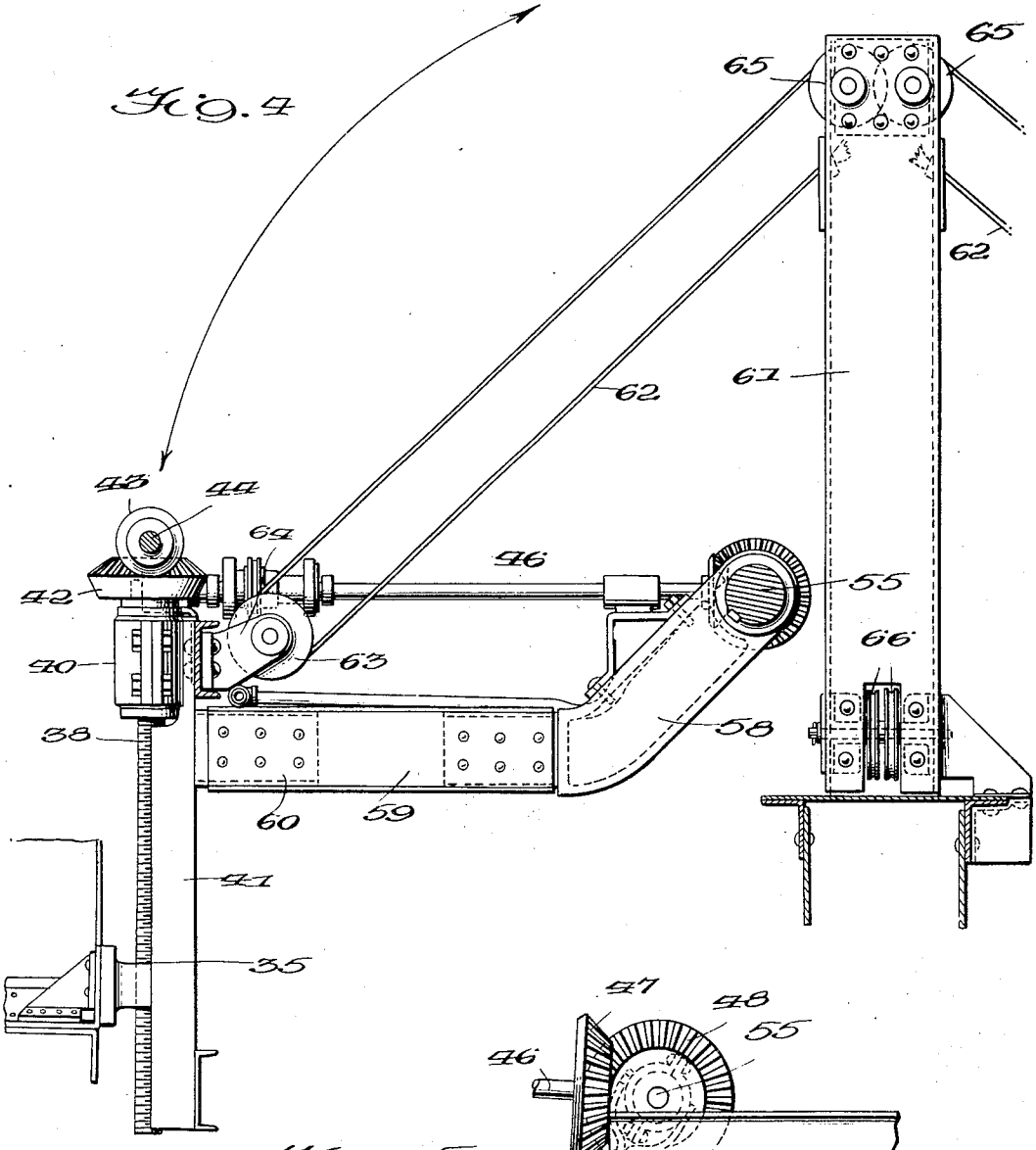
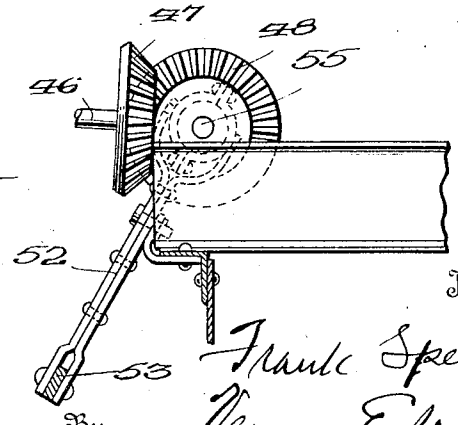


Fig. 5



Inventor

Frank Speno

By Vernon E. Hodges

His Attorney

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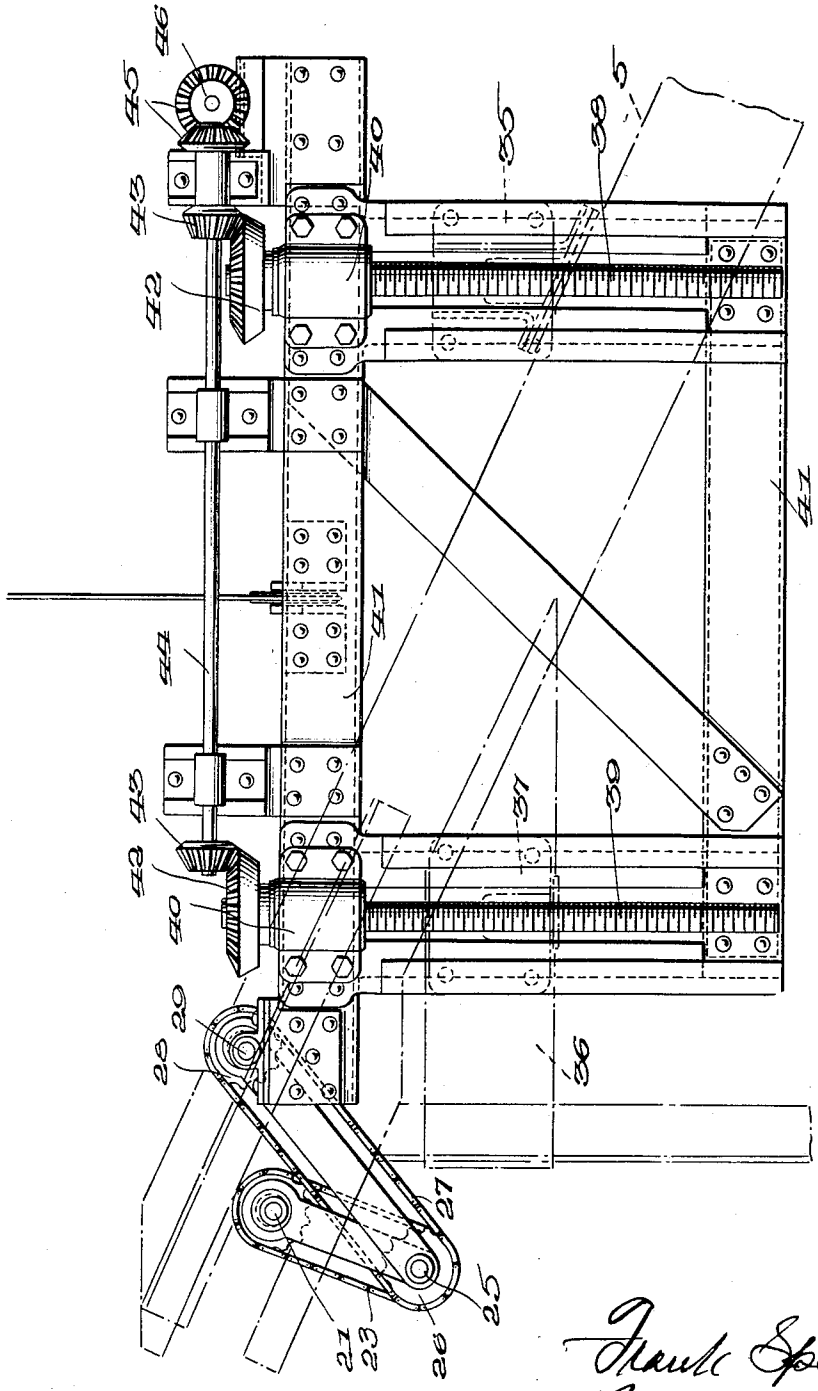

Fig. 6.

Inventor
Frank Speno
By Vernon E. Hodges
Fix Attorney

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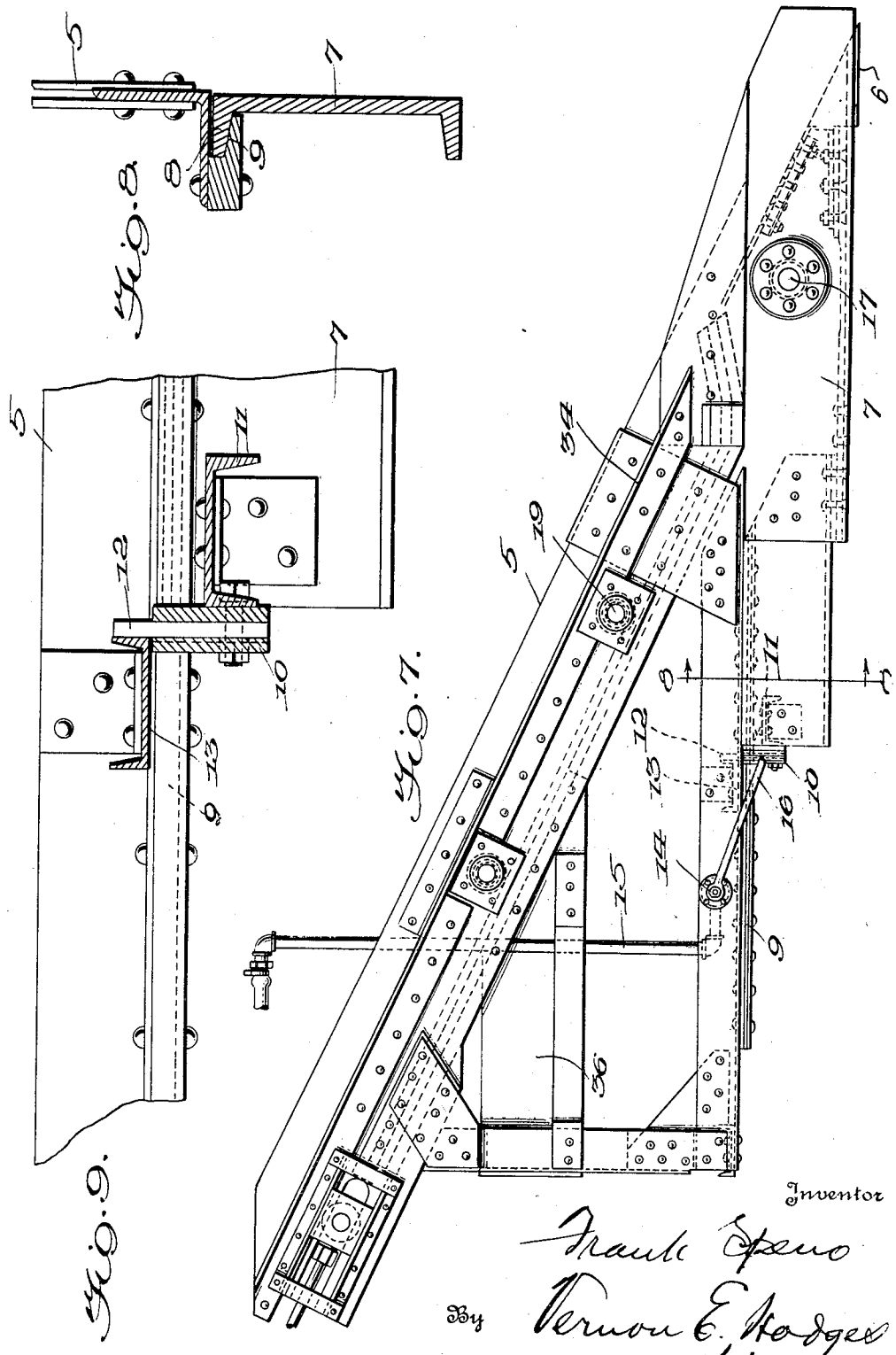

Inventor
Frank Speno
By Vernon E. Hodges
his Attorney

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Fig. 10.

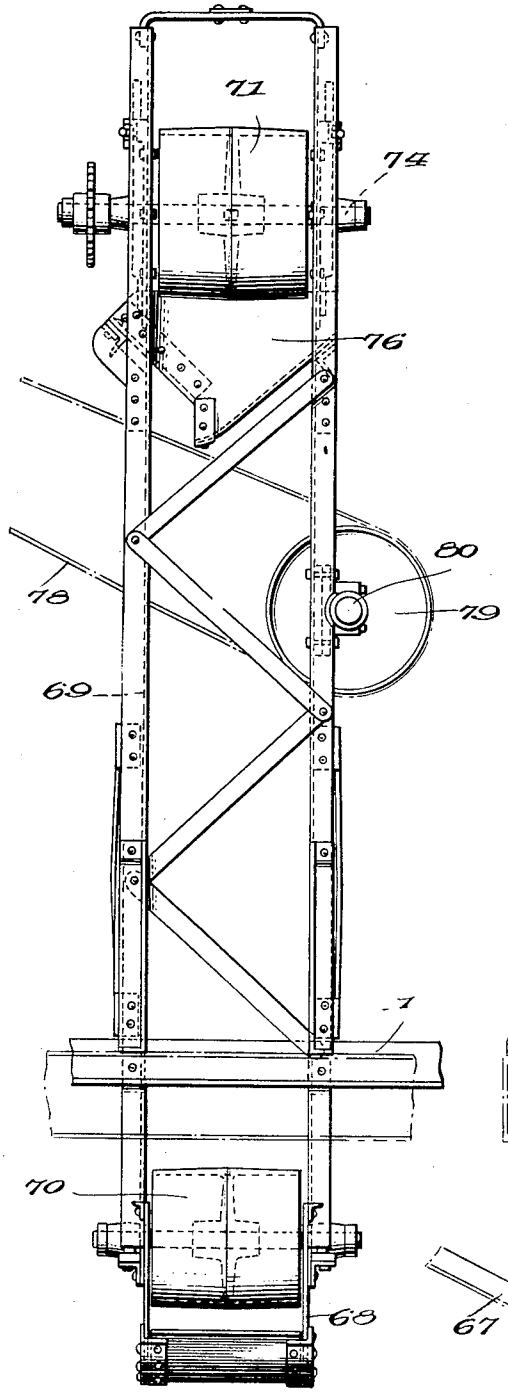
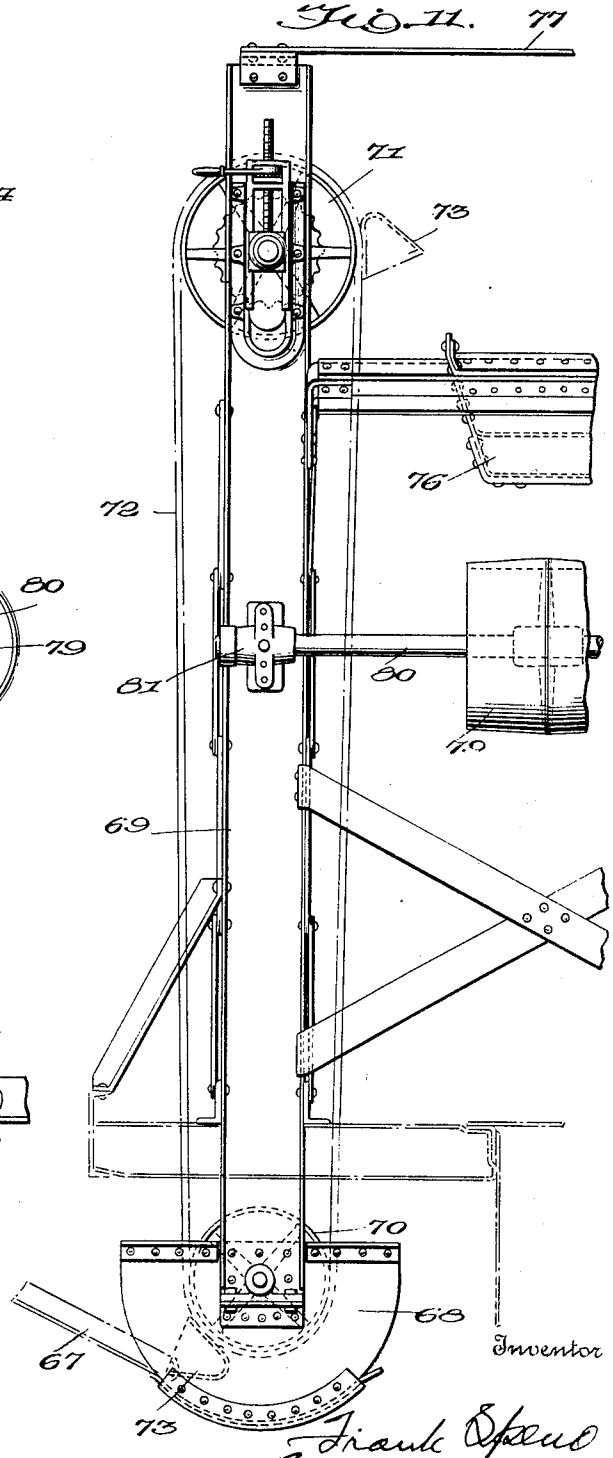


Fig. 11.



Inventor

Frank Speno

By Vernon E. Hodges

his Attorney

Patented Mar. 20, 1934 1,951,451

UNITED STATES PATENT OFFICE

1,951,451

BALLAST CLEANING MACHINE

Frank Speno, Ithaca, N. Y.

Application June 7, 1928, Serial No. 283,669

23 Claims. (Cl. 37—107)

This invention relates to an improvement in ballast cleaning machines.

The object of the invention is to provide a machine for picking up the ballast which previously has been removed from between the cross ties of a railroad track and placed along the sides of the track just beyond the tie ends, removing the dirt and cinders from the ballast thus gathered up and redepositing the clean ballast back between the ties in as clean a condition as it originally was when taken from the stone quarry.

This has always been done in practice by manual labor because no really successful machine has been developed heretofore which would accomplish this object. A great many attempts have been made along the line but they have all resulted in more or less failures, and none have reached the stage where they could be used successfully in actual practice.

The machine is so constructed as to scoop up the ballast along the sides of the track at the ends of the ties over which it passes and cause a movement of the ballast through conveyers to a screen, which sifts the cinders and dirt from the ballast, discharging the dirt off to one side of the track or into cars following the machine while the cleaned ballast is directed back between the ties.

The entire operation is automatic. The machine is built preferably on a railroad flat car which may be pulled by an engine in the front, and as it is pulled along the rails it gathers up and cleans the ballast after the latter has been thrown outward to the ends of the ties by manual labor.

Another important object of the invention is the automatic stopping of the movement of the car or machine whenever a scoop which gathers up the ballast comes into contact with or strikes a monument, stone, culvert or other obstacle in its path, which retards or prevents its forward movement. This is accomplished by movably connecting a shoe with the scoop, so that when this shoe of the scoop engages such obstacle it causes relative movement between the two and opens a valve in the brake system applying the air brakes and at the same time causing a marked decrease in the pressure in the air line, which is indicated to the engineer of the locomotive, signalling him to stop instantly.

In the accompanying drawings:

Fig. 1 is a top plan view of the rear portion of the machine;

Fig. 1*a* is a similar view of the front portion;

Fig. 2 is a side elevation of the rear portion of the machine;

Fig. 2*a* is a similar view of the front portion;

Fig. 3 is a plan view partly in section of the mechanism for adjusting the position of and elevating the scoop;

Fig. 4 is a side elevation partly in section of the same;

Fig. 5 is a detail side elevation of the driving clutch for the elevating screws;

Fig. 6 is a front elevation of the adjusting mechanism for the scoop;

Fig. 7 is a side elevation of the scoop;

Fig. 8 is a sectional view on the line 8—8 of Fig. 7;

Fig. 9 is a detail horizontal section through the shearing bar;

Fig. 10 is a front elevation of the ballast elevator; and

Fig. 11 is a side elevation of the same.

The machine is adapted to be built onto a flat car and to be pulled by a locomotive in the usual manner. The flat car is designated generally by the numeral 1 and has an engine or motor 2 mounted thereon for driving the ballast cleaning machine and the operating parts thereof. This motor or engine 2 drives a main drive shaft 3 by a belt 4, as shown in Figs. 1 and 2. This drive shaft 3 runs longitudinally of the flat car 1 and power is taken therefrom to drive the operating parts of the machine.

Scoops are arranged upon the opposite sides of the machine so as to scoop ballast lying along the side of the track just beyond the ends of the cross ties, and these scoops are approximately identical in structure and operation, and for that reason only one will be described in detail. The scoops are designated generally by the numeral 5 and are provided with teeth 6 at the front thereof for cutting into the ballast and directing the loosened ballast back toward the conveyer in the scoops. The teeth of at least the right-hand scoop are arranged on a bias or with their front edges at an acute angle to the axis of the scoops, as shown in Fig. 1*a*, so as to engage the ballast farthest from the ends of the ties first, with a tendency to move it inwardly rather than the opposite.

It has been found that when the teeth are arranged at right angles to the axis of the scoop, and with the edges of the roadway slanting toward the outside, that whenever the teeth of the scoop are moved into the ballast there will be a natural tendency to agitate it and cause it to roll down the roadway toward the sides so that the machine cannot gather it up. This is obviated by arranging the teeth at an acute angle

to the axis of the scoop, as shown in the drawings.

As shown in Figs. 7 to 9, the scoop 5 has a shoe 7 carried by the lower end thereof, which shoe carries the teeth 6 on the front end thereof. The shoe 7 has longitudinally arranged inwardly extending flanges 8 near the back portion thereof, and normally in position to be received in grooves or channels 9 carried by the scoop 5 and extending longitudinally thereof on its lower edge. A clamp 10 is carried by a cross bar 11 at the back of the shoe 7 and this clamp carries a shearing bar 12 extending upwardly immediately in front of a cross bar 13 carried by the lower portion of the scoop 5. This shearing bar 12 is of some suitable metal of sufficient stength to withstand the pressure or force tending to move the shoe 7 relative to the scoop 5 under normal operation, but of such strength that whenever the teeth of the scoop engage or contact with an abutment or fixed obstacle, which resists or prevents a further forward movement of the teeth, this causes a shearing of the bar 12 between the cross bars 11 and 13 which allows the members 5 and 7 to move relative to each other and the latter to slide back upon the track 9.

Disposed immediately behind the shearing bar 12 is an air valve 14 in the air line 15, which valve has a suitably disposed lever 16 located immediately behind the shoe 7, so that upon the backward movement of the latter after the shearing of the bar 12, the shoe 7 causes a turning of the valve 14 which opens the air line 15 of the train and automatically applies the air brakes to the train. Carried by the shoe 7 is a pulley 17 over which passes an endless conveyer 18, which extends upwardly therefrom and over the pulleys 19 to the pulley 20 mounted in the upper end of the scoop 5. The pulley 20 is adjustably mounted for tightening the endless conveyer in a customary manner

The pulley 20 is mounted upon a shaft 21 as shown in Figs. 3 and 6, which drives the same from a sprocket wheel 22 connected by chain 23 with a sprocket wheel 24 mounted upon the shaft 25. A sprocket wheel 26 is likewise mounted upon the shaft 25 and is integral with wheel 24 and connected by a sprocket chain 27 to sprocket wheel 28 mounted on a shaft 29, geared to shaft 30, which is connected by sprocket chain 31 with the main drive shaft 3. Links 32 pivotally support the shaft 25 from the shaft 29 and links 33 connect the shaft 25 with the shaft 21. This causes a flexible driving connection between the shafts 29 and 21, so as to allow relative adjustment therebetween but to maintain the driving connection in the adjusted positions.

The scoop 5 has a saddle 34 near the front end thereof to which is connected a front bracket arm 35. As shown in Fig. 7, a plate 36 extends longitudinally of the scoop 5 and a rear bracket arm 37 is connected with this plate 36. The bracket arms 35 and 37 support the scoop at the front and rear thereof. These bracket arms 35 and 37 are internally threaded and receive screws 38 and 39, which depend from bearings 40 carried by a frame 41, on which frame is also mounted the outer end of the driving shaft 29 for the conveyor 18. The screws 38 and 39 have bevel gears 42 fixed to the upper ends thereof, meshing with pinions 43 on a shaft 44, which is geared by the bevel pinions 45 to a shaft 46.

The inner end of the shaft 46 has a gear 47 secured thereto, meshing with oppositely disposed bevel gears 48, as shown in Fig. 3, loosely mounted upon a sleeve 49, to which sleeve is keyed a clutch member 50 for clutching engagement as at 51 with either of the gears 48. The clutch member 50 is shifted or moved into clutching engagement at 51 by a yoke 52 actuated by a lever 53, as shown in Figs. 3 and 5. The sleeve 49 is connected with and driven from the drive shaft 3 by the sprocket gearing 54.

A shaft 55 is journaled in bearings 56 supported in brackets 57 mounted upon the flat car 1. Keyed to the shaft 55 are conveyer arms 58, which receive sleeves 59, and which sleeves in turn receive arms 60 secured to the inner side of the frame 41 so as to connect this frame with the shaft 55.

An upwardly extending post 61, shown in Fig. 4, has one end of a cable 62 secured thereto in fixed relation, which cable passes around a sheave 63 mounted in a bracket 64 fixed to the frame 41, and the cable 62 then passes over a sheave 65 carried by the upper end of the post 61 and downward around a sheave 66 at the lower end of said post, from where the cable may pass to a suitable pulley or winding drum (not shown), to either raise or lower each of the pivotally mounted scoops 5 into either operative or inoperative positions, respectively.

An angular chute 67 is disposed beneath the upper end of the endless conveyer 18 and is carried by the scoop 5 in position to receive the scooped up ballast therefrom and direct this ballast into a hopper 68, shown in Figs. 10 and 11. A frame 69 is mounted upon the flat car 1 and carries the hopper 68. This frame 69 carries a pulley 70 at the lower end thereof within the hopper 68 and a similar pulley 71 at its upper end. An endless bucket conveyer, designated generally by the numeral 72, provided with buckets 73, extends over the pulleys 70 and 71. The driving pulley 71 is mounted on a shaft 74, which is driven by a sprocket chain 75, shown in Figs. 1 and 2 from the main driving shaft 3. As the ballast is discharged into the hopper 68 by the chute 67, it is scooped up by the buckets 73 and is carried upward to the top of the frame 69 where it is thrown into a hopper 76.

It will be noted in Fig. 1, that the two associated frames 69 are connected together by a cross member 77, which supports these frames and that the frames and endless bucket conveyers 72 are disposed upon opposite sides of the hopper 76, so that the ballast is thrown into this hopper as the buckets travel over the upper pulleys 71. The hopper 76 is disposed immediately above an endless conveyer 78, which passes over a pulley 79 mounted on a shaft 80 carried in bearings 81 supported by the frames 69 as shown in Figs. 10 and 11. The opposite end of the endless conveyer 78 passes over a pulley 82 and its intermediate portion is supported by idle pulleys 83. The pulley 82 is fixed on its drive shaft 84 and driven by a sprocket chain 85 from a stub shaft 86 connected by the bevel gears 87 with a shaft 88, which is driven by a sprocket chain 89 from the main drive shaft 3, as shown particularly in Fig. 1.

The endless conveyer 78 discharges the ballast into a hopper 90, which directs it into an oscillating screen 91 of usual construction, and the details of this screen are not described. The oscillating screen 91 is driven by a belt 92 which passes over a pulley mounted on shaft 93 at its upper end and over a pulley on shaft 94 at its

lower end, which shaft is connected by a sprocket chain 95 with the stub shaft 86 being driven therefrom for causing an oscillation of the screen 91 to agitate the ballast and separate the dirt and cinders therefrom.

The ballast passes over the end of the screen 91 into a suitable discharge chute designated generally by the numeral 96 for directing it back into the spaces between the cross ties. A hopper 97 is disposed beneath the screen 91, for receiving the dirt and cinders therefrom, and this hopper is disposed immediately above a belt conveyer 98 supported upon a turn table designated generally by the numeral 99 upon which the frame 100 of this belt conveyer is slidably mounted. The belt conveyer 98 is driven by a sprocket chain 101 from the shaft 88, which is connected therewith through the sprocket wheels 102. The belt conveyer may be slid outward from the position shown in Fig. 2 for discharging the dirt and cinders thereover to one side of the track, or may be elevated by the hand wheel and screw, designated generally by the number 103, to direct the dirt up into cars following the flat car 1 carrying the machine.

The turn table 99 allows the belt conveyer 98 to be turned in either direction for discharging the dirt off of either side of the track. The details of construction of this belt conveyer are not described and claimed in substantial particularity in this application, since they are made the subject matter of a separate application.

In the operation of the machine, the flat car 1 is intended to be drawn along the track by a locomotive. The scoops 5 are lowered to the proper positions both by the cables 62 and the supporting screws 38 and 39, which adjust the height of the scoops relative to the supporting framework and arms. The positions of these scoops being properly determined both as to elevation and inclination, the car is moved forward after the ballast has been shovelled out from between the cross ties and the teeth 6 of the scoops 5 dig into the ballast, directing it upward over the conveyers 18, which carry it to the upper ends of the scoops and discharge it into the chutes 67, which deliver it into the opposite sides of the hopper 68 from where it is carried by the buckets 73 up to the top of the frame 69, and thrown into the hopper 76 which allows it to fall onto the conveyer 78, which in turn carries it upward and discharges it into the hopper 90, which hopper directs it into the agitating screen 91, the oscillation of which separates the dirt from the ballast and allows the ballast to pass over the end of the screen while the dirt falls through the screen into the hopper 97 and onto the conveyer belt 98, which discharges it to one side of the track or into the following cars, as desired.

The screws 38 and 39 adjust the height of the scoops 5 relative to the frame 41 and likewise relative to the flat car and the drive for the endless conveyer 18 is so provided that positive driving connection is provided therefor, regardless of the height of the scoop. When the scoops are not in use and during the transportation of the machine to its place of use, the scoops are intended to be folded up, which is done by drawing up the cables 62, which pulls the scoops up about the axis of the shaft 55 into parallel relation on opposite sides of the posts 61, approximately at right angles to their initial positions. This likewise carries all of the operating parts for the scoop and conveyer thereof, so that the operative relation is not disturbed in the least because of the elevation of the scoops.

The chutes 67 may be detachably connected with the scoops 5 but the relation between the scoops 5 and the endless conveyers 72 is such that the latter need not be adjusted in their positions or any changes made in order to fold up the scoops. It is therefore very easy and simple to either fold up the scoops, rendering them inoperative, or, on the contrary, to move them into operative positions.

If the teeth of the scoops should strike an obstruction which would restrain the forward movement thereof, this would cause a backward sliding of the shoe 7 and a shearing of the bar 12, allowing this sliding movement. The shoe 7 strikes the lever of the valve 14, opening the air line and applying the brakes to stop the train. This prevents any injury or damage to the scoops.

I claim:—

1. A ballast cleaning machine including scoops, material conveyers mounted in the scoops, supporting arms for the scoops for moving the scoops into and out of operating positions, means for adjustably suspending the scoops from the supporting arms, and driving means for the conveyers carried by the arms.

2. A ballast cleaning machine including scoops, material conveyers mounted in the scoops, supporting arms for the scoops for moving the scoops into and out of operating positions, means for adjustably suspending the scoops from the supporting arms, and driving means for the conveyers carried by the arms, said driving means being adjustable to allow relative movement between the arms and scoops.

3. A ballast cleaning machine having scoops suspended therefrom, arms carried by the machine for moving the scoops into and out of operative positions, a frame carried by the arms, screws mounted on the frame, driving means carried by the arms for causing rotary movement of the screws, means carried by the screws for supporting the scoops to adjust the relative positions thereof, endless conveyers mounted in the scoops, driving means carried by the arms for the endless conveyers, and a flexible driving connection between the driving means and the conveyers to allow a driving connection during relative movement of the scoops and arms.

4. A ballast cleaning machine having scoops mounted on the opposite sides thereof, each of said scoops being provided with teeth, the teeth of at least the scoop on the right hand side of the machine having the cutting edge thereof from the outer side inwardly arranged at an acute angle to the line of movement of the machine with the edge at the outer side in advance of the edge at the inner side.

5. A ballast cleaning machine having scoops carried thereby, and provided with teeth for engaging the material to be scooped, the teeth of at least the scoop on the right hand side of the machine having the extreme ends thereof from the outer side inwardly arranged at an acute angle to the direction of movement of the scoop and machine, the arrangement having the teeth at the outer side in advance of the teeth at the inner side.

6. In a ballast cleaning machine having an air brake line, a valve connected with said air brake line, a scoop carried by the machine, and means connected with the scoop for causing an opening of the valve and air brake line when-

ever the scoop strikes a relatively fixed obstruction.

7. In a ballast cleaning machine having an air brake system, means for opening the system to apply the brakes, a scoop carried by the machine, and means connected with the scoop for causing an opening of the air brake line whenever the scoop strikes a relatively fixed obstruction.

8. In a ballast cleaning machine having an air brake pipe, means for opening the pipe to apply the brakes, a scoop carried by the machine for scooping material, and a shoe connected with the scoop for opening said means whenever the scoop strikes a relatively fixed obstruction.

9. In a ballast cleaning machine having a pipe adapted to be connected with an air brake system, a valve connected with the pipe for opening the air brake system to apply the brakes, a scoop carried by the machine for scooping material, a conveyer associated with the scoop, a shoe slidably connected with the scoop, and forming the scooping end thereof, and means for normally preventing relative movement between the shoe and scoop but allowing relative movement whenever the shoe strikes a relatively fixed obstruction, causing an opening of the valve of the air brake system.

10. In a ballast cleaning machine having a pipe adapted to be connected with an air brake system, a valve connected with and for opening said pipe, a scoop carried by the machine for scooping material, an endless conveyer mounted in the scoop, a shoe slidably carried by the scoop and forming the scooping end thereof, and a shearing bar interposed between the scoop and shoe for normally preventing relative sliding movement therebetween, and means for causing a shearing of the bar whenever the scoop strikes a relatively fixed obstruction to allow relative movement thereof and to cause an opening of the valve of the air brake system.

11. A ballast cleaning machine having scoops disposed at the opposite sides thereof, pivotally mounted supporting arms for the scoops, means for causing a movement of the scoops into and out of operative positions, conveyers disposed in position to receive the material from the scoops, said conveyers being disconnected from the scoops during operation of the machine to allow movement of the scoops into inoperative positions without movement of the conveyers from their operating positions.

12. A ballast cleaning machine having scoops disposed upon the opposite sides thereof, pivotally mounted supporting arms for the scoops, means for moving scoops into and out of operative positions, endless conveyers disposed within the scoops, and endless conveyers arranged adjacent the discharge end of the scoops in fixed relation to the machine and so disposed in their operative positions when the scoops are moved into inoperative positions.

13. A ballast cleaning machine comprising scooping means, and means operatively connected with the scooping means for automatically stopping the machine whenever the scooping means strikes a relatively fixed obstruction, restraining further forward movement.

14. A ballast cleaning machine comprising scooping means, and means for controlling the movement of the machine and operatively connected with the scooping means for automatically stopping the machine when the movement of the scooping means is restrained by a relatively fixed obstruction.

15. A ballast cleaning machine comprising a brake system, scooping means, and means operatively connected with the scooping means and with the brake system for automatically applying the brakes when the movement of the scooping means is restrained by a relatively fixed obstruction.

16. A ballast cleaning machine comprising a base, a frame pivotally connected therewith, scooping means carried by said frame, means for mechanically raising and lowering the scooping means on the pivoted frame, and actuating means carried by the base and having a mechanical driving connection with said raising and lowering means.

17. A ballast cleaning machine comprising a base, a frame pivotally mounted thereon, scooping means carried by said frame, means for mechanically raising and lowering the scooping means on the pivoted frame, and power operated means carried by the base and having a mechanical driving connection with said raising and lowering means for actuating said raising and lowering of the scooping means.

18. A ballast cleaning machine comprising a base, a frame pivotally mounted thereon, scooping means carried by said frame, means for mechanically raising and lowering the scooping means on the pivoted frame, power operated means carried by the base and having a mechanical driving connection with said raising and lowering means for actuating said raising and lowering of the scooping means, and power operated means connected with the pivoted frame for swinging said scooping means into and out of operating positions.

19. A ballast cleaning machine comprising scooping means, a conveyer associated therewith, supporting means for moving the scooping means into and out of operating positions, driving means for the conveyer carried by the supporting means, and means for adjusting the scooping means relative to the supporting means, the conveyer driving means being adjustable to allow the relative movement between the scooping means and supporting means.

20. In a ballast cleaning machine, scooping means having a conveyer, supporting means for the scooping means, driving means for the conveyer carried by the supporting means, means for adjusting the conveyer relative to said driving means, and transmission means forming a driving connection between the driving means and the conveyer and being adjustable in response to adjustments of the conveyer to maintain said driving connection in different adjusted positions of the conveyer.

21. In a ballast cleaning machine, scooping means having an endless conveyer associated therewith, supporting means for the scooping means and conveyer, driving means for the conveyer carried by the supporting means, means for adjusting the scooping means and conveyer vertically relative to the supporting and driving means, and transmission means forming a driving connection between the driving means and the conveyer and being adjustable in response to adjustments of the conveyer to maintain said driving connection in different adjusted positions of the conveyer.

22. In a ballast cleaning machine, scooping means having an endless conveyer therein, supporting means for the scooping means, driving means for the conveyer carried by the supporting means, means for adjusting the conveyer

vertically relative to the supporting means, and articulated transmission means forming a driving connection between the driving means and the conveyer and being adjustable with the conveyer to maintain said driving connection in different adjusted positions of the conveyer.

23. In a ballast cleaning machine, a support, arms mounted on the support, means pivotally connecting the arms to the support, a frame carried by the arms at the outer end portions thereof, screws mounted in the frame, a scoop having nuts received on the screws and supporting the scoop therefrom, means carried by the arms for rotating said screws, and driving means mounted on the support and geared to said last-mentioned means coaxially with the pivotal means for the arms to maintain a driving connection during swinging movement of the arms.

FRANK SPENO.