

Oct. 14, 1941.

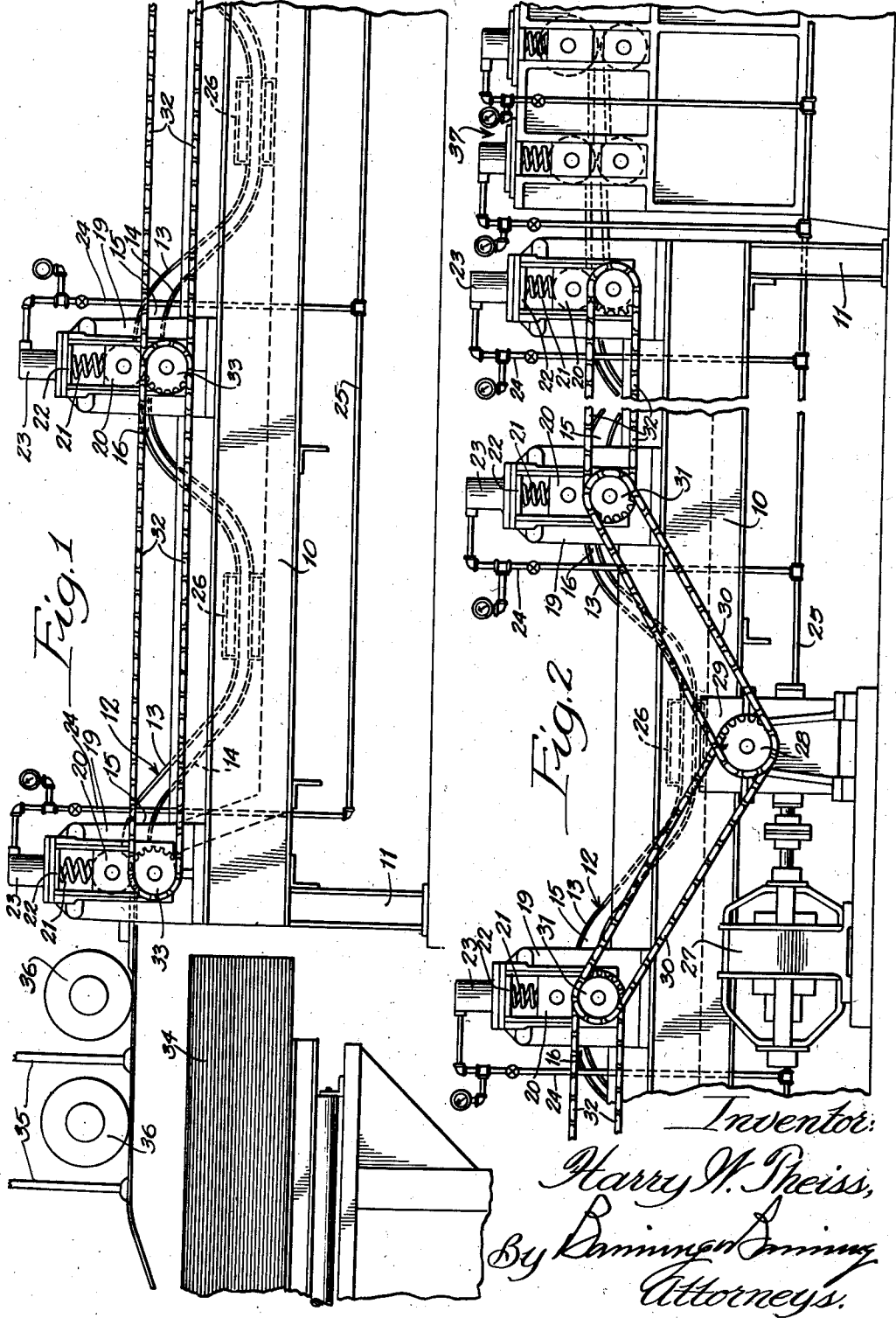
H. W. THEISS

2,259,278

MECHANISM FOR FEEDING METALLIC SHEETS THROUGH A BATH

Filed Nov. 28, 1938

3 Sheets-Sheet 1



Inventor:  
Harry W. Theiss,  
By *Lawrence J. ...*  
Attorneys.

Oct. 14, 1941.

H. W. THEISS

2,259,278

MECHANISM FOR FEEDING METALLIC SHEETS THROUGH A BATH

Filed Nov. 28, 1938

3 Sheets-Sheet 2

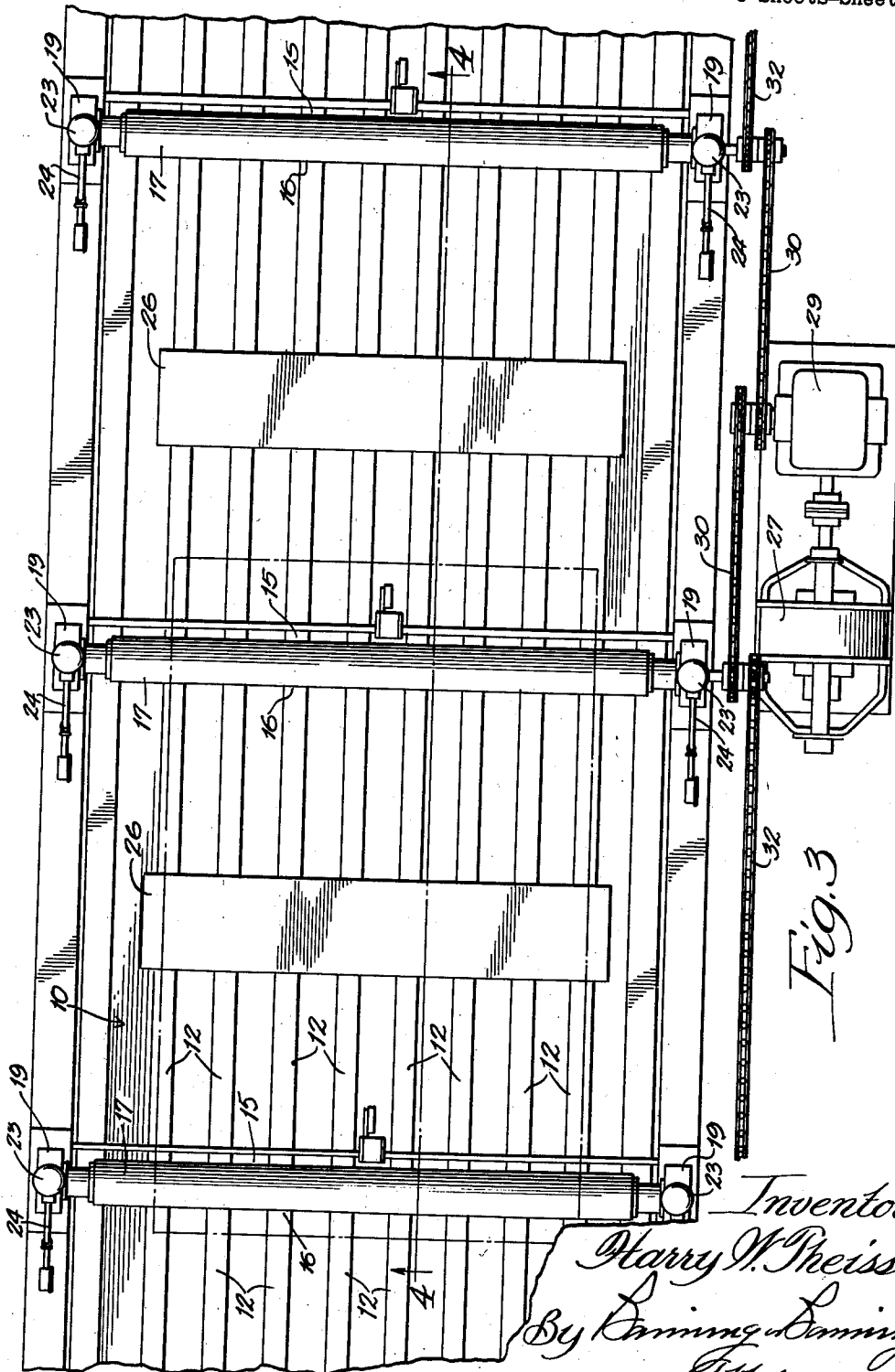


Fig. 3

Inventor:  
Harry W. Theiss,  
By *Dunning & Dunning*  
Attorneys.

Oct. 14, 1941.

H. W. THEISS

2,259,278

MECHANISM FOR FEEDING METALLIC SHEETS THROUGH A BATH

Filed Nov. 28, 1938

3 Sheets-Sheet 3

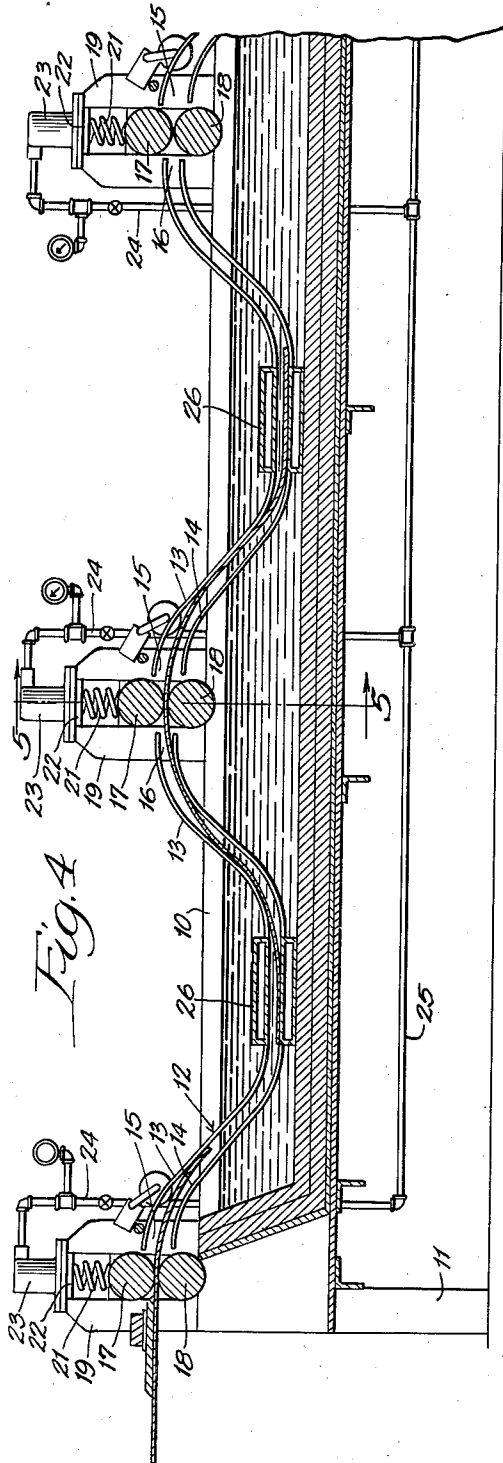


Fig. 4

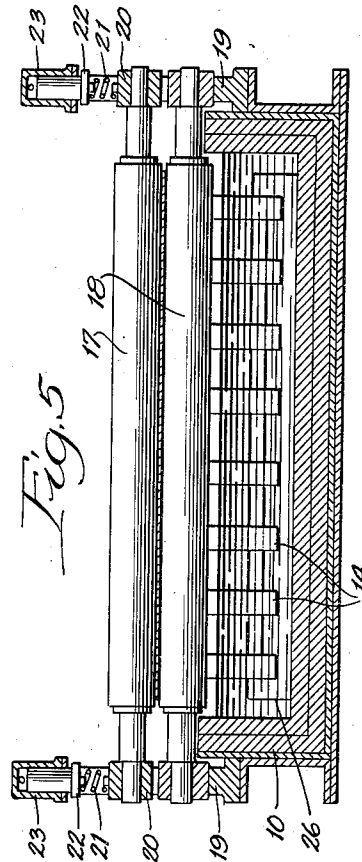


Fig. 5

Inventor,  
Harry W. Theiss,  
By *Samuel L. Harris*  
Attorneys.

# UNITED STATES PATENT OFFICE

2,259,278

## MECHANISM FOR FEEDING METALLIC SHEETS THROUGH A BATH

Harry W. Theiss, Louisville, Ohio, assignor to Continental Steel Corporation, Kokomo, Ind., a corporation of Indiana.

Application November 28, 1938, Serial No. 242,758

4 Claims. (Cl. 266—7)

The apparatus of the present invention is designed more particularly for the carrying out of a method of pickling metallic sheets which forms the subject matter of my co-pending application, Serial No. 242,757, filed November 28, 1938.

In the pickling of metallic sheets in preparation for a coating by electrolytic or similar processes it has been found highly advantageous to make provision for the feeding of the individual sheets in a processional series and through an undulatory guideway for the purpose of alternately submerging and elevating the sheets with respect to the surface of the liquid in the tank in order to effect a more perfect and uniform pickling action, to conserve the liquid employed and economize space, and otherwise improve the operation in the manner set forth in full detail in the co-pending application above referred to.

The apparatus of the present invention is designed to operate in conformity with the foregoing requirements and to provide adequate means for maintaining a closely spaced procession of sheets which are moved uniformly from end to end of the tank and are discharged therefrom at timed intervals, thereby maintaining continuity in the operation.

It is also desirable to make provision for so constructing the feeding means that the same will be located in elevated relation above the liquid in the tank and at points where they will be readily accessible, and in constructing the guideway for the sheets in units or sections so disposed that they may be readily mounted and assembled within the tank or individually removed therefrom as occasion may require.

Further objects and details of the invention will appear from the description thereof in conjunction with the accompanying drawings, wherein—

Figure 1 is a side elevation of the forward end of a pickling tank embodying the features of the present invention;

Fig. 2 is a view partly broken away showing the intermediate and terminal portions of the tank and associated mechanisms;

Fig. 3 is a plan view of the intermediate portion of the tank;

Fig. 4 is a sectional elevation of the forward end of the tank; and

Fig. 5 is a cross sectional view taken on line 5—5 of Fig. 4.

The pickling tank 10 of the present invention is of elongated formation and of sufficient length to permit the metal sheets to be alternately sub-

merged and elevated several times during the progress of the sheets from end to end of the tank. As shown, the tank is mounted upon legs or standards 11 which serve to elevate it to a convenient height above the level of the floor. Within the tank and extending from end to end thereof is a sinuous guideway designated 12 in its entirety, which guideway is so configured as to recurrently submerge and elevate the sheets and to impart to them a flexing movement first in one direction and then in the other so that while the sheets are progressing from end to end of the tank they are constantly being bent back and forth which serves to bring the acid in the tank into more intimate contact with the surface of the sheets and to dislodge scale or other impurities adhering to the surface.

The guideway 12 is made up of sections arranged in sequential series so that the discharge end of each section leads into the mouth of the next succeeding section. Each section is composed of a series of upper slats 13 and a series of lower slats 14, the series being vertically spaced from one another to afford an intermediate guideway for the travel of the sheets. The individual slats of each series are spaced laterally from one another as indicated in Fig. 3, so that abundant space is afforded for the inflow of the liquid, and the slats at the entering end 15 of each unit are more widely separated vertically than at the discharge end 16, so that a throated entrance is afforded for the sheets.

Each section of the guideway is so configured that its entering and discharging ends stand above the level of the liquid within the tank while the intermediate section dips down close to the bottom of the tank, so that the sheets will enter each section and pass down below the surface and be again elevated for discharge into the next succeeding section of the guideway.

At each point of juncture between adjacent sections of the guideway is located a feeding unit comprising an upper feed roll 17 and a lower feed roll 18. Each pair of rolls is mounted within standards 19, the lower rolls being journaled at their ends within the standards, and the upper rolls being journaled within slide blocks 20 backed by springs 21 which hold the rolls in resilient compressive relation to one another. In order to maintain uniform pressure at all times throughout the entire series of rolls, hydraulic means are provided which include a head plate 22 for each of the springs 21, which is acted upon by pressure admitted to a cylinder 23 through a pipe 24 which connects with a header pipe 25, so

that equality in the compressive action is maintained throughout the entire series.

The rolls are preferably rubber covered and so disposed that their contacting surfaces align with the adjacent ends of the guide sections, and the spacing of the succeeding feed rolls is such that each flexible metal sheet will remain in the bite of a given pair of rolls until its leading edge enters the bite of the next succeeding pair, so that continuity in the feeding action is maintained and the sheets are compelled to follow the sinuous course afforded by the guideway.

In order to heat the pickling bath at recurrent intervals a series of submerged gas heaters 26 is provided, one of said heaters being located to surround the submerged bend or turn of each section of the guideway, which arrangement also affords a convenient support for holding the guide sections slightly elevated above the floor of the tank.

The entire series of pairs of rolls is driven in unison from a common source such as a motor 27 located adjacent to the middle of the tank, which drives a main sprocket 28 through suitable shaft connections and reducing gears located in a housing 29. The main sprocket engages companion main sprocket chains 30 each of which drives a sprocket 31 located on the shaft of the adjacent lower feed roll, and in order to drive the remaining feed rolls of the series, companion transmission sprocket chains 32 are provided which engage sprockets 33 on the shafts of the remaining lower feed rolls comprising the series. In this way all of the lower feed rolls are driven in unison and at the same rate so that the feeding sequence will be maintained.

The sheets in the first instance are fed from a stack 34 located in proximity to the forward end of the tank, from which the sheets are lifted individually by suction means 35 having magnetic rolls 36—36 whose feeding surfaces are aligned with the bite of the proximate pair of feed rolls located at the entering end of the tank, after which the sheets will be relayed in an undulating path from end to end of the tank and finally discharged therefrom into scrubber mechanism 37 which need not be described in detail.

In operation, the tank is filled to the intended level with an acid pickling bath, and the sheets are stacked at the front end of the tank and immediately below the vacuum cups or equivalent means for lifting the sheets singly to the intended level, at which point they come in contact with the magnetic rollers and are suspended therefrom and fed forwardly into the mouth of the first section of the undulating guideway.

The sheets are confined between the upper and lower slats comprising the guideway, and being flexible will follow the path of the guideway being shoved forward by the first rollers of the feeding series. The sheets are thus carried down and submerged within the liquid in the tank and are thence shoved upwardly into the bite of the second set of rollers, and so on throughout the entire series. As the sheets dip down into the tank they will be flexed in one direction, and thereafter, upon their emergence from the tank, will be flexed in the opposite direction, and this alternate flexation in opposite directions will continue throughout the entire path of travel of the sheets. This flexation, combined with the alternate submergence and elevation of the sheets, serves to loosen up any scale or impurities adhering to the surface of the sheets and to more evenly and effectively distribute the pickling liq-

uid upon the opposite surfaces of the sheets, so that the pickling operation will be uniformly and evenly distributed on both sides of the sheets, with a resulting speed in the operation, and decrease in tendency to blister or other deleterious action.

The feeding of individual sheets is much more effective and convenient than any operation involving the feeding of a continuous strip, since such an operation would require the splicing or fastening of strips to one another in order to maintain the continuity of the operation. By feeding the individual sheets in the manner described the continuity of the procession can be maintained through extended intervals but without interference or the necessity of readjustment or special manipulation in the event gaps occur from time to time in the procession. This is due to the fact that each sheet is individually fed throughout the extent of the tank by the proper spacing of the rollers, so that while continuity in the operation is ordinarily desirable it is not indispensable.

Although the apparatus has been particularly designed for use in connection with a tank containing a pickling liquid, it is not the intention to limit the claims to a pickling operation, since the feeding means are adapted for use in other capacities.

It will furthermore be understood that changes or variations in the structure shown may be introduced without departing from the spirit of the invention.

I claim:

1. In sheet feeding mechanism of the class described, the combination of a tank adapted to contain liquid, an undulatory guideway extending from end to end of the tank and alternately descending below the intended level of the liquid and alternately extending above said level and adapted to guide flexible sheets therethrough for alternate submergence and elevation, pairs of rollers located each at a point of elevation of the guideway above the liquid level, means for operating said pairs of rollers in unison for relaying the individual sheets through the guideway, said means including a common source of power and sprocket mechanism leading therefrom to one of the rollers of each pair, and fluid pressure means for exerting uniform pressure between the rollers of each pair.

2. In sheet feeding mechanism of the class described, the combination of a tank adapted to contain liquid, an undulatory guideway extending from end to end of the tank and alternately extending above and below the intended liquid level in the tank, said guideway comprising sections each consisting of vertically spaced slats between which the sheets are intended to travel, the entering end of each section being throated to facilitate the entry of sheets from the next preceding section, the divisions between the sections being above the liquid level in the tank, and pairs of feeding rollers located each at a point of division between the sections for relaying the sheets from section to section through the guideway, and fluid pressure means common to all of the pairs of rollers for maintaining equality of pressure of the several pairs of rollers.

3. In sheet feeding mechanism of the class described, the combination of a tank adapted to contain liquid, an undulatory guideway extending from end to end of the tank and alternately extending above and below the intended liquid level in the tank, said guideway compris-

ing sections each consisting of vertically spaced slats between which the sheets are intended to travel, the entering end of each section being throated to facilitate the entry of sheets from the next preceding section, the divisions between the sections being above the liquid level in the tank, pairs of feeding rollers located each at a point of division between the sections for relaying the sheets from section to section through the guideway, and fluid pressure means common to all of the pairs of rollers for maintaining equality of pressure of the several pairs of rollers, and a submerged heating element surrounding the depressed base of at least one of the sections of the guideway.

4. In mechanism for feeding metallic sheets through a bath, the combination of a tank adapted to contain a pickling liquid, an undulatory guideway extending from end to end of the

5 tank and alternately and recurrently descending below the intended level of the liquid and alternately and recurrently extending above said level and adapted to guide flexible sheets there-through for alternate submergence and elevation, and feeding means adapted to maintain continuity of sequential travel of the individual sheets throughout the guideway, the sigmoidal curvature of the guideway being of proper character and extent to recurrently bend the sheets back and forth with sufficient frequency and to a sufficient extent to dislodge scale and other impurities adhering to the surface of the sheet while the same are passing through the tank, 10 15 whereby the sheets are mechanically cleaned of such scale and other impurities simultaneously with the pickling of the sheets.

HARRY W. THEISS.