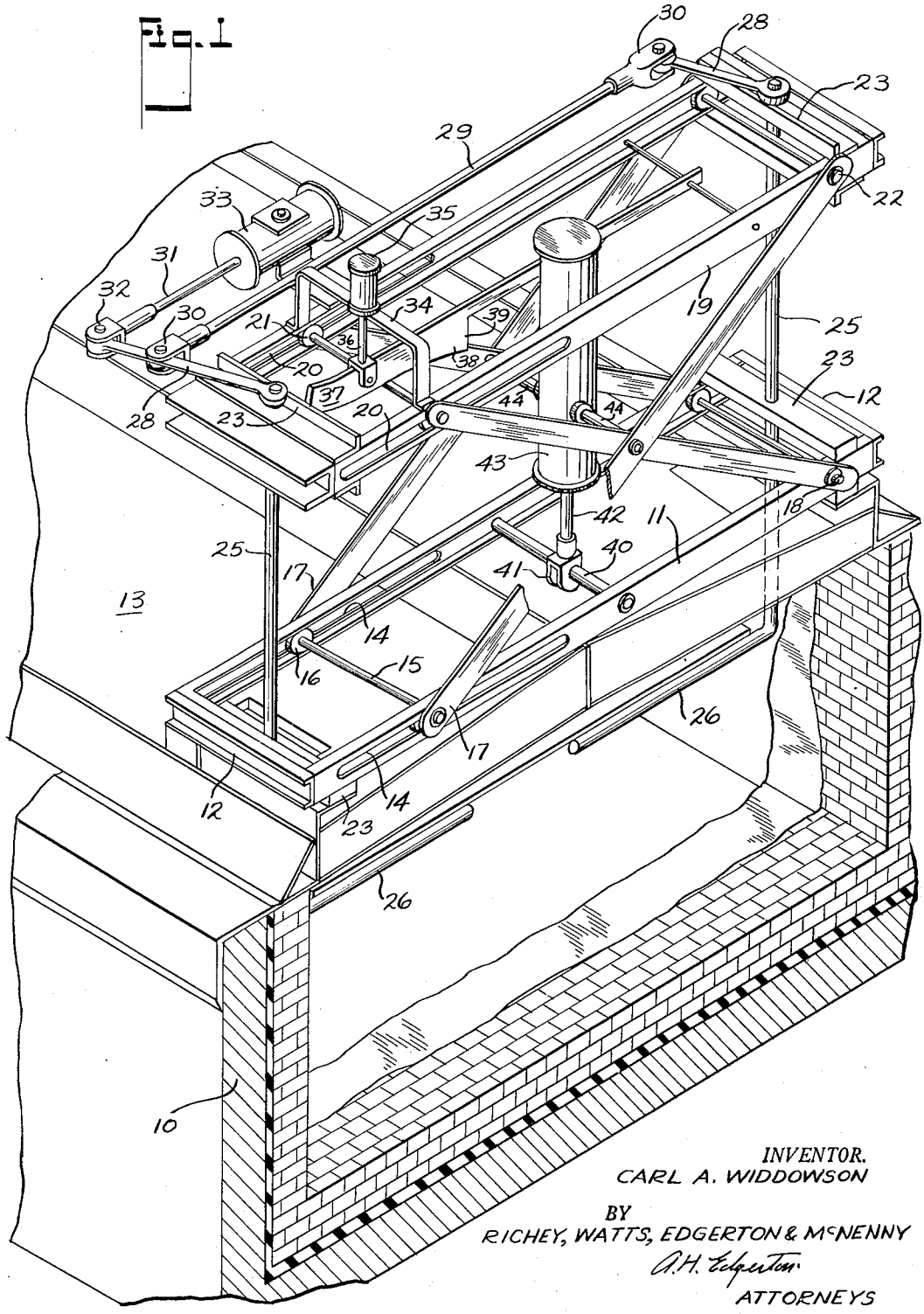
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STRIP LIFT MECHANISM

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Fig. 1



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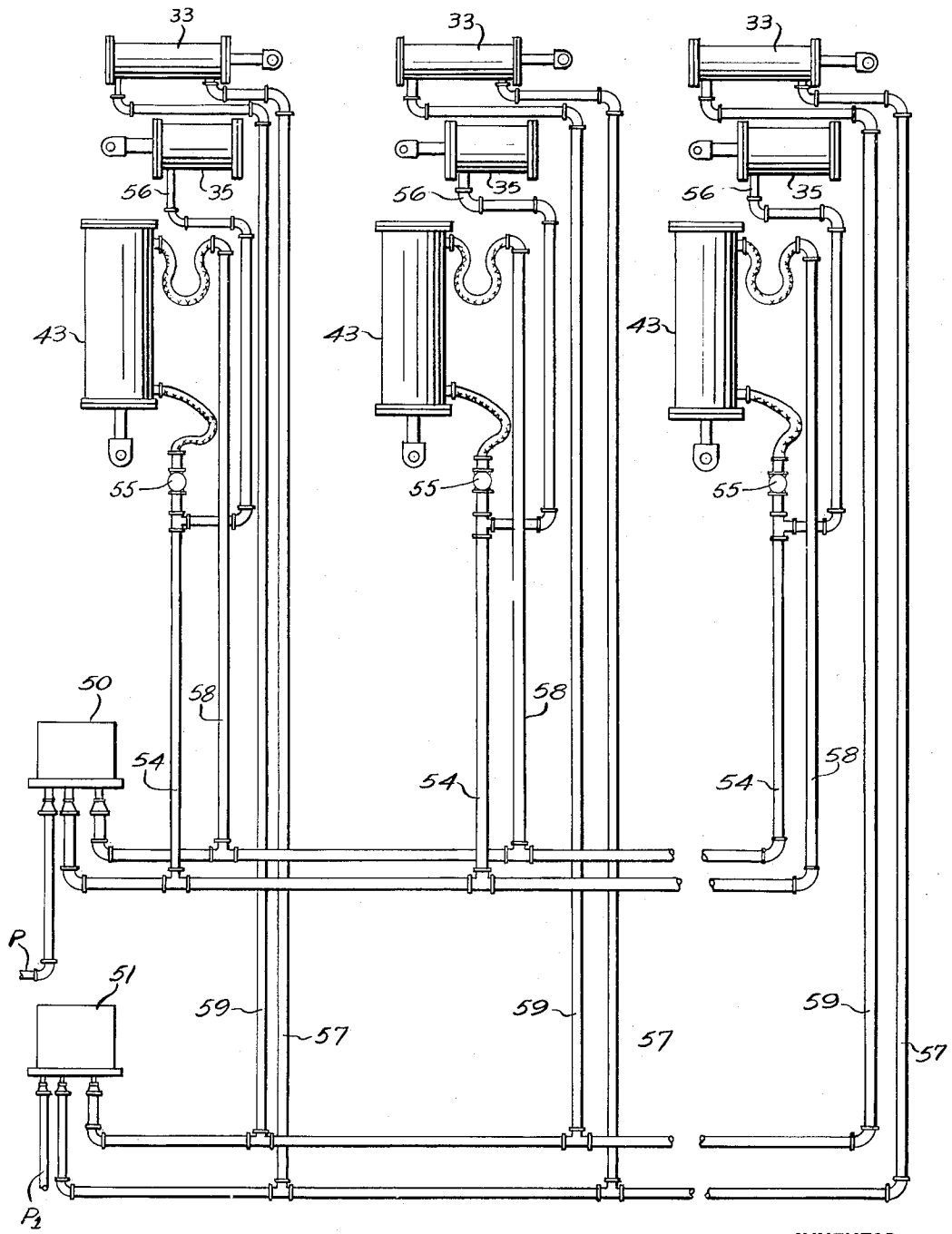


Fig 2

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STRIP LIFT MECHANISM

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7 Claims. (Cl. 134—133)

This invention relates broadly to apparatus for pickling steel and more specifically to mechanism for lifting sheet steel strip stock into and out of a pickling bath and/or cleaning solution of the type employed in a continuous pickling or cleaning line.

One of the objects of the invention is to provide a strip lifting device embodying an organization of fluid operated elevating units arranged for actuation in unison from a single point of control.

Another object of the invention is to provide a device in which the height of the device, in both its lowered and extended position, is less than that of other machines now in use.

Another object of the invention is to provide a plurality of elevators arranged to accommodate the ready observation thereof by an operator standing at one end of the tank containing the pickling or cleaning solution.

Other objects and advantages more or less ancillary to the foregoing, and the manner in which all the various objects are realized, will appear in the following description, which considered in connection with the accompanying drawings, sets forth the preferred embodiment of the invention.

Referring to the drawings:

Fig. 1 is a view in perspective of one of the units of the improved strip lifting device; and

Fig. 2 is a diagrammatic view of the pipe lines and valves for the control of the fluid operated elements of the assembly.

The pickling solution is retained in a rubber coated steel trough or tank **10** of rectangular form lined with masonry and preferably disposed above the ground level. The tank is provided with rubber coated cover plates throughout its length which are mounted on the ledge formed by the side walls of the tank. In a typical installation, the tank is approximately 320 feet long and about eight feet wide, though, these dimensions may vary in some plants according to the volume and character of the work being handled. One end of the tank is provided with a coil supporting stand (not shown) and the opposed end thereof is equipped with a power driven reel to receive the strip stock after passing through the pickling bath. Since the coil supporting frame, reel and driving mechanism therefore form per se no part of the present invention, further description thereof is deemed unnecessary herein.

Referring to Fig. 1, the tank **10** is provided with a plurality of transversely disposed strip lifting mechanisms, each similar in structure and function to the other. It will be understood therefore, that the description of one of the units will suffice for all.

The side walls of the tank are bridged by channel irons **11** disposed in parallel relation with each other and retained in fixed position by channels **12** having the flanges thereof affixed to the ends of the channels **11** superjacent the cover plates **13**. The webs of one end of the channels **11** are fabricated with slots **14** for the reception of axle shafts **15** having rollers **16** mounted thereon to track

within the channels. The outer ends of the shafts **15** are connected to the lower ends of a pair of hinged lazy tong bars **17** and the opposed ends of the channels are drilled to receive stationary pivot shafts **18** for the lower ends of the second bars of the lazy tongs. The upper ends of the bars **17** carry a frame **19** formed of channel irons fabricated like the channels **11** with slots **20** in one end thereof for a shaft and roller assembly **21** and a pair of fixed pivots **22** like the base frame assembly. The ends of the upper frame **19** and the ends of the channel irons **11** are provided with cross bars **23** pierced at the center thereof to receive lift rods **25**. The lower ends **26** of the lift rods are bent normal to the stem thereof to protrude inwardly about two-thirds the width of the tank when adjusted in their operative position. The upper ends of the rods **25** are affixed to lever arms **28** pivotally connected to a drag link **29** through yokes **30**. One of the arms protrudes beyond its yoke **30** and is pivotally connected to a piston rod **31** through a clevis **32** operatively mounted in a cylinder **33**. The frame **19** is provided with a bridge member **34** for the support of a spring pressed piston in a cylinder **35** having the piston rod **36** thereof pivotally connected to a latch bar **37** fulcrumed on the frame **19**. The latch bar is formed with a depending lug **38** adjacent the free end thereof having a tapered leading edge to override the axle **15** during the translation thereof and a shoulder **39** on the opposite face to abut the shafts **15** and restrain the return movement thereof until lifted by actuation of the piston in the cylinder assembly **35**.

The webs of the channels **11** are drilled in the center thereof to receive a cross bar **40** having a clevis **41** pivotally mounted on the center thereof which in turn is connected to a piston rod **42** mounted in a cylinder **43**. The cylinder is formed with pintles **44** on the side wall thereof which are fulcrumed to the lazy tong bars **17** at the center thereof.

Referring now to Fig. 2, the cylinder operating mechanism comprises two independent control units, each embodying a four-way solenoid valve; the first control set **50** being designed to operate the lifting frame **19** and locking mechanism therefor, and the second unit **51** being constructed to effectuate the rotation of the lift rods to facilitate their removal from the pickling solution. The valves **50** and **51** are connected to a source of fluid under pressure through the lines P and P1.

The strip lifting arms are normally suspended above the pickling solution with the end portion **26** thereof folded back against the side walls of the tank, thus, when it is desired to adjust the machine to its operative position, the valve **50** is adjusted to admit pressure fluid to the line **54**, and the flexible tube coupled with the lower end of the cylinder. As the fluid enters the cylinder it acts upon the lower face of the stationary piston therein and effects the descent of the cylinder **43**. The actuation thereof is, however, momentarily delayed in this stage of the operation by a spring loaded relief valve **55** which diverts the passage of fluid to the lifting cylinder until sufficient fluid has passed through a branch line **56** connected to the forward end of the cylinder **35** to overcome the spring, retract the piston, effect the elevation of the latch bar **37**, and thus release the engagement thereof with the axle **15**. The relief valve **55** is also provided with a check valve to permit free return flow of fluid through the lines **54—56**. When the frame **19** is lowered, the valve **51** may be adjusted to admit pressure fluid through the line **57** to the forward end of the cylinder **33** which will cause the rods **25** to be rotated to position the ends **26** thereof under the submerged strip. While in this position, the valve **50** may be readjusted to admit pressure fluid into the line **58** and flexible hose coupled with the top of the cylinder **43**. As the fluid

enters the cylinder, it will act upon the upper face of the fixed piston and effect the elevation of the cylinder 43, the pintles 41 on the cylinder lifting the central fulcrum of the lazy tong bars and thus elevating the frame 19. While in this position, the strip will be lifted from the tank and suspended above the pickling solution. As the frame rises, the axle 15 will be drawn inwardly, the cam surface of the lug 38 lifting the bar until the shaft 15 passes thereunder and comes to rest behind the shoulder 39. The return movement of the lifting rods may be effected by lowering the frame 19 in the manner described above and adjusting the valve 51 to cause the pressure fluid to flow through the return line 59 connected with the rear end of the cylinder 33.

Although the foregoing description is necessarily of a detailed character, in order that the invention may be completely set forth, it is to be understod that the specific terminology is not intended to be restrictive or confining, and that various rearrangements of parts and modifications of detail may be resorted to without departing from the scope or spirit of the invention as herein claimed.

What is claimed is:

1. Apparatus for lifting sheet steel strip stock from a pickling tank comprising spaced channel irons mounted transversely of said tank having slots in the webs of one end thereof, end members under said channels, shafts protruding through said slots, rollers on said shafts engaged with the flanged portions of said channels, lazy straps pivoted on said shafts and to said channel irons, a frame carried by the other ends of said lazy straps embodying second channel irons having slots therein, shafts therein, rollers on said shafts engaged with the flanged portions of said frame channels, pivotal connection between said straps and said second named channels, end members uniting said second channels, hooked lift rods in said end members, a piston pivotally connected to the first named channels, a cylinder operatively connected therewith, pintles on said cylinder connected with the central portions of said lazy straps for elevating said frame, a second piston cylinder assembly carried by said frame channels parallel thereto and linkage intermediate the pistons of said last named cylinder and said lift rods for the rotation thereof.

2. Apparatus for lifting strip steel stock from a pickling tank comprising a frame mounted transverse the tank end members thereon, lazy straps pivotally mounted at one end to said frame and slidably connected to the frame at its opposite end, lift rods mounted in said end members, a piston rod pivoted to the lower frame, a cylinder operatively mounted thereon, pintles on said cylinder fulcrumed to the centers of said lazy straps, a second piston cylinder assembly carried by the upper frame in parallel relation thereto and linkage pivotally connected to the second piston cylinder assembly and to said lift rods for the rotative movement thereof.

3. Apparatus for lifting strip steel from a pickling tank comprising a rectangular structual steel frame mounted transverse the tank on the top thereof, a second rectangular frame disposed in superimposed relation therewith, lazy tong bars pivoted at one end to said frames and slidably connected to the frames at the other end, lift rod hooks in the end portions of said frame, a piston rod pivotally connected to the central portion of the first named frame, a cylinder operatively connected with said piston rod, pintles on said cylinder pivotally connected to the central portion of said lazy tong bars, a second cylinder mounted on said second frame in parallel relation therewith, a piston rod operatively connected with said second cylinder, an arm pivotally connected to said piston rod and one of said lift rod hooks and linkage uniting said lift rod hooks.

4. Apparatus for lifting steel strip stock from a pickling tank comprising a channel iron frame mounted on the top of the tank in transverse relation thereto, a second similar frame disposed in superimposed relation thereto, lazy tongs intermediate said frames for elevating the upper frame, hooked lift rods carried by the upper frame and guided for sliding movement in the first named frame, a hydraulic cylinder carried by said lazy tongs, a piston in said cylinder pivotally connected to the first named frame and means for actuating said cylinder.

5. Apparatus for lifting steel strip stock from a pickling tank comprising a channel iron frame mounted on the top of the tank in transverse relation thereto, a second similar frame disposed in superimposed relation to the first frame, lazy tongs intermediate said frames for elevating the upper frame, a fixed pivot on one end of said lazy tongs, a shaft slidable in a horizontal plane on the opposed end thereof, hooked lift rods carried by the upper frame and guided for vertical sliding movement in the first named frame, a hydraulic cylinder carried by said lazy tongs, a piston in said cylinder pivotally connected to the first named frame for raising and lowering said second frame, fluid means for actuating said cylinder, a second cylinder carried by said second frame, a piston therein, fluid means for actuating said piston and, a pivotal latch bar engageable with slidable shaft on the first named frame, coupled with the piston in said second named cylinder for lifting said latch.

6. Apparatus for lifting steel strip stock from a pickling tank comprising a channel iron frame mounted on the top of the tank in transverse relation thereto, a second similar frame disposed in superimposed relation to the first frame, lazy tongs intermediate said frames for elevating the upper frame, hooked lift rods carried by the upper frame and guided for sliding movement in the first named frame, a hydraulic cylinder carried by said lazy tongs, a piston in said cylinder pivotally connected to the first named frame, fluid means for actuating said cylinder, a second cylinder on said second frame and linkage intermediate said second cylinder and said lift rods for the rotation thereof.

7. Apparatus for lifting steel strip stock from a pickling tank comprising a channel iron frame mounted on the top of the tank in transverse relation thereto, a second similar frame disposed in superimposed relation to the first frame, lazy tongs intermediate said frames for elevating the upper frame, a fixed pivot on one end of said lazy tongs, a slidable shaft on the opposed end thereof, hooked lift rods carried by the upper frame and guided for vertical sliding movement in the first named frame, a hydraulic cylinder carried by said lazy tongs, a piston in said cylinder pivotally connected to the first named frame, fluid means for actuating said cylinder and raising and lowering said second frame, a second cylinder carried by said second frame, a piston therein, fluid means for actuating said piston, a latch engageable with the slidable shaft of said lazy tongs connected to said piston, a third cylinder on the second frame, a piston therein, fluid means for actuating said piston and linkage coupled with the piston in said third named cylinder and with said hooked lift rods for rotating said rods into operative position under the strip stock when the second named frame is lowered.

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