March 11, 1941. F. J. WOOD 2,234,815

CONTINUOUS STRIP PICKLING AND CLEANING DEVICE

Filed Dec. 20, 1939 3 Sheets-Sheet 1

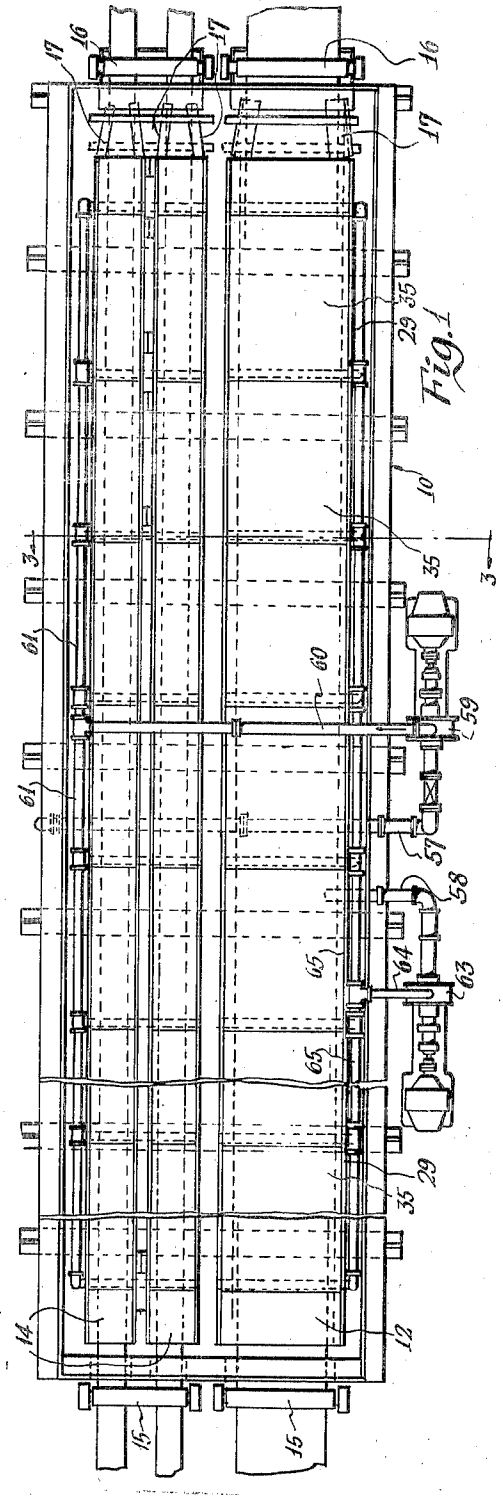

Fig. 1

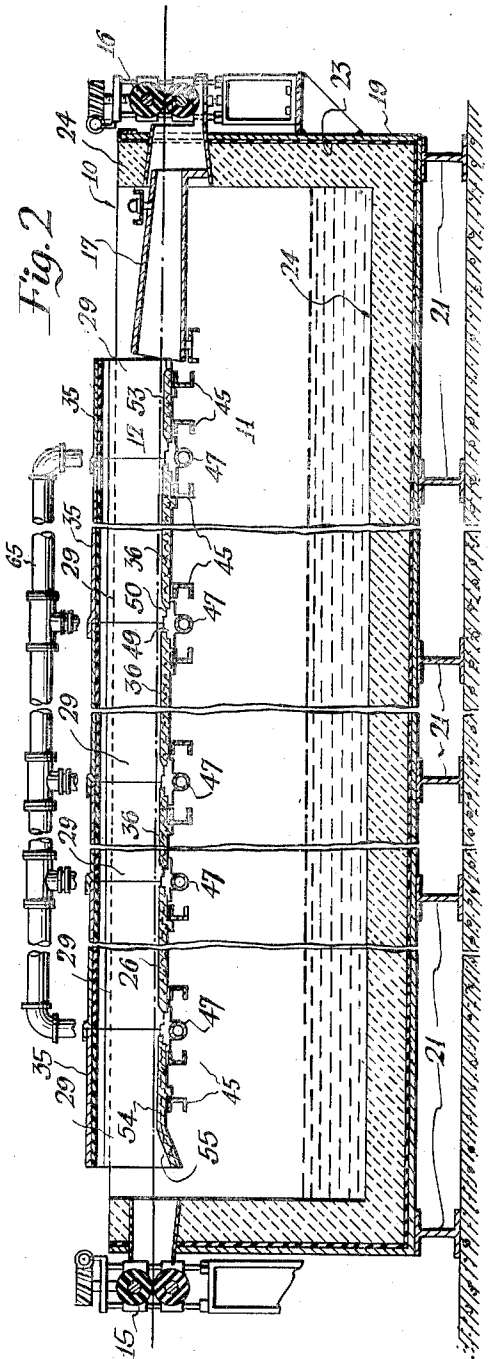

Fig. 2

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Fig. 3

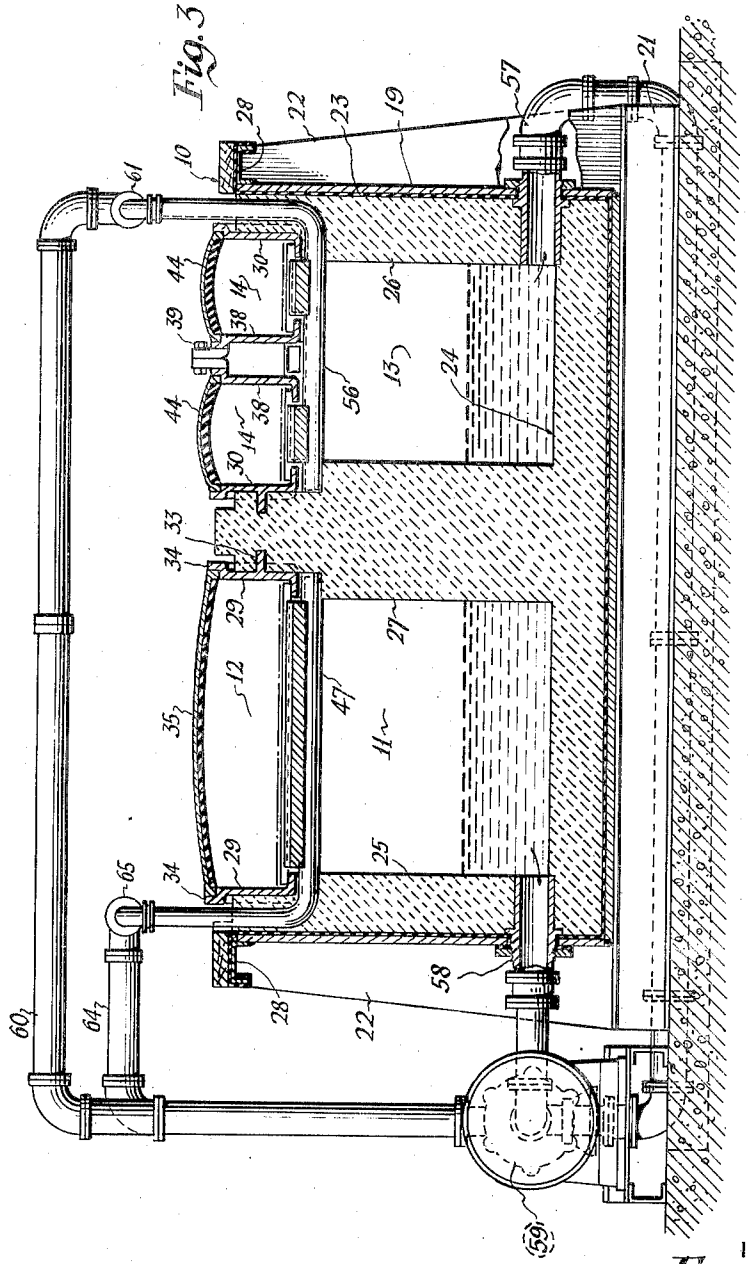

Fig. 4

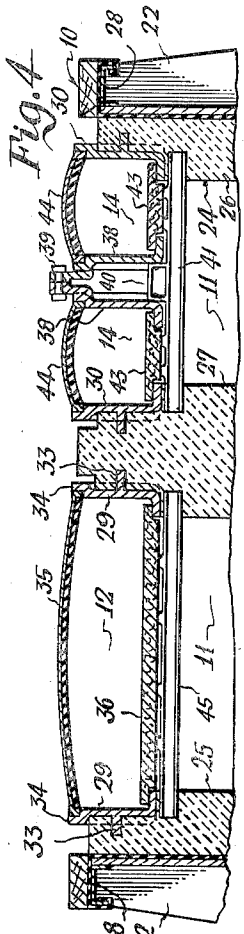

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Fig. 5

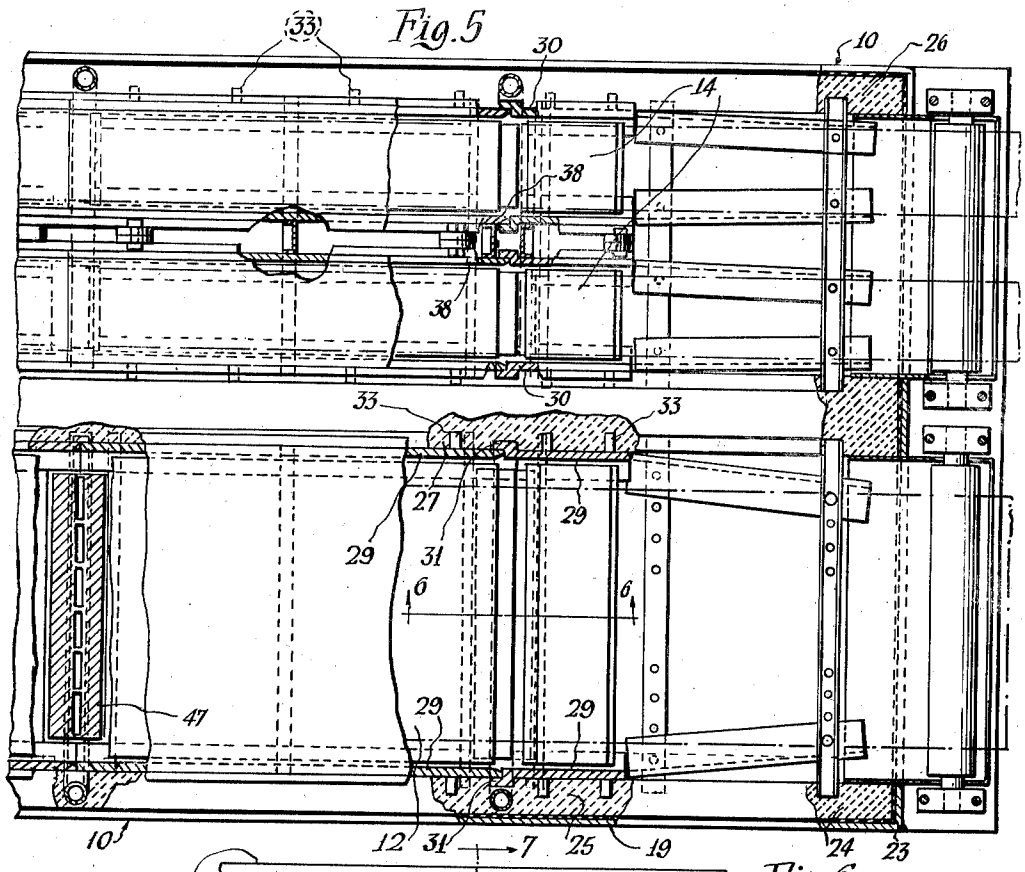


Fig. 6

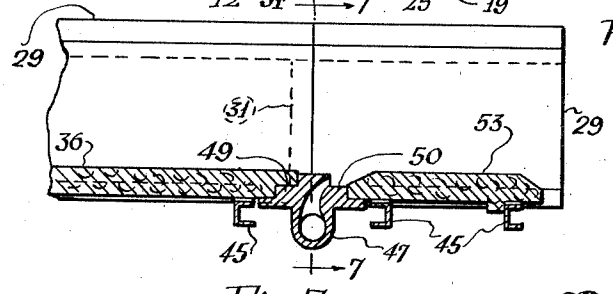
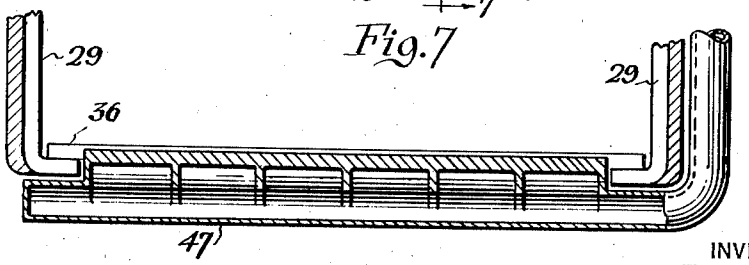


Fig. 7



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UNITED STATES PATENT OFFICE

2,234,815

CONTINUOUS STRIP PICKLING AND CLEANING DEVICE

Frank J. Wood, Riverside, Ill., assignor to Goodman Manufacturing Company, Chicago, Ill., a corporation of Illinois

Application December 20, 1939, Serial No. 310,132

6 Claims. (Cl. 266—3)

This invention relates to improvements in continuous strip pickling and cleaning devices, and more particularly to improvements in construction of the acid tank and trough for such a device.

The principal objects of my invention are to provide an acid tank and trough for a continuous strip pickling and cleaning device, having a tank made from brick or other similar material impervious to the effects of the acid in the pickling solution and having a pickling trough, through which the metal passes during the pickling operation, recessed in said tank, and consisting of sectional side walls made from a material impervious to the effects of the acid in the pickling solution and to the abrasive action of the edges of the strip of metal passing through the pickling trough, and a bottom made from a relatively smooth non-scratching material impervious to the effects of the acid in the pickling solution.

A more specific object of my invention is to provide a pickling and cleaning tank and trough of the character described, wherein the bottom of the trough consists of a plurality of spaced apart aligned bottom members made from a non-scratching material impervious to the effects of the acid in the pickling solution, and wherein the space between said members is closed by transversely extending nozzles, for conducting pickling fluid into said trough under pressure.

Other objects of my invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

Figure 1 is a plan view of a pickling tank constructed in accordance with my invention;

Figure 2 is a longitudinal sectional view taken through the pickling tank;

Figure 3 is an enlarged transverse sectional view taken substantially along line 3—3 of Figure 1;

Figure 4 is a detail view in transverse section, showing certain details of construction of the pickling trough sections and their support on the tank;

Figure 5 is a fragmentary enlarged plan view of the pickling tank, with certain parts broken away and certain other parts shown in section, in order to more clearly illustrate certain details of my invention;

Figure 6 is an enlarged fragmentary longitudinal sectional view taken through one of the pickling troughs and showing certain details of the nozzles and the construction of the bottom of the trough; and

Figure 7 is a transverse sectional view taken substantially along line 7—7 of Figure 6.

Referring now in particular to the embodiment of my invention illustrated in the drawings, a pickling tank 10, adapted to serve as a container for the pickling fluid, is provided. Said tank, as herein shown, contains two compartments, one of which is indicated by reference character 11 and has a relatively wide pickling and cleaning trough 12 extending therealong, for pickling wide strips of metal, and the other of which is indicated by reference character 13 and is shown as having two narrow pickling troughs 14, 14 extending therealong, for simultaneously pickling narrow strips of metal. Pinch rolls 15, 15 are provided at the entering ends of said troughs, for pushing the metal through said troughs, and pinch or squeegee rolls 16, 16 are provided at the discharge ends of said troughs, for squeezing the acid from the metal as it comes from the pickling bath. Guides generally indicated by reference character 17 are provided at the discharge ends of said troughs, to guide the metal against vertical and lateral displacement. Said guides are similar in construction to those shown in my prior Patent No. 2,141,732, which issued December 27, 1938, so will not herein be shown or described in detail.

With reference now in particular to the details of construction of the pickling tank 10, said tank, as herein shown, has a steel outer shell 19, of a rectangular formation, mounted in a supporting framework. Said framework includes a plurality of spaced apart I-beams 21, 21, secured to a suitable foundation, and upright side frame members 22, 22 mounted on the ends of said I-beams and extending upwardly along the sides of said shell. Said side frame members are connected together by channels 28, 28 extending along the upper ends of said side frame members.

The shell 19 is provided with a lining, impervious to the effects of acid in the pickling solution, which includes an inner expansible and contractible lining disposed next to the inside of said shell and indicated generally by reference character 23, and an outer brick or cement lining next to said resilient expansible lining and indicated generally by reference character 24.

The inner lining 23 may be a rubber, asphalt, or other like material, which will permit independent expansion and contraction of the shell and outer lining thereof.

The outer lining 24 may be a cement impervious to the effects of the acid in the pickling solution or acid resisting bricks set in sulphur cement, or may be any other similar type of lining. Said outer lining, as herein shown, forms a pair of spaced apart outer side walls 25 and 26 extending along the shell 19, and a dividing wall 27, dividing said tank into the compartments 11 and 13.

The upper inner sides of the side walls 25 and 26 are recessed, to receive and form a support

for side wall sections 29, 29 of the pickling trough 12 and for side wall sections 30, 30 of one pickling trough 14 respectively. Opposite sides of the center dividing wall 27 are recessed to receive a support for the other side wall sections 29, 29 of the pickling trough 12 and for side wall sections 30, 30 of the other pickling trough 14.

Referring now in particular to the novel construction of the pickling troughs 12 and 14, 14, the side wall sections 29 and 30 are of a similar construction and are mounted in the walls 25, 26 and 27 in a similar manner, so the side wall sections 29, 29 only need herein be described in detail. Said side wall sections, as herein shown, are made from a material impervious to the effects of the acid in the pickling solution and to the abrasive action of the edges of the metal when passing through the pickling trough. One type of material from which said sections may be made, is a cast iron having a high silicon content.

Each section 29 has an outwardly flared shouldered forward end 31, within which the rear end of the next forward side wall is adapted to fit and be cemented thereto, to form an overlapping tight joint between said sections (see Figure 5). A pair of spaced apart lugs 33, 33 project outwardly from each of said side wall sections to securely mount said sections in recesses formed in said side walls. Said lugs may be cemented in said recesses by means of any suitable cement impervious to the effects of the acid in the pickling solution. Each side wall section also has an outwardly flared shouldered upper portion 34, adapted to form a recess to receive one side of a sectional cover 35 for the trough 12.

The lower ends of the side wall sections 29, 29 are of an angular or L-shaped formation, and the base thereof extends inwardly along the shouldered portion of the side wall of the tank 10 and is adapted to have an end of a bottom section 36 of the trough mounted thereon.

The inner walls of the troughs 14, 14 are formed from pairs of abutting side wall sections 38, 38, which are secured together adjacent their upper ends by means of nuts and bolts 39 (see Figure 3). Said side wall sections are supported at their lower ends on a supporting member 40 extending longitudinally along the compartment 13 and supported on spaced apart transversely extending beams 41, 41. Said beams are mounted at their ends in the side walls 25 and 26 of the tank compartment 13. Sectional bottom pieces 43 are supported on the lower inwardly extending ends of said side wall sections and the side wall sections 30, 30, and covers 44, 44 are mounted in recessed upper outwardly flared ends of said side wall sections.

The sectional bottom pieces 36 and 43 of the troughs 12 and 14, 14 are of a similar construction except as to size, so the bottom pieces 36, 36 only will herein be described in detail. Each bottom piece 36 is made from a material having a smooth upper surface impervious to the effects of the acid in the pickling solution and preferably a plastic. Said plastic may consist of any of the commercial forms of material bonded together by a phenol formaldehyde resin, such as the plastic materials having the trade names Gatke, Haveg, Karbate, Wyertex, or any other similar form of material. Said bottom pieces are supported at their ends on the inwardly extending ends of the side wall sections 29, 29 and on spaced apart transversely extending beams, such as channels 45, 45. Spaces are provided between adjacent ends of each of said bottom pieces and said spaces are closed by fluid nozzles 47, 47. Said side wall pieces may be cemented to said side wall sections and to said nozzles by a cement impervious to the effects of the acid in the pickling solution, to form fluid-tight joints between said bottom pieces, side walls, and nozzles.

The fluid nozzles 47, 47, as herein shown, extend across the compartment 11 and open in the direction of travel of the metal through the pickling trough, to direct the fluid in the direction of travel of the metal through the pickling solution. The inner ends of said nozzles are mounted in the dividing wall 27, while the opposite portions thereof extend through and upwardly along the outer side wall 25. Said nozzles may be cemented in said side walls with an acid resisting cement.

Each nozzle 47, as herein shown, has a widened upper portion having a shouldered step-shaped advance side 49 and a shouldered rear side 50, with the fluid passageways directed to open in the direction of said rear side. Said advance side is adapted to be engaged by an adjacent shouldered end of a bottom piece 36. Said rear side is adapted to be engaged by an advance end of the next adjacent bottom piece. Said advance end is beveled in a direction to permit the free flow of fluid from the respective nozzle in the direction of travel of the metal through the trough.

A discharge end bottom piece 53 is provided at the discharge end of each pickling trough and has opposite beveled ends, as is clearly shown in Figure 6. An advance end bottom piece 54 is provided at the entering end of each pickling trough. Said advance end bottom piece has a downwardly inclined advance end 55 at the entering end of the trough, and has an opposite shouldered end formed similar to the shouldered ends of the bottom pieces 36, 36 (see Figure 2).

Fluids may be conducted from the pickling tank 10 to the nozzles 47, 47 and to nozzles 56, 56 of the pickling troughs 14, 14, through fluid conductors 57 and 58. The fluid conductor 57 leads from the compartment 13 to a pump 59, herein shown as being a centrifugal pump of an ordinary construction. Fluid is conducted from said pump to the respective nozzles 56, 56 by means of a conductor 60 leading to longitudinally extending branch conductors 61, 61 (see Figure 1). The fluid conductor 58 leads from the compartment 11 to a pump 63. Fluid is conducted from said pump to the respective nozzles 47, 47 by means of a conductor 64 leading to longitudinally extending branch conductors 65, 65.

It may be seen from the foregoing that a pickling tank construction has been provided which includes a tank lined with an acid resisting material and so formed as to have pickling troughs recessed in the upper ends of the lining thereof. It may also be seen that the pickling troughs are of a sectional construction, so arranged that they may readily be assembled and be rigidly supported in the sides of the tank. It may further be seen that the sectional sides of each trough are so constructed that they may be made from a material impervious to the effects of acid in the pickling solution and to the abrasive action of the edges of the strip metal, and that the sectional bottom of each trough is constructed from a smooth non-scratching acid resisting material, impervious to the effects of the acid in the pickling solution, having the pickling nozzles recessed

beneath the upper surfaces of said bottom and interposed between each bottom section, in order to provide a smooth simplified form of non-scratching bottom for the trough.

While I have herein shown and described one form in which my invention may be embodied, it will be understood that the construction thereof and the arrangement of the various parts may be altered without departing from the spirit and scope thereof. Furthermore, I do not wish to be construed as limiting my invention to the specific embodiment illustrated, excepting as it may be limited in the appended claims.

I claim as my invention:

1. In combination, a pickling tank, and a trough through which the metal is adapted to pass while being pickled, extending along said tank, the side walls of said trough including a plurality of interengaging aligned side wall members constructed from a ferrous material impervious to the effects of acid in the pickling solution and to the abrasive action of the edges of the metal when passing through the pickling trough, the bottom of said trough including a plurality of spaced apart aligned bottom pieces engaging said side walls at their opposite edges and supported by said side walls and constructed from a relatively smooth non-scratching plastic material impervious to the effects of acid in the pickling solution, and transversely extending nozzles bridging the gaps between said bottom pieces, for conducting pickling fluid under pressure to said trough in the direction of travel of the metal therethrough, said nozzles being disposed beneath the tops of said bottom pieces.

2. In combination, a pickling tank, and a pickling trough mounted above and extending along said tank, said trough including a plurality of aligned interengaging side walls mounted in and extending along opposite side walls of said tank and constructed from a ferrous material impervious to the effects of acid in the pickling solution and to the abrasive action of the metal when passing through the pickling trough, and the bottom of said trough including a plurality of aligned bottom pieces engaging said metallic side walls at their opposite edges and supported by said side walls and constructed from a relatively smooth non-scratching plastic material impervious to the effects of acid in the pickling solution.

3. In combination, a pickling tank, and a pickling trough mounted above and extending along said tank, said trough including a plurality of aligned interengaging side walls mounted in and extending along opposite side walls of said tank and constructed from a ferrous material impervious to the effects of acid in the pickling solution and to the abrasive action of the metal when passing through the pickling trough, a plurality of spaced apart nozzles extending transversely between said side walls, and a plurality of bottom pieces mounted in the spaces between said nozzles, said bottom pieces being constructed from a relatively smooth non-scratching plastic material impervious to the effects of acid in the pickling solution and having beveled advance faces adjacent the openings in said nozzles, and the upper surface thereof being above said nozzles, for supporting the metal out of contact with said nozzles as it travels through said pickling trough.

4. In combination, a pickling tank constructed from a metal shell lined with an aggregate material impervious to the effects of acid in the pickling solution, and a pickling trough mounted above and extending along said tank, said trough including a plurality of aligned interengaging side walls mounted in and extending along opposite side walls of said tank and constructed from a ferrous material impervious to the effects of acid in the pickling solution and to the abrasive action of the metal when passing through the pickling trough, and the bottom of said trough including a plurality of aligned bottom pieces supported by and engaging said metallic side walls at their opposite edges and constructed from a relatively smooth non-scratching plastic material impervious to the effects of acid in the pickling solution, overlapping connections between the ends of adjacent side walls, each of said side walls of said tank having an upper shouldered portion extending therealong adapted to receive the side walls of said trough and provided with a plurality of spaced apart recessed portions, and each side wall of said trough having a lug projecting outwardly therefrom adapted to engage a recess in one of said recessed portions.

5. In combination, a pickling tank constructed from a metal shell lined with an aggregate material impervious to the effects of acid in the pickling solution, and a pickling trough mounted above and extending along said tank, said trough including a plurality of aligned interengaging side walls mounted in and extending along opposite side walls of said tank and constructed from a ferrous material impervious to the effects of acid in the pickling solution and to the abrasive action of the metal when passing through the pickling trough, and the bottom of said trough including a plurality of aligned bottom pieces supported by and engaging said metallic side walls at their opposite edges and constructed from a relatively smooth non-scratching plastic material impervious to the effects of acid in the pickling solution, each of said side walls of said tank having an upper shouldered portion extending therealong adapted to receive the side walls of said trough and provided with a plurality of spaced apart recessed portions, and each side wall of said trough having a lug projecting outwardly therefrom adapted to engage a recess in one of said recessed portions of said tank, overlapping connections between the ends of adjacent side walls, and fluid nozzles extending across said troughs and disposed between adjacent ends of said bottom pieces.

6. In an apparatus of the class described, a pickling trough adapted to be mounted on and extend along the top of a pickling tank and have strip metal pass therethrough during the pickling operation, the side walls of said trough including a plurality of interengaging aligned side wall members, the bottom of said tank including a plurality of spaced apart aligned bottom pieces engaging said side walls at their edges and supported thereby, and transversely extending fluid nozzles bridging the gaps between said bottom pieces, for conducting pickling fluid under pressure to said trough in the direction of travel of the metal therethrough, said nozzles being disposed beneath the tops of said bottom pieces.

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