Dec. 6, 1932. A. D. EVANS ET AL 1,890,250

METHOD OF AND APPARATUS FOR HANDLING TIN PLATE

Filed March 24, 1930 7 Sheets-Sheet 1

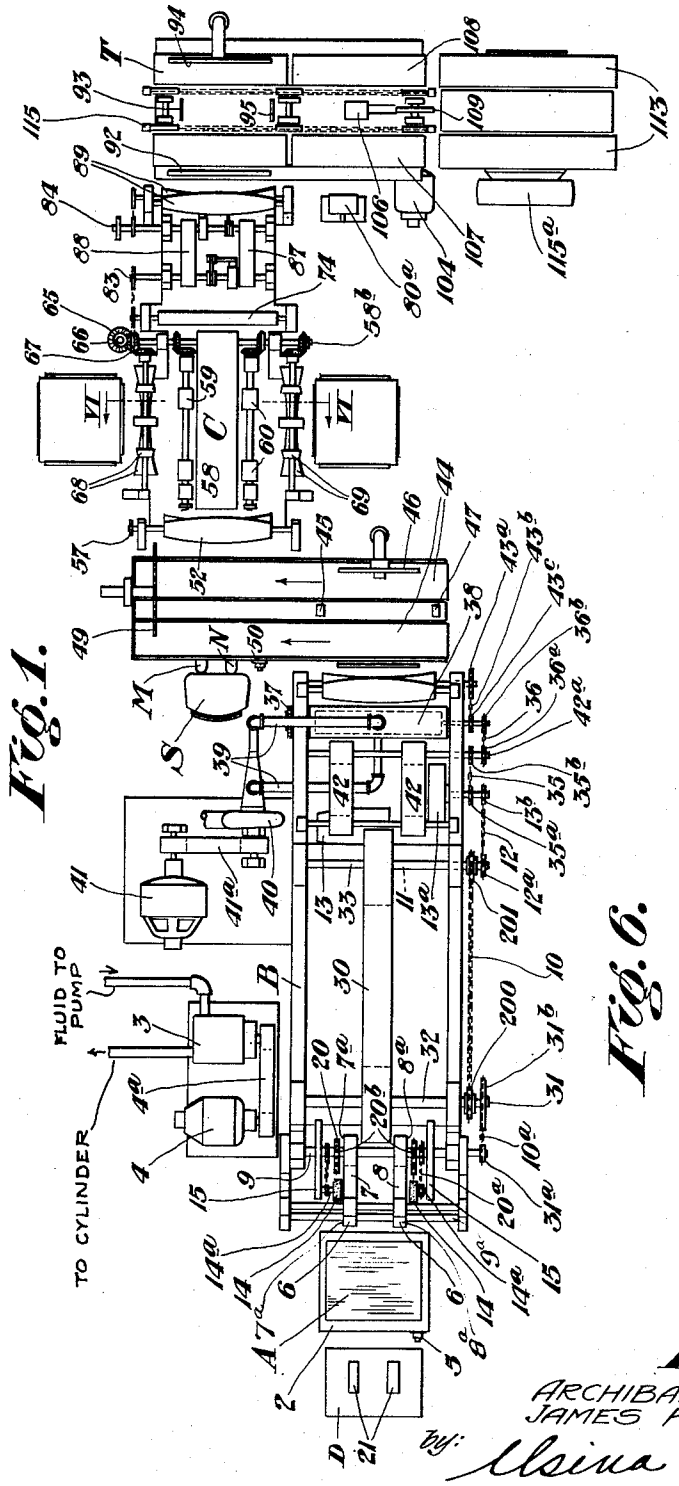


Fig. 1.

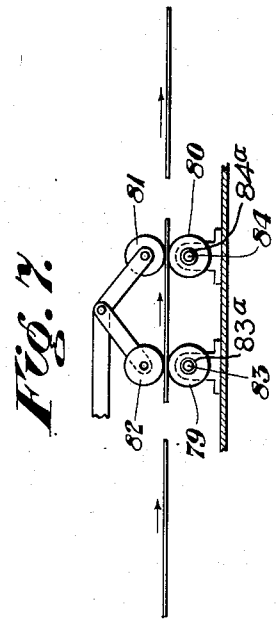


Fig. 7.

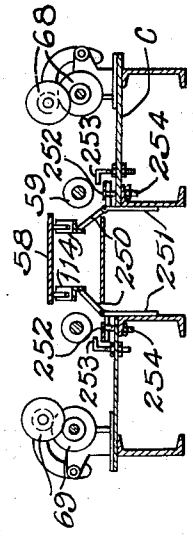


Fig. 6.

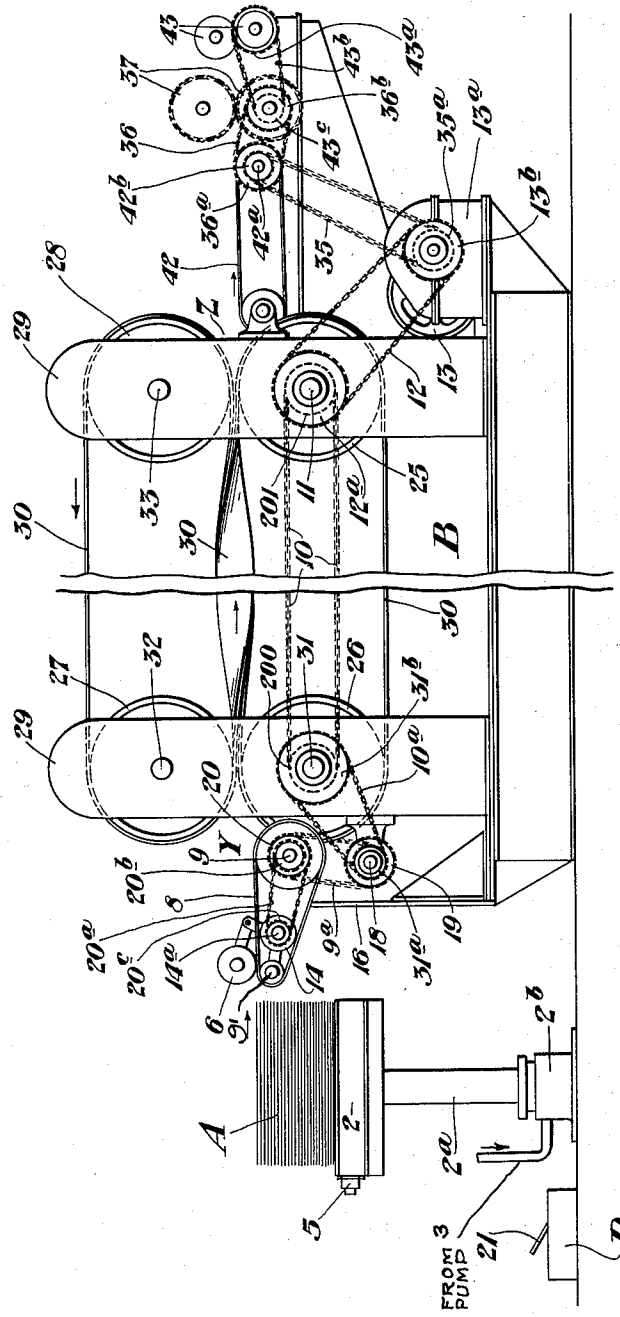
Inventors:
ARCHIBALD. D. EVANS and
JAMES K. LAMOREE.
by: Usina & Rauber
their Attorneys.

Dec. 6, 1932. A. D. EVANS ET AL 1,890,250

METHOD OF AND APPARATUS FOR HANDLING TIN PLATE

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Fig. 2.



Inventors:
ARCHIBALD D. EVANS and
JAMES K. LAMOREE.

by: Usina & Raubert

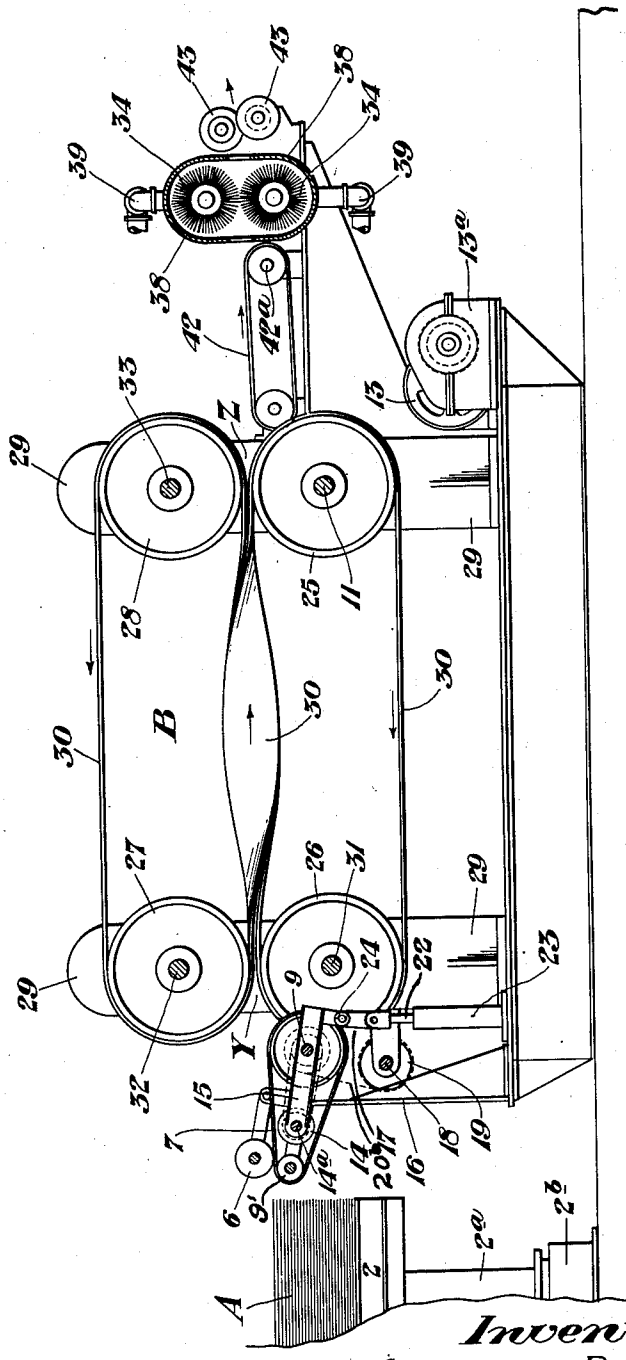
their Attorneys.

Dec. 6, 1932. A. D. EVANS ET AL 1,890,250

METHOD OF AND APPARATUS FOR HANDLING TIN PLATE

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Fig. 3.



Inventors:
ARCHIBALD D. EVANS and
JAMES K. LAMOREE.
by: Usina & Rauber
their Attorneys.

Dec. 6, 1932. A. D. EVANS ET AL 1,890,250

METHOD OF AND APPARATUS FOR HANDLING TIN PLATE

Filed March 24, 1930 7 Sheets-Sheet 4

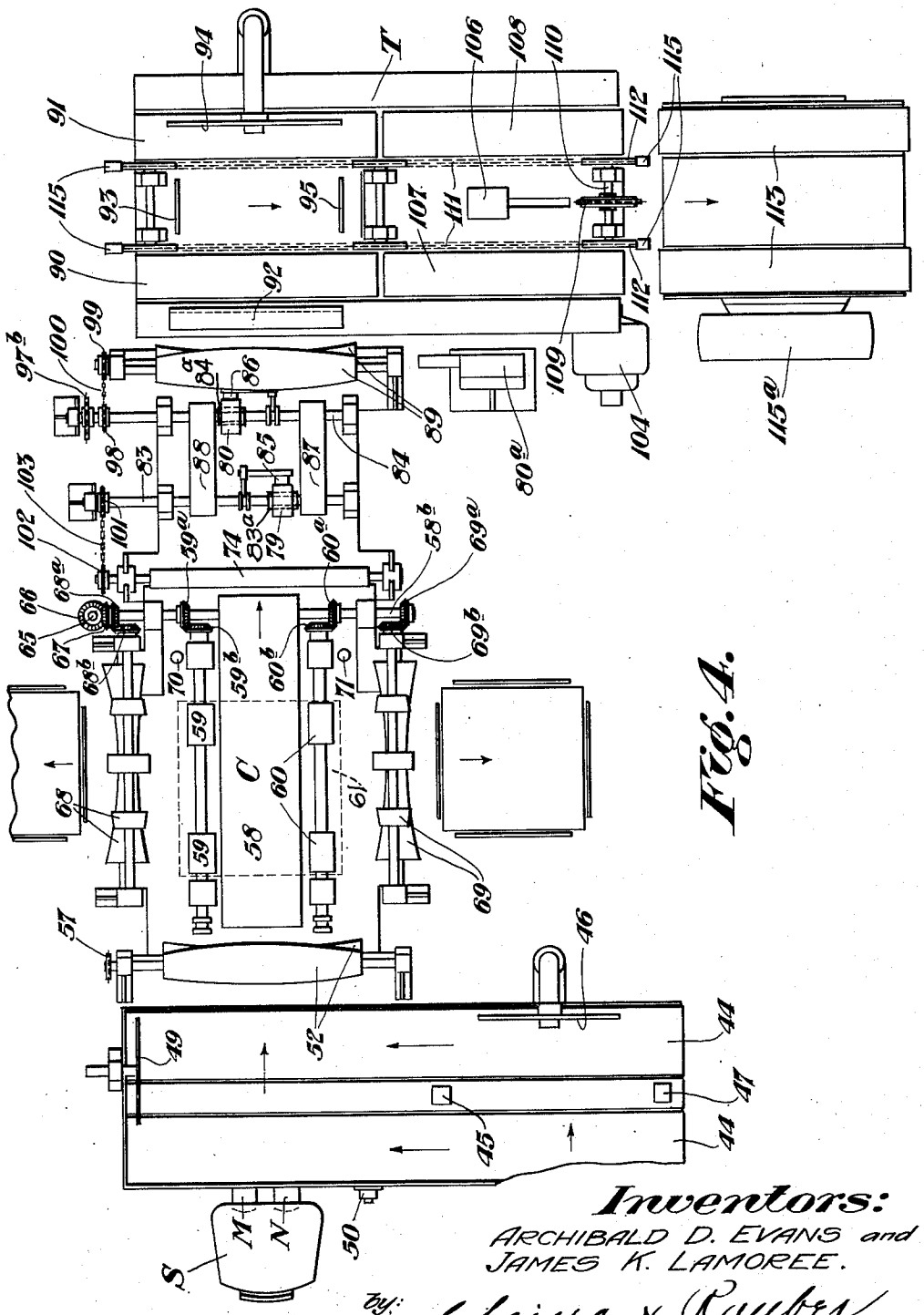


Fig. 4.

Inventors:
ARCHIBALD D. EVANS and
JAMES K. LAMOREE.

by: Cisina & Rauber

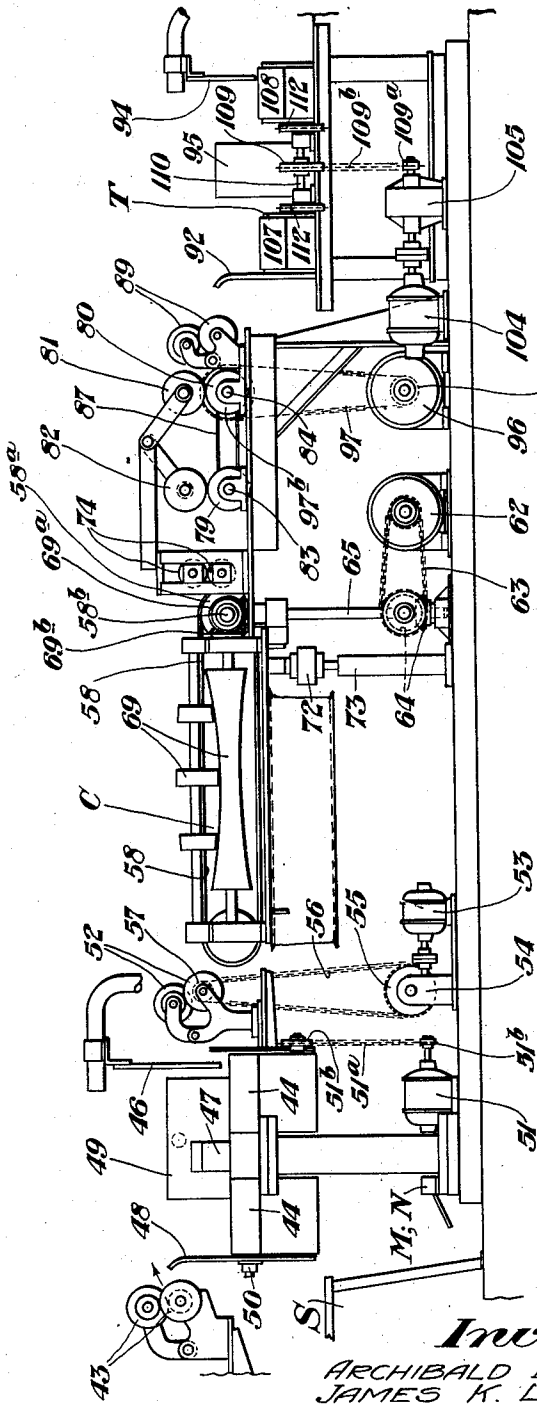
their Attorneys.

Dec. 6, 1932. A. D. EVANS ET AL 1,890,250

METHOD OF AND APPARATUS FOR HANDLING TIN PLATE

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Fig. 5.



Inventors:
ARCHIBALD D. EVANS and
JAMES K. LAMOREE.
by: Usina & Rauber
their Attorneys.

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METHOD OF AND APPARATUS FOR HANDLING TIN PLATE

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Fig. 8.

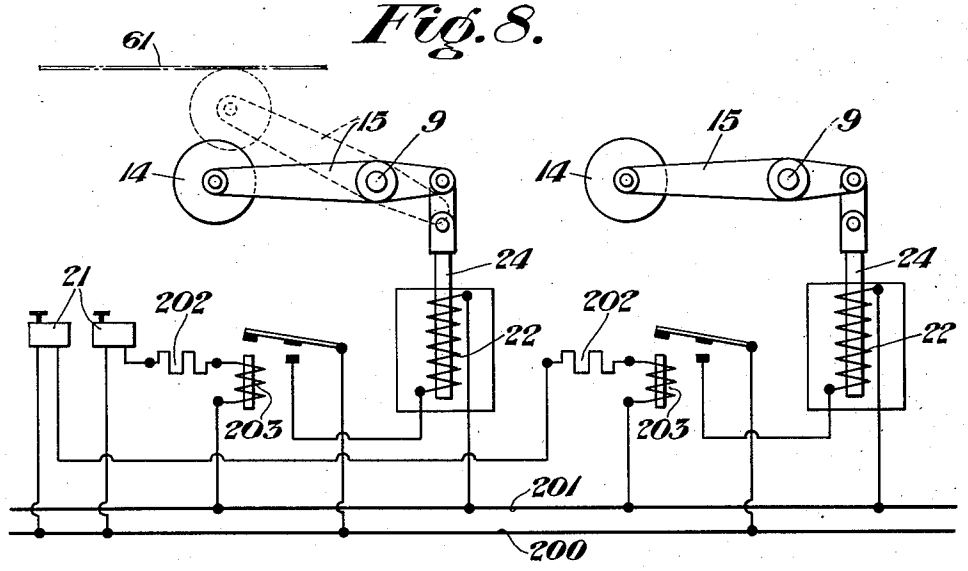
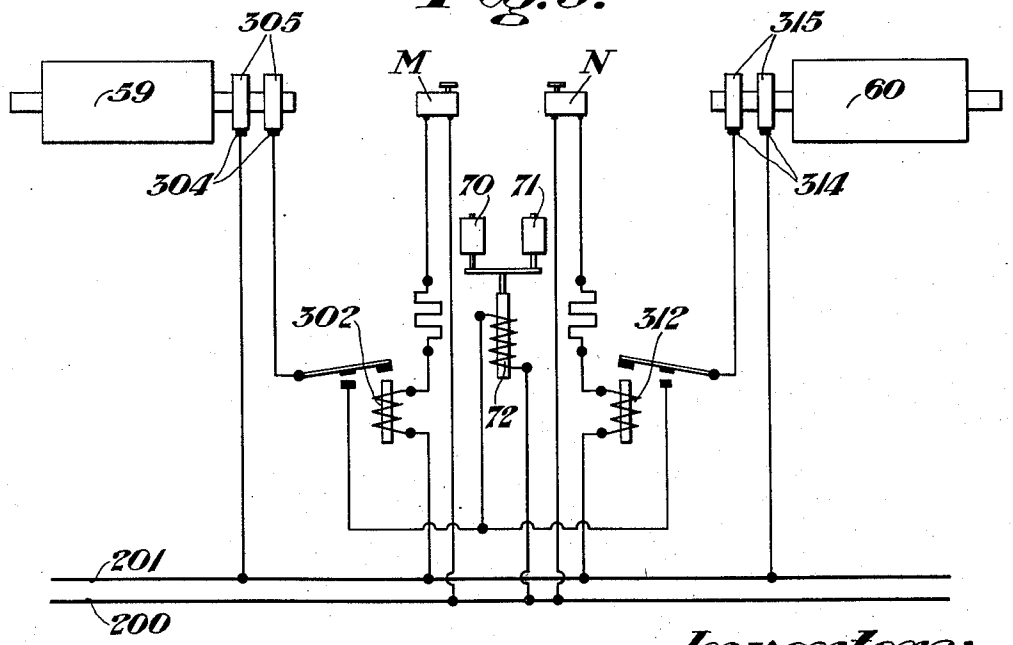


Fig. 9.



Inventors:
ARCHIBALD D. EVANS and
JAMES K. LAMOREE.

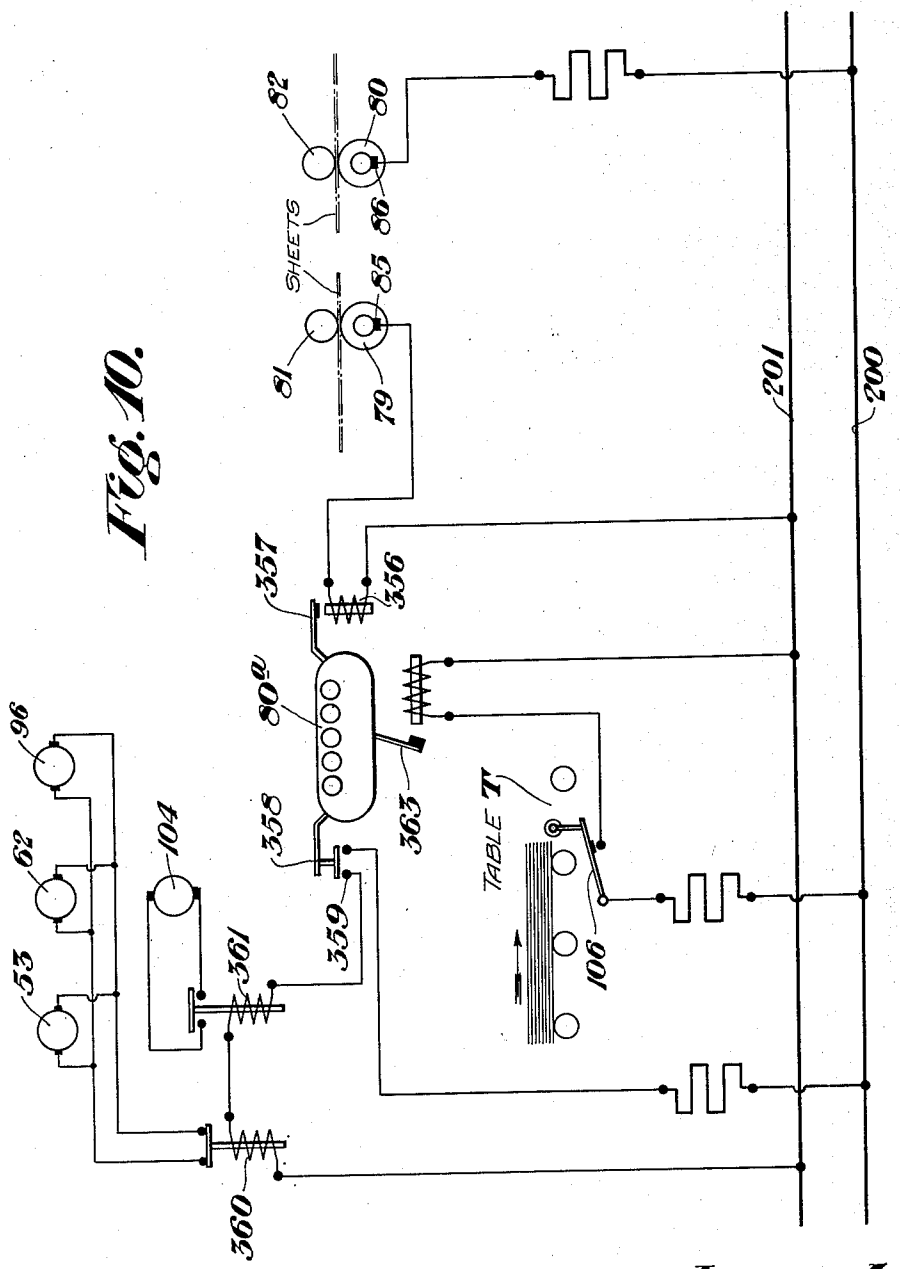
by: Masius & Rauber
their Attorneys.

Dec. 6, 1932. A. D. EVANS ET AL. 1,890,250

METHOD OF AND APPARATUS FOR HANDLING TIN PLATE

Filed March 24, 1930 7 Sheets-Sheet 7

Fig. 10.



Inventors:
ARCHIBALD D. EVANS and
JAMES K. LAMOREE.

by: Masius & Rauber
their Attorneys.

Patented Dec. 6, 1932 1,890,250

UNITED STATES PATENT OFFICE

ARCHIBALD D. EVANS, OF WARREN, OHIO, AND JAMES K. LAMOREE, OF MOUNT LEBANON, PENNSYLVANIA

METHOD OF AND APPARATUS FOR HANDLING TIN PLATE

Application filed March 24, 1930. Serial No. 438,485.

This invention relates to a method of and mechanism for handling tin plate and has for its object the provision of such a method and mechanism which will provide for mechanical handling of the plates during the inspecting, counting and piling thereof prior to boxing or assembling for shipping.

Heretofore, tin plate has been generally handled manually when inspected, counted by hand and weighed by hand prior to boxing.

The present method and mechanism eliminates all manual lifting and handling of the tin plate except for the feeding of the plates into suitable conveying mechanism by the inspectors.

In the drawings:

Figure 1 is a plan view of the sheet handling apparatus.

Figure 2 is an enlarged side elevation of the sheet turnover mechanism.

Figure 3 is a sectional elevation of the turnover mechanism.

Figure 4 is an enlarged plan of the mechanism for handling the turned plates or sheets.

Figure 5 is a side elevation of the apparatus of Figure 4.

Figure 6 is a transverse section taken on the line VI—VI of Figure 1 through the three-way selective conveyer operated by the second inspector.

Figure 7 is a diagrammatic detail showing the manner in which the sheets close the circuit to an electrically operated counting mechanism.

Figure 8 is an elementary wiring diagram of the control circuit for the buffing rollers.

Figure 9 is an elementary wiring diagram of the control for the magnetic rollers and stops of the selective conveyer.

Figure 10 is an elementary wiring diagram of the counter control and pile trip switch.

Referring more particularly to the drawings, the tin plate A to be inspected is mounted on the platform 2 which is carried by a vertically movable plunger 2^a of a fluid pressure cylinder 2^b. The plunger 2^a is adapted to be elevated as the plates are inspected and moved off the pile so as to maintain the top sheet at the proper height at all times.

The inspector or sorter stands upon a platform D facing the sheets A, and the top face of each sheet is in turn examined and the sheet is then fed into the handling mechanism, to be described.

The cylinder 2^b is adapted to receive hydraulic power from a pump 3 which is driven by a belt 4^a from a motor 4. A switch 5 controls the operation of the motor 4 and is positioned conveniently to the platform D so as to enable the first sorter to maintain the proper elevation of the pile of plates A.

A pair of feed-in rollers 6 and conveyer belts 7 and 8 serve to convey the plates from the pile A after their top faces are inspected. The belts 7 and 8 are trained over suitable pulleys on shafts 9 and 9′. The shaft 9 is adapted to be driven by a chain 9^a which is trained over sprockets 20 and 19 on the shafts 9 and 18, respectively. The shaft 18 is connected to the shaft 31 of a plate turnover conveyer (to be described) by a chain 10^a trained over sprockets 31^a and 31^b on the shafts 18 and 31, respectively. The shaft 31 is connected to the power shaft 11 of the turnover conveyer by a chain 10 trained over sprockets 200 and 201 on the shafts 31 and 11, respectively. The shaft 11 receives its power from a motor 13 through a reduction gear assembly 13^a which has a sprocket 13^b connected by a chain 12 to a sprocket 12^a on the shaft 11.

As the sheets or plates are conveyed forwardly by the belts 7 and 8, buffing rollers 14, which are mounted on shafts 14^a journaled in swinging arms 15, may be raised to engage and mark the underside of the plates if the top face shows an imperfection. The arms 15 are mounted on and are free to pivot about the shaft 9 and are limited in their downward movement by a stop 16 and in their upward movement by a stop 17. The buffing rollers 14 are driven from the shaft 9 by chains 20^a trained over sprockets on the shafts 9 and 14^a, respectively.

The buffing rollers 14 normally rest on the stop 16 by gravity, and when it is desired to mark an imperfect sheet, one or the other or both of the buffing rollers 14 may be elevated into contact with the under surface of

the plate or sheet through the medium of the foot switches 21 which are operated by the assorter or inspector. When either of the switches 21 are operated a circuit is closed from the power lines 200 and 201 through the switch 21, and a resistance 202 and solenoid or magnetic contactor 203, which contactor in turn closes a circuit from the lines 200 and 201 through the solenoid 22. The movement of the solenoid core 24 causes the arms 15 to rotate about the shaft 9, which elevates the roll 14 into contact with the lower face of the sheet or plate being inspected, thus marking the sheet for future inspection.

The plates or sheets pass from the conveyer belts 7 and 8 into a turnover conveyer B which conveys the plates forwardly and turns them over while they are being conveyed without injury or damage to the plates. This operation is for the purpose of exposing the under or unexamined face of the plates to the scrutiny of a second sorter or inspector.

The turnover conveyer comprises housings 29 which support shafts 11, 31, 32 and 33 carrying rollers or pulleys 25, 26, 27 and 28, respectively. The pulleys 25, 26, 27 and 28 are all arranged in the same plane so as to permit a single endless belt 30 to be trained about the four pulleys in such a manner as to provide two adjacent belt surfaces traveling in the same direction and making a 180 degree turn between the pulleys.

The pulley 25 is keyed or otherwise secured to the shaft 11 and is the driving pulley. The other pulleys 26, 27 and 28 are idler pulleys. The belt 30 is trained or wrapped around the pulleys as follows.

Starting at the pulley 25 the belt is passed under the pulley 25, then rearwardly under and over the pulley 26, then passed forwardly and turned 180 degrees and passed under and over the pulley 28, passed rearwardly over and under the pulley 27, passed forwardly and turned 180 degrees, and then passed over the pulley 25 to the point of starting.

From the above it will readily be seen that this arrangement of the belt 30 provides two portions of the same belt moving from points Y to Z, closely adjacent and turning or twisting 180 degrees so that a plate or sheet entering the nip of the adjacent portions of the belt at Y will be tightly held between the adjacent belt surfaces, turned 180 degrees, and delivered to the point Z.

A simple belt conveyer 42 is provided for receiving the turned sheets or plates from the turnover conveyer B and delivering such plates to a vacuum cleaning device (to be described).

Upon emerging from the palm oil bath in the regular tinning operation the sheets or plates are cleaned by means of bran flour. Particles of this flour adhere to the sheets or plates and must be removed. In order to remove the particles of bran flour a vacuum cleaning mechanism is provided consisting of two rotary brushes 34 which are adapted to be rotated at a speed greatly exceeding the speed of the sheets or plates. It is the purpose of the brushes 34 to mechanically dislodge the particles of bran from the sheet surfaces.

The conveyer 42 has its head shaft 42^a provided with a drive-sprocket 42^b which is connected by a chain 35 with a sprocket 35^a on the gear reduction assembly 13^a. The head shaft 42^a of the conveyer 42 is provided with a second sprocket 36^a which is connected to a sprocket 36^b on the lower one of the brushes 34 by a chain 36. The brushes 34 are connected together for rotation by gears 37.

The brushes 34 are enclosed in a sheet metal casing 38 to which are connected suction lines 39 leading to a suction pump 40 which is operated by a motor 41 through a belt drive connection 41^a.

The succession of sheets or plates passed between the cleaning brushes are fed into the nip of a pair of curved feed-out and piling rollers 43 and projected outwardly within the confining guides 45, 46, 47 and 48 so as to form a pile on a normally stationary transverse belt conveyer 44. The lower one of the piling rolls 43 is provided with a sprocket 43^a connected by a chain 43^b with a sprocket 43^c on the lower brush 34.

When a sufficient number of sheets or plates are accumulated on the transverse or cross conveyer 44, the second inspector or assorter stationed at station S causes the cross conveyer belts 44 to advance the pile of sheets to the stop 49 by operating the switch 50 which will energize the motor 51 which is connected to one of the pulleys over which the belts 44 are trained by a chain 51^a trained over sprockets 51^b.

The guide 45 is mounted so as to yield as the pile of plates are moved against it when the conveyer belts 44 are operated.

The switch 50 is a standard two gang structure and is connected so as to oppositely control the circuits to the motors 51 and 13, that is, when the switch 50 is operated to complete the circuit to the motor 51 so as to operate the conveyer belts 44, it simultaneously breaks the circiut to the motor 13 so as to stop the conveyer 42, turnover conveyer B and other mechanism to the rear and thus stop the supply of plates or sheets to the conveyer 44. After the pile of sheets or plates on the conveyer 44 has been moved over against the stop 49 the switch 50 will be reversed to break the circuit to the motor 51 and again complete the circuit to the motor 13.

The inspector or assorter's duty at the station S is to inspect the top face of the sheets

or plates in the piles moved over to his station by the conveyer 44. As the sorter at station S determines the grade of each sheet by inspecting the top exposed surface and giving proper heed to the markings on said sheet made by the buffing rolls 14, he feeds the sheets or plates into the bite of the curved feed-out rollers 52. The upper roller 52 is an idler roller while the lower roller 52 is driven by a motor 53 through a reduction gear 54, sprockets 55 and 57 and a chain 56. The rollers 52 deposit the sheets or plates on a three-way selective conveyer mechanism C.

The conveyer mechanism C comprises a forwardly extending conveyer belt 58 having magnet rollers 59 and 60 extending along each side thereof. The sheets or plates are adapted to be deposited on the conveyer belt 58 with the sides overhanging the magnet rollers 59 and 60, as indicated by the dotted line 61. The belt 58 is supported by rollers 114 which are carried by crank arms 250 pivoted on supporting brackets 251 and carrying steel bars 252 adapted to be attracted by the magnetic rolls 59 and 60, respectively. Stops 253 and 254 are provided for limiting the movement of the crank arms 250. The magnet rollers 59 and 60 are constantly driven in opposite directions by a motor 62, chain drive 63, bevel gears 64 and vertical shaft 65 which is connected to the shaft 58^b of the pulley 58^a by gears 66 and 67. Gears 59^a and 60^a on the shaft 58^b are meshed with gears 59^b and 60^b on the magnet rollers 59 and 60, respectively, and the gears 68^a and 69^a are meshed with gears 68^b and 69^b on the lower ones of curved feed-out rollers 68 and 69. The feed-out rollers 68 and 69 are adapted to receive the sheets fed transversely by the magnet rollers 59 and 60, respectively.

Stops 70 and 71 are provided and arranged to move downwardly by gravity and upwardly by means of the electrical coil 72 secured to a pedestal 73 interwired with the magnet rollers 59 and 60 and controlled by the foot switches M and N which are adapted to energize the magnet rollers 59 and 60 and are operated by the second inspector. Depressing and closing switch M operates a magnetic contactor 302, which sets up a circuit through solenoid switch 72 and the brushes and collector rings 304 and 305, respectively, on the magnetic roll 59, then through the internal winding of the magnetic roll 59 so as to energize the roll. The solenoid 72, being energized by the same circuit, will raise the stops 70 and 71. The operation of the magnetic roll 60 is controlled by the switch N which, when depressed, will operate a magnetic contactor 312 and set up a circuit through solenoid 72 and brushes 314 and collector rings 315 on the magnetic roll 60, thus energizing the roll 60 and raising the stops 70 and 71, the same as when the roll 59 was energized.

In operation, the sheets or plates passed through the roller 52 by the second inspector are deposited on the moving belt 58. If the sheets are perfect they will be permitted to move forwardly on the conveyer 58; however, in the event the sheet or plate is imperfect, that is, what is known in the trade as a "second" or "mender," the inspector will depress one or the other of the foot control switches M or N at the instant the sheet is deposited on the conveyor belt 58, thus completing one of the electrical circuits previously described for the magnetic rolls 59 or 60 and the solenoid 72. As previously stated, energizing the solenoid 72 raises the stops 70 and 71, which arrest the forward movement of the sheet or plate and serve as guides for the sheet or plate as it is moved to one side by the magnetic roller selected.

If the foot control switch M is depressed the steel bar 252 carried by the crank arms 250 supporting the rollers 114 nearest the magnetic roll 59, which is energized by the switch M, will be attracted toward the energized magnetic roll 59 until it moves against a stop 253, thus lowering the rollers 114 supporting that side of the belt 58. This movement allows the side of the belt 58 adjacent the magnetic roll 59 to drop sufficiently to permit the imperfect sheet or plate to come in contact with the magnetic roll, which is constantly rotated to draw the sheet or plate off the belt 58, and feed the sheet into the feed-out rollers 68.

As the foot control switch N is depressed the steel bar 252 carried by the lever supporting the rolls 114 nearest the magnetic roll 60 will be attracted by the magnetic roll 60 and the rollers 114 supported by this crank arm will be lowered, thus permitting the side of the belt 58 nearest the magnet roll 60 to fall or sag, and allowing the imperfect sheet or plate to come into contact with the magnetic roll 60 so as to enable the roll 60, which is continuously rotating, to draw the sheet or plate off the belt 58 and feed it into the feed-out rollers 69.

The switches M and N are standard control switches and therefore are only indicated generally.

A pair of pinch-rollers 74 are provided immediately in advance of the belt conveyer 58 and are adapted to receive the sheets or plates from the conveyer belt 58 and feed them forwardly onto a counting conveyer (to be described).

As each successive sheet or plate is advanced by the rollers 74 it passes over energized disks 79 and 80 and is forced into contact with said disks by idler rollers 81 and 82. The disks 79 and 80 are keyed to shafts 83 and 84, respectively, and are insulated therefrom by insulating sleeves 83^a and 84^a, respectively. The disks 79 and 80 are energized from a suitable source of electric cur-

rent through brushes 85 and 86. The plates passing over the energized rollers 79 and 80 will complete a circuit to a standard electrically operated counter indicated at 80ª.

The shafts 83 and 84 carry suitable pulleys over which endless belts 87 and 88 are trained and which serve to convey the successive sheets over the disks 79 and 80 and into the bite of curved piling rollers 89 which are adapted to feed the sheets or plates forwardly onto a transverse piling conveyer table T. The table T has idler conveyer belts 90—91 and 107—108 thereon adapted to move with the piles of plates when said piles are pushed along the table. Suitable guides 92, 93, 94 and 95 are provided to receive and guide the sheets or plates in a pile as they are projected forwardly by the curved rollers 89.

A motor 96 is connected to and adapted to drive the conveyer shaft 84 through a chain 97 and sprockets 97ª and 97ᵇ. The shaft 84 is connected to and drives the lower curved piling roller by a chain 100 trained over sprockets 98 and 99. The shaft 83 is provided with a sprocket 101 which is connected to a sprocket 102 on the lower one of the pinch-rollers 74 by a chain 103.

The automatic electrically operated counting device is a standard commercial five figure alarm counter, solenoid operated and is adapted to control the circuits to the motors 53, 62 and 96. When the counter reaches a predetermined number an electrical contact will be tripped, breaking the circuit to motors 53, 62 and 96 and making the circuit to the motor 104 which operates a pile pushing conveyor mechanism (to be described). The description of the electrical circuits of the control will be hereinafter set forth in detail.

As the pile of plates or sheets are conveyed along the table T they will engage and operate a standard limit switch 106 which completes a circuit which resets the counting device and thereby again completes the circuit to motors 53, 62 and 96 and breaks the circuit to the motor 104. Thus the operation from the second inspector, which has been temporarily interrupted while the completed pile is moved, is automatically resumed.

When the sheets pass over disks 79 and 80 they close an electric circuit. The distance between the disks 79 and 80 determines the period of time during which the circuit is closed, and it will be understood even though the sheet is in contact with one of these disks the circuit will not be closed until the sheet comes in contact with the other disk. When this circuit is closed solenoid 356 actuates operating lever 357 on the counter 80ª, thus counting the sheet or plate. When a predetermined number of sheets or plates has been reached a lever 358 on the counter 80ª operates and closes the switch 359, which energizes the coils of the magnetic contactors 360 and 361, so as to close said contactors. The operation of the magnetic contactor 361 closes the control circuit to the motor 104, thereby starting this motor. The control circuits to motors 53, 62, 96 and 104 are regular commercial type circuits and will not be further described. The motor 104 drives the table T so as to convey the pile of sheets across the table until the pile strikes the switch 106, which closes the circuit energizing the solenoid 362 operating reset lever 363 on the counter 80ª, thereby resetting the counter and breaking the contact of the switch 359, which, in turn, stops the motor 104 and starts the motors 53, 62 and 96, whereby the cycles are repeated.

The belts 90—91 are supported by a series of idler rollers and together with the guides 92, 93, 94 and 95 form a piling lay-boy into which the successive sheets fall from the curved piling rollers 89. The guide 95 is yieldable in the direction the pile of plates is moved so as not to interfere with the transfer of the pile of plates along the table T.

The belts 107 and 108 are adjacent to and in the same horizontal plane as the belts 90 and 91 and form a storage station where the pile of plates rests after the limit switch 106 has been operated.

The pile pushing mechanism for pushing the piles of plates along the table T comprises a pair of chains 111 trained over sprockets 112 on shafts 110 at each end of the table and having plate engaging fingers 115. The shaft 110 at the forward end of the table is provided with a drive sprocket 109 which is connected to sprocket 109ª on a speed reducing assembly 105 by a chain 109ᵇ. The speed reducing assembly 105 is coupled to and driven by the motor 104.

A platform scale 115ª is provided at the discharge end of the table T and an operator is stationed at this point who moves the piles of plates or sheets along the table from the limit switch 106 and onto the scale where the piles are weighed. The operator will then manually remove the weighed plates and either place them in boxes or pile them as desired.

The scale 115ª is provided with idler conveyer belts 113 to facilitate the movement of the sheets or plates onto the scale.

One scale and operator can readily handle the output from two sets of handling equipment, therefore in practice two lines of handling equipment will preferably be installed, right and left-hand, and both will discharge their piles of inspected plates onto a single scale.

A very material saving in labor and a better grade of tin plate results from handling the tin plate in accordance with the method and with the apparatus of this invention.

Although our invention is described in con-

nection with the making of tin plate, it, as is obvious, is adapted for use in making plates and similar materials.

While we have shown and described certain specific steps in our method and a certain specific apparatus for carrying out our method, it is to be understood that we do not wish to be limited thereto since various modifications may be made without departing from the scope of our invention, as defined in the appended claims.

We claim:

1. A tin plate handling mechanism comprising a vertically movable plate supporting platform adapted to support a pile of plates to be inspected, conveying mechanism for receiving and conveying the plates forwardly as they are manually moved from said pile, and a combined turning and conveying mechanism adapted to receive the plates from said conveying mechanism and to simultaneously feed said plates forwardly while turning said plates 180 degrees, said combined turning and conveying mechanism comprising two pairs of vertically spaced rollers, said pairs of rollers being spaced in the direction of travel of the plates, and a continuous belt trained over said rollers, said belt extending under the lower rollers of said pairs of rollers, over the lower roller of the rear pair of rollers, turned 180 degrees, passed under and over the top one of the forward pair of rollers, passed over and under the top one of the rear pair of rollers, turned 180 degrees, and then passed over the lower one of the forward pair of rollers whereby the two belt portions turned 180 degrees extend parallel with each other and form a twisted path through which the plates are conveyed and turned 180 degrees.

2. A tin plate handling mechanism comprising a vertically movable plate supporting platform adapted to support a pile of plates to be inspected, conveying mechanism for receiving and conveying the plates forwardly as they are manually moved from said pile, a combined turning and conveying mechanism adapted to receive the plates from said conveying mechanism and to simultaneously feed said plates forwardly while turning said plates 180 degrees, said last named mechanism comprising two pairs of vertically spaced rollers, said pairs of rollers being spaced in the direction of travel of the plates, and a continuous belt trained over said rollers, said belt extending under the lower rollers of said pairs of rollers, over the lower roller of the rear pair of rollers, turned 180 degrees, passed under and over the top one of the forward pair of rollers, passed over and under the top one of the rear pair of rollers, turned 180 degrees, and then passed over the lower one of the forward pair of rollers whereby the two belt portions turned 180 degrees extend parallel with each other to form a twisted path through which the plates are conveyed and turned 180 degrees, and power means for operating said conveying mechanism and said combined turning and conveying mechanism.

3. A tin plate handling mechanism comprising a vertically movable plate supporting platform adapted to support a pile of plates to be inspected, conveying mechanism for receiving and conveying the plates forwardly as they are manually moved from said pile after inspection of their top faces, marking mechanism under the control of the inspector adapted to mark the under side of imperfect plates as they pass over said conveying mechanism, a combined turning and conveying mechanism adapted to receive the plates from said conveying mechanism and to simultaneously feed said plates forwardly while turning said plates 180 degrees, said last named mechanism comprising two pairs of vertically spaced rollers, said pairs of rollers being spaced in the direction of travel of the plates, and a continuous belt trained over said rollers, said belt extending under the lower rollers of said pairs of rollers, over the lower roller of the rear pair of rollers, turned 180 degrees, passed under and over the top one of the forward pair of rollers, passed over and under the top one of the rear pair of rollers, turned 180 degrees, and then passed over the lower one of the forward pair of rollers whereby the two belt portions turned 180 degrees extend parallel with each other to form a twisted path through which the plates are conveyed and turned 180 degrees, and power means for operating said conveying mechanism and said combined turning and conveying mechanism.

4. In a tin plate handling mechanism, a combined turning and conveying mechanism comprising two pairs of vertically spaced rollers, said pairs of rollers being spaced in the direction of travel of the plates, and a continuous belt trained over said rollers, said belt extending under the lower rollers of said pairs of rollers, over the lower roller of the lower pair of rollers, turned 180 degrees, passed under and over the top one of the forward pair of rollers, passed over and under the top one of the rear pair of rollers, turned 180 degrees, and then passed over the lower one of the forward pair of rollers, whereby the two belt portions turned 180 degrees extend parallel with each other and form a twisted path through which the plates are conveyed and turned 180 degrees.

5. A tin plate handling mechanism comprising means for supporting a pile of plates to be inspected and a combined turning and conveying mechanism adapted to receive single plates from said pile, said combined turning and conveying mechanism comprising a series of rollers and a single continuous belt

trained about said rollers so as to have two parallel lengths of belt turning at 180 degrees, and forming a twisted path through which the plates are conveyed and turned 180 degrees, and means for operating said combined turning and conveying mechanism.

6. The method of handling and inspecting tin plate which includes assembling plates at an inspection station, inspecting the top faces of the plates, marking the under face of imperfect plates, passing all of the inspected plates to a second inspection station, turning the inspected plates while in transit from the first inspection station to said second inspection station, inspecting said plates at said second inspection station, and piling said plates beyond said second inspection station in accordance with the second inspection and in accordance with the markings made at the first inspection.

7. The method of handling and inspecting tin plates which consists in assembling the plates to be inspected at an inspection station, inspecting the top faces of successive plates, marking the imperfect plates, passing the inspected plates to a second inspection station, and turning said plates 180 degrees while in transit to said second station, then inspecting the turned plates at the second inspection station and finally assorting and piling said plates in accordance with said second inspection and in accordance to the markings made at said first inspection station.

In testimony whereof, we have hereunto set our hands.

ARCHIBALD D. EVANS.
JAMES K. LAMOREE.