

Nov. 19, 1968

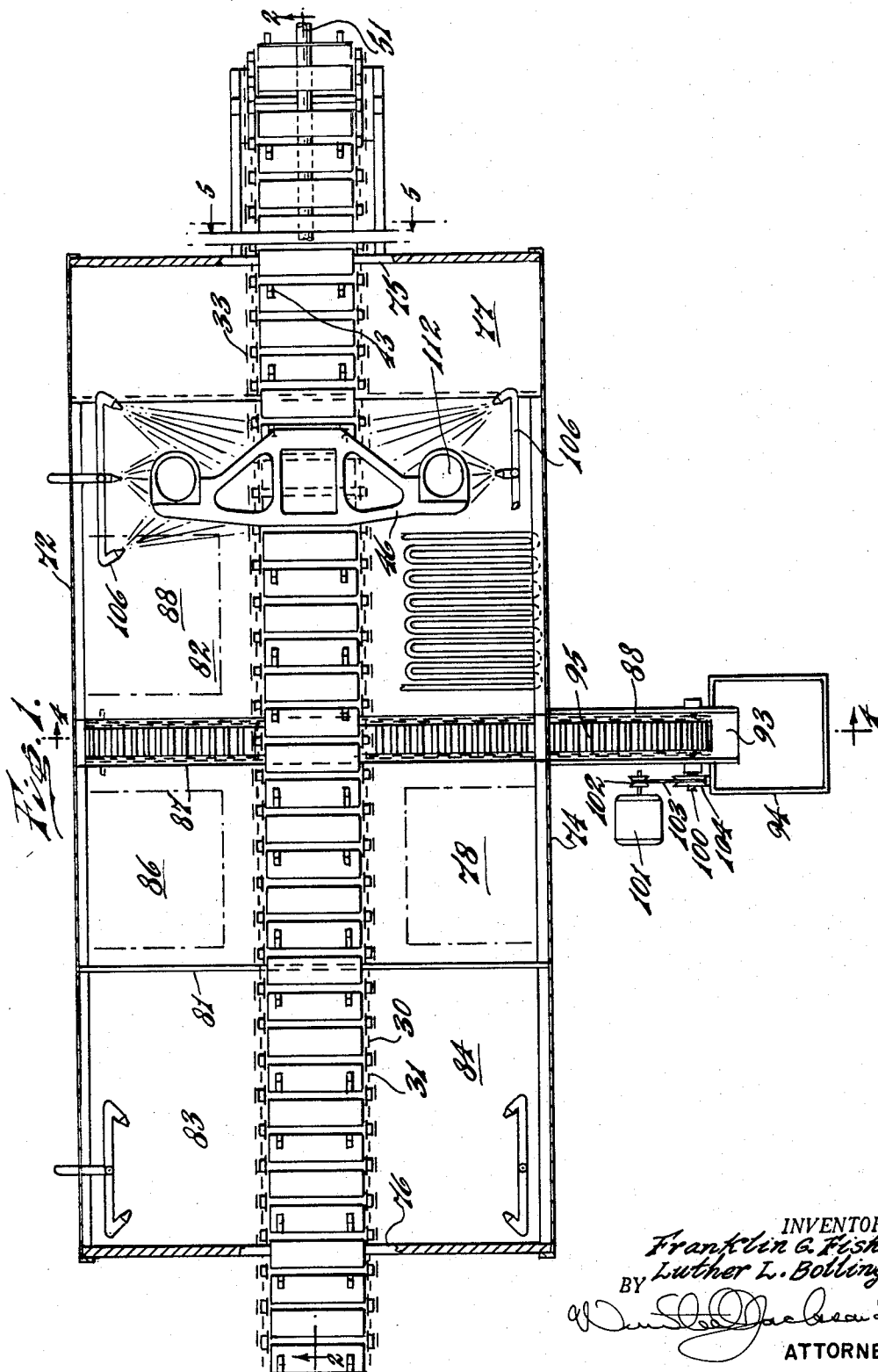
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3,411,518

CLEANING DEVICE AND STRUCTURAL MEMBERS

Filed Nov. 23, 1966

5 Sheets-Sheet 1



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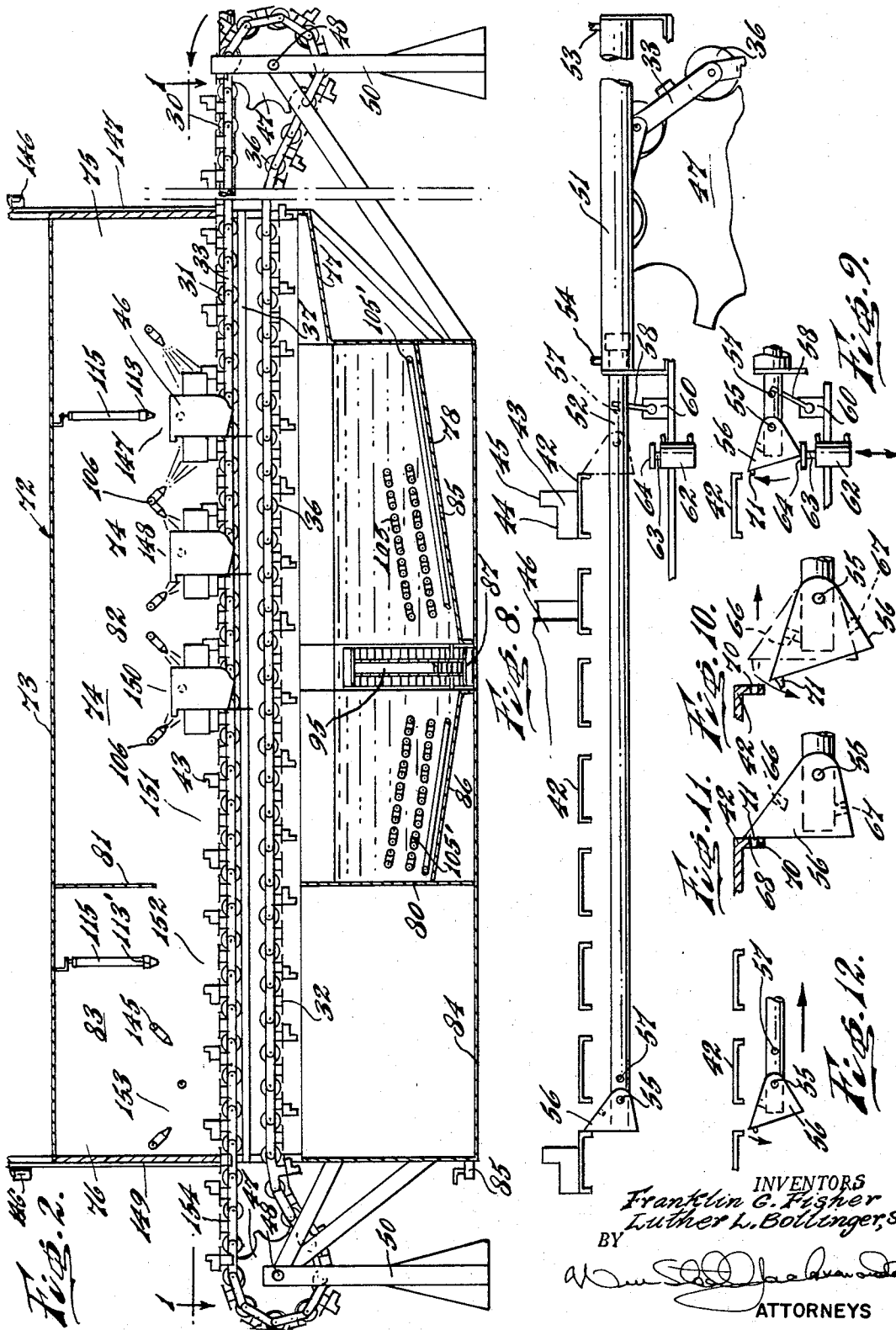
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CLEANING DEVICE AND STRUCTURAL MEMBERS

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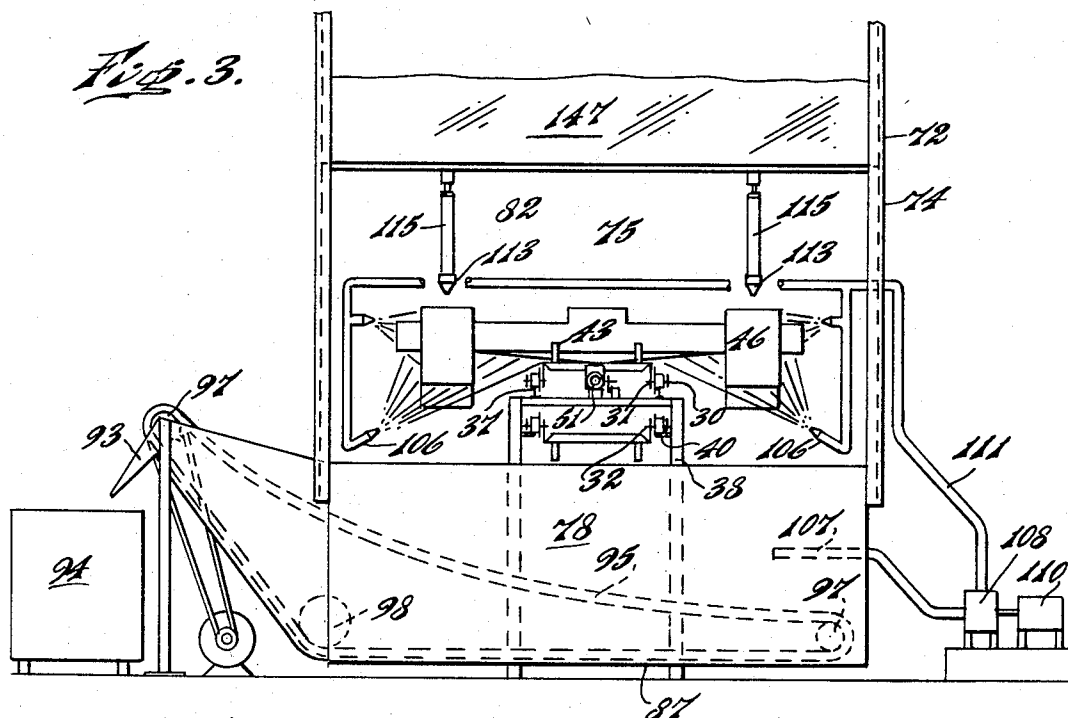
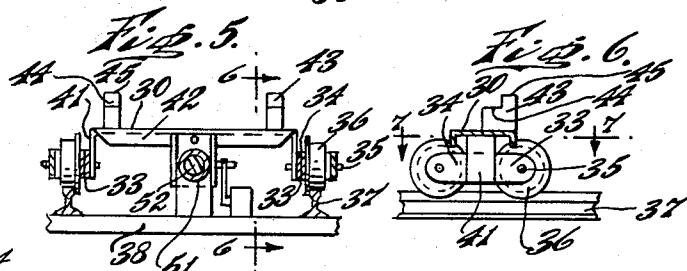
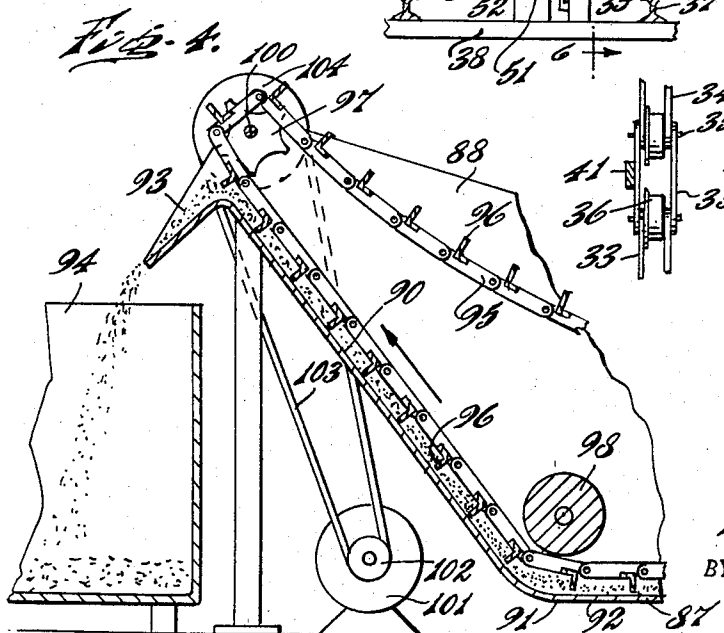
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5 Sheets-Sheet 3



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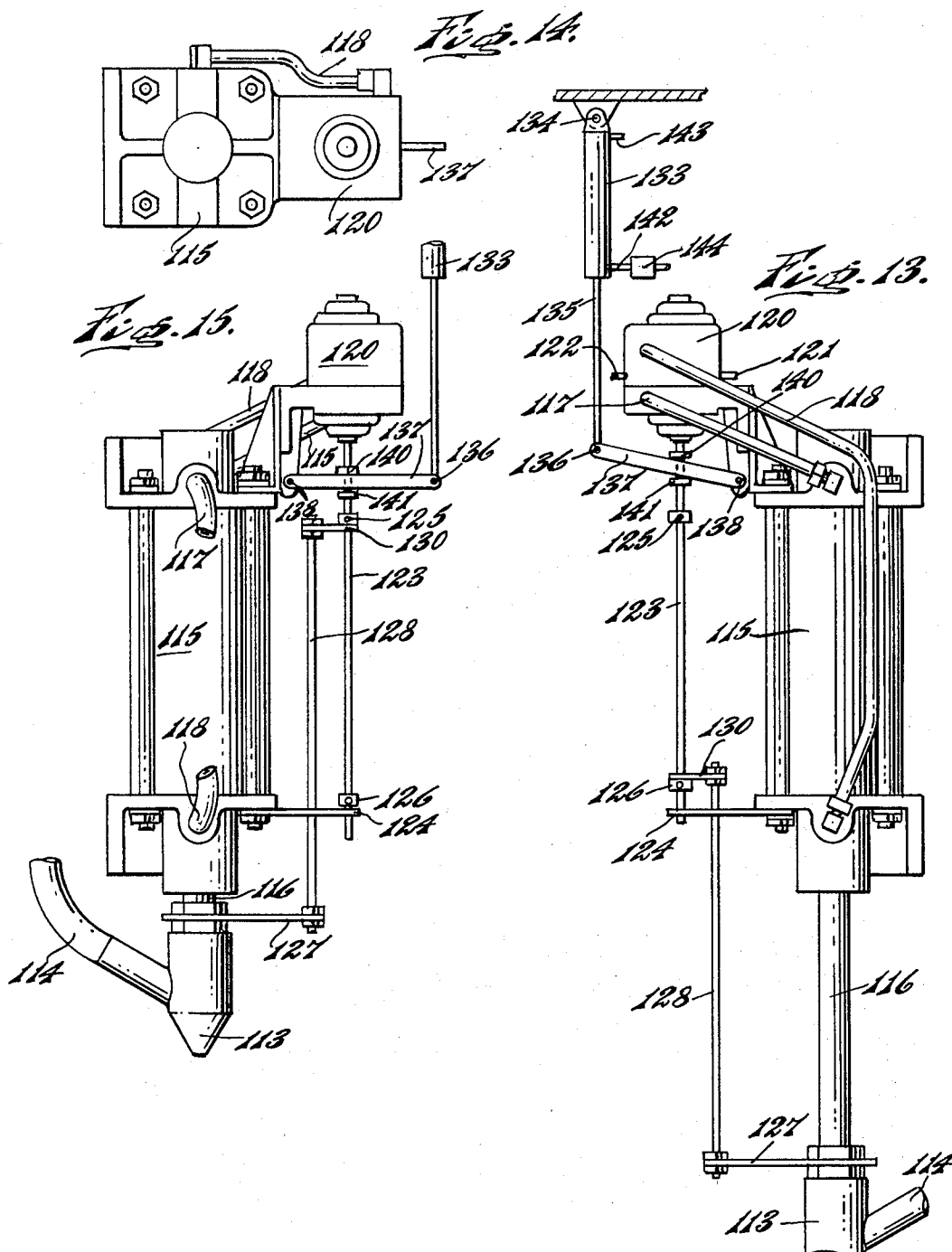
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5 Sheets-Sheet 4



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CLEANING DEVICE AND STRUCTURAL MEMBERS

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Fig. 16.

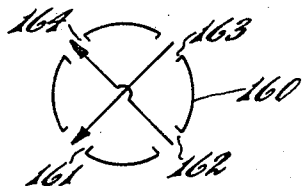


Fig. 17.

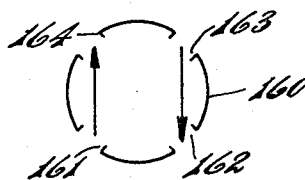
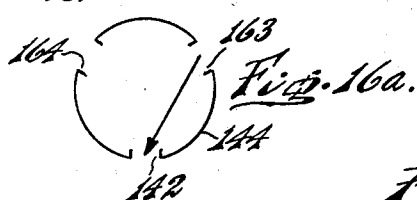
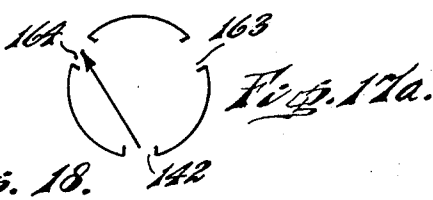


Fig. 18.

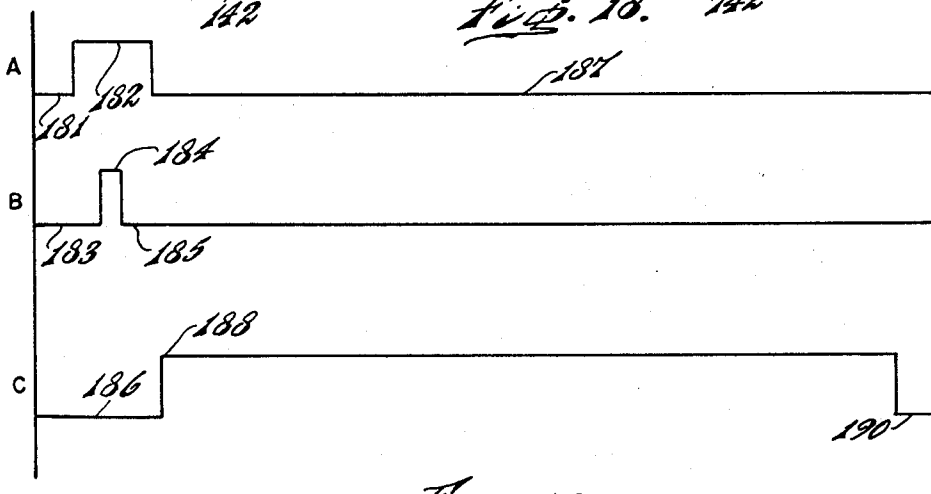
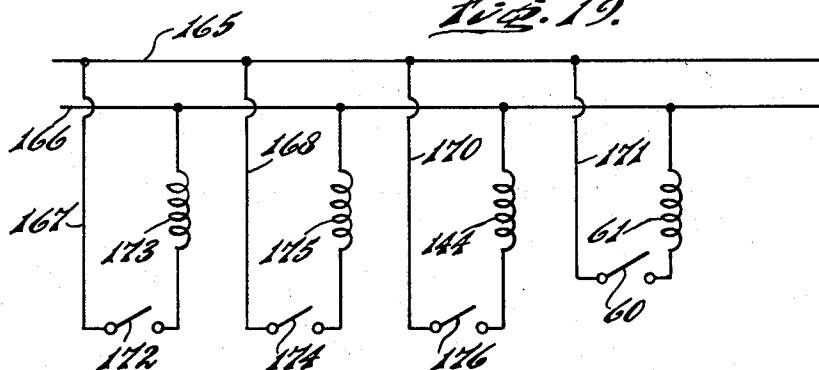


Fig. 19.



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3,411,518

CLEANING DEVICE AND STRUCTURAL MEMBERS

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5 Claims. (Cl. 134—72)

The present invention relates to liquid cleaning mechanism for structural members, especially railway car side frames and railway car bolsters.

In summary, the invention comprises washing equipment for cleaning structural members, especially railway car truck side frames and bolsters. The structural members are arranged at spaced positions on a generally horizontal conveyor which is advanced through a housing above a sump. The outsides of the structural members are sprayed and also a spray enters the hollow interior to wash the interior. In a preferred embodiment a reciprocating piston provided with a dog advances the conveyor step by step, the dog being held in operative position during the forward stroke, allowed to move to inoperative position for retraction and raised to operative position in its retracted position for the next forward stroke. In the preferred embodiment the spray which enters the interior of the structural members is reciprocated by a piston and cylinder, the piston controlling the valve position at opposite ends of the stroke. The solid particles washed from the structural members collect in a trough at the bottom of the sump, being brought there to by sloping bottom walls of the sump, and the trough has a trough extension in prolongation thereof provided with a sloping bottom wall, and a scraper conveyor in the trough and trough extension to remove solid particles.

A purpose of the invention is to reduce the labor and the delay incident to washing structural members and the like.

A further purpose is to facilitate the washing of very heavy and inconvenient items such as railway truck side frames and bolsters.

A further purpose is to mount a structural member on a generally horizontal conveyor, and pass it through chambers, in one chamber pre-heating, internally washing, externally washing and desirably draining the structural member and in another chamber internally and externally rinsing the structural member.

A further purpose is to automatically manipulate a spray nozzle so that it reciprocates from a position externally to a structural member to an internal position and passes back and forth through this sequence indefinitely as required.

A further purpose is to progress the conveyor step by step in response to a pusher piston and piston rod by a dog which in one case connects with the conveyor and is preferably locked into such engagement and in another position is retracted from engagement with the conveyor, desirably positively bringing the dog into engaging position again when it has fully retracted.

A further purpose is to collect solid particles from the washing solution in a trough and to remove them from the solution by a scraper conveyor having rakes which ride along an inclined bottom of a trough extension.

In the drawings we have chosen to illustrate one only of the numerous embodiments in which the invention may appear, selecting the forms shown from the standpoint of convenience of illustration, satisfactory operation, and clear demonstration of the principles involved.

FIGURE 1 is a diagrammatic sectional plan view of the conveyor of the invention, the section being taken on the line 1—1 of FIGURE 2.

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FIGURE 2 is a diagrammatic vertical section of the device of the invention, the section being taken on the line 2—2 of FIGURE 1.

FIGURE 3 is a diagrammatic right end elevation of FIGURE 2, with the entrance door raised.

FIGURE 4 is an enlarged fragmentary vertical section of FIGURE 1 on the line 4—4.

FIGURE 5 is an enlarged fragmentary vertical section on the line 5—5 of FIGURE 1 showing part of the conveyor and the upper track, the section also showing for placement purposes the pusher mechanism.

FIGURE 6 is a fragmentary section on the line 6—6 of FIGURE 5.

FIGURE 7 is a fragmentary section on the line 7—7 of FIGURE 6.

FIGURE 8 is a fragmentary enlarged diagrammatic longitudinal elevation showing the pusher mechanism.

FIGURE 9 is a view corresponding to a fragment of FIGURE 8 showing the mechanism for raising the dog to operating position.

FIGURE 10 is a fragmentary enlarged axial section showing the dog prior to and after raising to operative position in FIGURE 9.

FIGURE 11 is an enlarged view corresponding to FIGURE 10, showing the dog locked into engagement with the conveyor.

FIGURE 12 is a view corresponding to FIGURE 9 but showing the dog retracted as the piston rod begins its retraction stroke.

FIGURE 13 is a diagrammatic enlarged fragmentary vertical section of the mechanism for reciprocating one of the spray heads which enters the interior of the structural member, the device being shown extended downward.

FIGURE 14 is a partial top plan view of the device of FIGURE 13.

FIGURE 15 is a side elevation of the mechanism of FIGURE 13 looking from the other side and showing the spray head retracted.

FIGURE 16 is a conventional valve diagram for a valve for controlling the application of fluid pressure or exhaust in a double-ended fluid cylinder according to the invention, the valve being shown in one limiting position.

FIGURE 17 is a view corresponding to FIGURE 16 but showing the valve in the opposite limiting position.

FIGURES 16a and 17a show the valve to control raising of the reciprocating sprays, the views corresponding to FIGURES 16 and 17.

FIGURE 18 is a developed diagram showing the operation of the timer, illustrating from a purely functional standpoint the cam tracks which control the doors, the pusher and the reciprocating sprays.

FIGURE 19 is an electrical diagram which corresponds to the timer shown in FIGURE 18.

Serious difficulty is caused by accumulation of dirt on machine parts. Among other things, dirt is likely to act as an abrasive and to enter mechanism and cause greatly increased wear between rubbing surfaces. It may render lubrication completely ineffective. It may also greatly increase the friction of moving parts so as to render a mechanism inoperative.

The difficulty caused by dirt is greatly increased when a binder or adhesive is present, such as grease, which tends to make dirt particles function as a coherent mass.

Difficulties of the character mentioned are particularly objectionable in railroad rolling stock, which must be capable of functioning exposed to the weather under a wide variety of weather conditions, and especially where they interfere with braking.

The present invention is concerned with cleaning and especially washing of structural members, especially those connected with railway equipment. The invention is es-

pecially concerned with the cleaning of railway truck side frames and bolsters, which are essentially sizable castings or weldments involving intricate shapes and having interior cavities where cleaning is desirable. The invention makes it possible to mechanize the operation, greatly reducing the labor involved.

In accordance with the invention a horizontal conveyor passes suitably step by step through the interior of a housing in a manner later described. The conveyor provides seats for the structural members so that they can be cleaned inside the housing. Among the functions performed are preheating, washing of the interior cavity, washing of the exterior, draining and rinsing.

The means for advancing the conveyor preferably carries it step by step through the operation, the next step being initiated when a structural member has been loaded on an unoccupied position at the approach end of the conveyor.

The spray mechanism which enters the cavities in the structural member is preferably automatically reciprocated in and out so that it can wash all surfaces of the cavities.

A substantial amount of solid material will collect in the sump, settling out of the washing solution, and the equipment of the invention automatically separates this from the wash solution and removes it from the sump by a scraper conveyor.

Considering now the drawings in detail a conveyor 30 has an upper horizontal forward stretch 31 and a lower horizontal return stretch 32. At the opposite sides the conveyor includes chains 33 made up of links 34 best seen in FIGURES 5, 6 and 7. There are two chains, one at each side of the conveyor and each chain as best seen in FIGURES 5 and 7 is composed of two sets of links 34 interconnected by pivot pins 35 with journal flanged wheels or rollers 36. On the upper flight 31 as best seen in FIGURES 5 and 6 the flanged wheels or rollers 36 are supported during most of their distance on rails 37 mounted on a frame 38, but on the return stretch 32 of the conveyor the load is much lighter since the structural members have been removed and the rollers roll on rails 40 which are cantilevered from the supporting structure 38 as best seen in FIGURE 3.

At suitable intervals the chain has extending vertically upward from it in the upper stretch brackets 41 best seen in FIGURES 5, 6 and 7, which support, between one chain and the other as shown in FIGURE 5, horizontal inverted channels 42.

At suitable intervals some of the channels 42 have secured thereto above the channels in the position of the upper stretch seats 43 having bearing portions 44 and projecting abutments 45. The structural members 46, which as shown in the drawings are intended to be, for example, railway truck side frames, rest on the bearing portions 44 of the seats 43 at the front and back and at the back against the abutment portion 45 of the seats 43.

At the opposite ends the rollers 36 of the conveyor pass over idler sprockets 47 which are journaled on shafts 48 supported from structural members 50 at opposite ends of the machine.

The advance of the conveyor is accomplished in a step-by-step manner by a double-acting fluid-actuated cylinder 51 having operating therein a piston and rod combination 52 and receiving fluid such as compressed air for forward motion by a pipe connection 53, while it receives fluid for retraction by a pipe connection 54. The rod is prevented from rotating about the axis of the cylinder preferably by making it of non-circular cross section as well known in the art, conveniently providing three lobes on the cross section.

At the forward end of the piston 52 in horizontal position there is provided a pivot pin 55 which pivotally mounts a dog 56 which tends to move under the action of gravity to an inactive position as shown in FIGURES

9, 10 (solid lines) and 12, and when in the inactive position the dog does not engage any of the flanges of the inverted channels 42, so that the piston and piston rod 52 can retract without danger of striking the conveyor.

When the piston and piston rod are fully retracted as shown in FIGURE 9, pin 57 on the piston rod strikes operator 58 of electric switch 60, energizing solenoid valve 61 to introduce pressure fluid into cylinder 62 to actuate piston and rod combination 63 as best seen in FIGURE 9 and raise the dog to the operative position shown in dot-and-dash lines in FIGURE 10. The pusher platform 64 on the piston 63 is long enough to keep the dog raised until it has engaged the next forward flange of one of the channels 42. Valve 61 is spring biased to return to the exhaust position, in which case the source of pressure is cut off from the cylinder 62 and the cylinder 62 is connected to exhaust.

It should be noted that the dog is limited in its retraction by engagement of its projection 66 with the piston as shown in FIGURE 10.

When the dog is raised to operative position as shown in FIGURE 10 and the piston and rod combination 52 are energized to advance the dog until it engages against the trailing flange of the next channel 42 as shown in FIGURE 11, abutment 67 engages the bottom of the piston so that the dog cannot rotate farther clockwise. It is desirable to avoid the possibility that the abutment might not remain in pushing engagement with the conveyor on the forward stroke. Each of the trailing flanges 68 of the channels 42 is provided in line with the dog 56 with a locking recess 70 into which a locking projection 71 on the dog enters, thus holding the dog positively up in operative position until retraction takes place, at which time the dog drops due to gravity.

Above and below the upper and lower stretches 31 and 32 of the conveyor is a housing 72 having a top 73 and sides 74, an entry door opening 75, and an exit door opening 76. Near the inlet the housing has a bottom apron 77 sloping to discharge solution into a sump 78 which terminates at an end wall 80 below a vertical shield 81 to form a generally closed washing chamber 82. Toward the discharge end there is a rinsing chamber 83 which is above a tank 84 drained by a cock 85.

The sump 78 has opposite sloping bottom walls 85 and 86 as best seen in FIGURE 2 which discharge at the bottom into a transversely extending trough 87 extending across the sump and at one side of the washing machine communicating in prolongation with a trough extension 88 which has a gradually upwardly sloping bottom wall 90 blending at the bottom in a gradual curve 91 with respect to the trough bottom 92.

At the top the trough extension has a downwardly disposed spout 93 discharging into a hopper 94 for collection of dirt.

In order to eliminate from the solution solid particles which settle out, a scraper conveyor 95 extends through the trough and the trough extension, having rakes 96 which tend to drag along solid particles and extend close to the bottom of the trough and the inclined upwardly sloping bottom of the trough extension. The scraper conveyor changes direction on sprockets 97 at the opposite ends and is guided by guide roller 98 at the entrance to the trough extension. One of the sprockets 97 is on a driven shaft 100 suitably journaled and driven from a motor 101, by pulley 102, belt 103 and pulley 104.

For the purpose of heating the sump and the solution in it, heating coils 105 near the bottom receive a suitable heating medium such as steam, and pipes 105' introduce live steam.

Positioned diagonally disposed above each of the locations at which structural members will come to rest within the washing chamber, for washing the outside of the structural members, are spray heads 106 receiving washing solution, suitably a solution of alkali metal poly-

phosphate such as sodium hexametaphosphate in water, which is withdrawn from the sump by suction pipe 107 to the inlet side of pump 108 driven by motor 110 and discharged to the spray heads by pipe 111.

In order to wash the inside of structural members having for example cavities 112, spray heads 113 are connected to pipe 111 by flexible hoses 114. The spray heads are manipulated to insert them into an advantageous position within the interior of the structural members, by double-acting cylinders 115 having cooperatively located therein a piston and rod combination 116. The cylinders are interconnected at opposite ends with a valve 120 by pipes 117 and 118. The valve 120 in one position as shown in FIGURE 16 connects a fluid pressure line 121 to pipe 117 connected to the top of the cylinder, while pipe 118 from the bottom of the cylinder is connected to exhaust connection 122. The valve has an operating rod 123 which is guided by an opening in a bracket 124 and has on this operating rod at limiting positions collars 125 and 126, allowing for motion by the piston rod. Mounted on the end of the piston rod is a valve operating bracket 127 which is interconnected to a pull rod 128 which at the opposite end carries a valve operating projection 130 which surrounds the valve operating rod 123, the rod 123 moving through an opening in the projection 130. Near the other end of its stroke and about the point where retraction should take place, the projection 130 moves the valve rod 123 to put the valve in the position shown in FIGURE 17 in which fluid actuating pressure from pipe 121 enters the bottom of the cylinder through pipe 118, and pipe 117 from the top of the cylinder is connected to exhaust. Thus the spray head 113 will continuously reciprocate back and forth moving into and out of the cavity or hollow part of the structural member.

When it is desired to have the reciprocation of the spray head 113 cease and retract it and have it remain retracted, this is accomplished by pneumatic cylinder 133 pivotally mounted on the frame at 134 and cooperating with a piston and rod combination 135 pivotally connected at 136 to a lever 137 fixedly pivoted at 138 on the frame and engaging at opposite ends collars 140 and 141 on the valve control rod. The cylinder 133 receives fluid pressure at 142 and exhausts at the opposite end at 143 and exerts a pull upward in excess of any pull which the cylinder 115 is capable of exerting so that when the cylinder 133 is actuated it pulls the valve 120 to the retracting position and holds it in the retracting position regardless of any tendency by fluid in piston 115 to advance the spray head again. Before the spray head can reciprocate, therefore, the pressure from pressure line 142 must be released by shifting valve 144 to an exhaust position and cutting off fluid pressure from the cylinder 133, under which conditions the cylinder 115 can function without interruption from cylinder 133.

In the form shown, there are a pair of reciprocable spray heads 113 having wash solution in the washing chamber 82.

Beyond the washing positions shown in FIGURE 2, washing solution is allowed to drain from the structural members and then the members are carried by the conveyor into rinsing chamber 83 beneath shield 81. In this chamber the structural members are first internally rinsed with water by a reciprocating spray head 113' similar to spray head 113 and then are externally sprayed with water by diagonally disposed spray heads 145.

The control of the mechanism will be understood by reference to FIGURES 16 to 19 inclusive. Each of the doors, the pusher, the dog-raising cylinder and the cylinders 115 for operating the reciprocating sprays is controlled by a valve as shown in FIGURES 16 and 17. This valve 160 has a port 161 connected to one end to the fluid cylinder and a port 162 connected to the other end to the fluid pressure. It also has a port 163 receiving fluid pressure, suitably compressed air, which can, depending

on the position of the valve, be connected to one or the other end of the fluid cylinder, and a port 164 for exhaust which can be alternately connected to one or the other end of the fluid cylinder.

The valve 160 has two positions, one of which is shown in FIGURE 16, in which fluid pressure from port 163 is connected to port 161 and thence to one end of the fluid cylinder. In that position port 162 from the other end of the fluid cylinder is connected to exhaust through port 164.

The opposite position of the valve 160 is shown in FIGURE 17. In this position fluid pressure from port 163 is connected to port 162 which communicates with the opposite end of the fluid cylinder and the one end of the fluid cylinder through port 161 is connected to exhaust through port 164.

Cylinder 133 for retracting the reciprocable spray head out of the way is single acting and controlled by valve 144 as shown in FIGURES 16a and 17a. In one position pipe 142 connected to the lower end of the cylinder, receives fluid pressure at 163 to raise the reciprocable spray heads, and exhaust port 164 is closed, as shown in FIGURE 16a. In the other position as shown in FIGURE 17a, fluid pressure connection 163 is closed and pipe 142 from the lower end of the cylinder is connected to exhaust 164. The upper end of cylinder 133 is always connected to exhaust at 143.

Electrical diagram FIGURE 19 shows power leads 165 and 166 connected to circuits 167, 168, 170 and 171 in parallel. Circuit 167 which controls the operation of the inlet and exit doors includes switch 172 and solenoid valve 173, which pneumatically is as shown in FIGURES 16 and 17, the valve being in one position when the switch 172 is closed and retracting under its internal spring operation to the other position when switch 172 is open. Circuit branch 168 includes switch 174 for manipulating the plunger and solenoid valve 175 which is of the character as just described in reference to FIGURES 16 and 17. Circuit branch 170 includes switch 176 and solenoid valve 144 of the character shown in FIGURES 16a and 17a, and controls the lowering of the reciprocating sprays. All of the switches 172, 174 and 176 are operated by the timer in the manner to be described.

Circuit branch 171 includes switch 60 previously described and solenoid valve 61 of the form previously discussed, which operates the dog-raising cylinder 62.

Referring now to FIGURE 18 and starting at zero time at the left, at the beginning of one timer cycle and one step in operation of the machine, track A shows the timer action in controlling the doors and track B shows the pusher control. Track C shows the control of the reciprocating sprays. On successive steps the timer simply goes through repeated cycles, driven, for example, by a suitable synchronous motor. On track A the initial lower portion 181 shows that the doors are closed initially and then they open as shown by track portion 182 and remain open for a period of time while the other tracks are undergoing the following action.

As shown by track B at 183 the pusher is initially retracted until after the door opens as suggested by track portion 183, and then the pusher advances one step as suggested by track portion 184. Having advanced one step the pusher then retracts as suggested by track portion 185 and of course as soon as it retracts the dog is again raised by circuit branch 171 as previously described. The pusher remains retracted during the remainder of the cycle.

The reciprocating sprays are all raised or retracted as shown by track portion 186 of track C until the doors have been closed as shown by track portion 187 of track A and then the cylinder which has raised the reciprocating sprays lowers them as shown by track portion 188, as soon as the raising cylinder for the reciprocating sprays releases them for automatically reciprocating up and down and this action continues until near the end of the

cycle. The reciprocating sprays are raised and held in their raised position as shown by track portion 190. In order to stop the operation it is merely necessary to stop the timer, disconnect the air pressure and stop the pump and the drive for the conveyor 95.

In operation it will be evident that a structural member is loaded suitably by a crane or hoist on to the conveyor outside the housing at position 30. The piston actuator 146 for raising door 147 is then energized to raise the inlet door 147 out of the way and pusher cylinder 51 is now energized. Exit door 149 is also raised by cylinder 146'. Dog 56 is already raised by cylinder 62 energized by the actuation of switch 60 in its appropriate circuit and cylinder 51 then pushes dog 56 forward and with it the conveyor for one step. Having completed the forward motion, door actuators 146 and 146' are de-energized and the doors are allowed to return to their lower position. While another structural member is being loaded at position 30, the previously loaded structural member is now exposed to warm water vapor inside the washing chamber 82 at position 31 so that the work can be pre-heated. This is especially important in very cold weather where otherwise the washing solution might tend to freeze on the work.

In the meantime, of course, the pusher cylinder has been actuated to return the dog 56 to its retracted position, the dog of course moving down into inoperative position by gravity.

Each time the conveyor advances one step, the pusher cylinder goes through this sequence.

At the next step as best seen in FIGURE 2, the spray heads 113 are brought down by releasing fluid cylinders 133 and moved repeatedly up and down by cylinders 115, spraying inside the hollow interior of the structural member, and then are raised and retracted by actuation of cylinders 133.

At the next positions 148 and 150 as shown in FIGURE 2, the exterior sprays 106 wash the structural members. At the next position 151 the wash solution is allowed to drain.

During all this time wash solution from the sprays including dirt from the structural members is entering the sump, where the solid particles settle out and flow over the inclined surfaces into the trough 87 and are raked by the scraper conveyor 95 out of the solution in the sump and deposited in the hopper 94. The wash solution in the meantime is heated by the heater coils 105 and the steam at 105' and withdrawn by pump 108 to again enter the spray nozzles.

At the next step the structural member passes from the wash chamber into the rinse chamber at position 152. It encounters downwardly moving and reciprocating rinse spray nozzles 113' which enter the hollow interior of the structural members and are ultimately raised out of the way by cylinders 133.

At the next position 153 sprays 145 rinse the exterior of the structural members.

Every time the conveyor advances one step door operating cylinder 154 is energized to raise door 155 at the exit door opening and of course the door 149 is raised when the conveyor advances to move the structural member to the last position 154 outside the washing mechanism, at which point the structural member is picked up by a crane or hoist and removed.

In view of our invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art,

to obtain all or part of the benefits of our invention without copying the structure shown, and we therefore claim all such insofar as they fall within the reasonable spirit and scope of our claims.

Having described our invention what we claim as new and desire to secure by Letters Patent is:

1. In a cleaning device for structural members, a housing including at the bottom thereof a sump, conveyor means extending horizontally through the housing and having means thereon for mounting a succession of structural members to be cleaned, said structural members including exterior surfaces to be cleaned and a hollow interior to be cleaned, said hollow interior being open from above, means for advancing the conveyor and structural members to respective stations inside the housing, spray means in the housing for applying liquid spray to the exterior of the structural members, second spray means located initially above the structural members and means for reciprocating the second spray means to make it enter into the hollow interior of a structural member so as to wash the said hollow interior, and means for retracting the second spray to clear the said structural member for advance of the conveyor means.

2. A device of claim 1, in which the means for advancing the conveyor comprises a longitudinally moveable piston and cylinder combination, a pivoted dog on the forward end of the piston having an active position in which it engages the conveyor and an inactive position in which it is free from the conveyor, means for advancing and retracting the piston in the cylinder and means operative when the piston is retracted to raise the dog into operative position.

3. A device of claim 2, in combination with a latching projection on the dog, there being latching recesses on the conveyor, the latching projection on the dog engaging in a latching recess on the conveyor when the dog is pushing forward in operative position so as to hold the dog in operative position.

4. A device of claim 1, in which the means for vertically reciprocating the second spray comprises a vertical relatively moveable piston and cylinder combination, said cylinder being double-acting, fluid means for alternate connection to piston ends of the cylinder and valve means operatively controlled by the piston to reverse the connection of the fluid means to the opposite ends of the cylinder.

5. A device of claim 1, in which solid particles are deposited in the tank, said tank having a trough for collection of said solid particles, sloping sides communicating with the trough, a trough extension having an upwardly sloping bottom wall communicating with the trough at the bottom and a scraper conveyor extending along the bottom of the trough and the trough extension and operative to remove solid particles from the trough and discharge them outside the tank.

References Cited

UNITED STATES PATENTS

1,734,585	11/1929	Ladewig et al. --- 134—129 XR
1,933,412	10/1933	Brown et al.
2,193,957	3/1940	Alexander et al.
2,318,524	5/1943	Read.
2,490,765	12/1949	Abbott ----- 134—129 XR
2,972,995	2/1961	Umbricht et al. ----- 134—72

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