Feb. 28, 1939. A. H. HANNON 2,148,552

BARREL PLATING MACHINE

Filed May 12, 1934 11 Sheets-Sheet 1

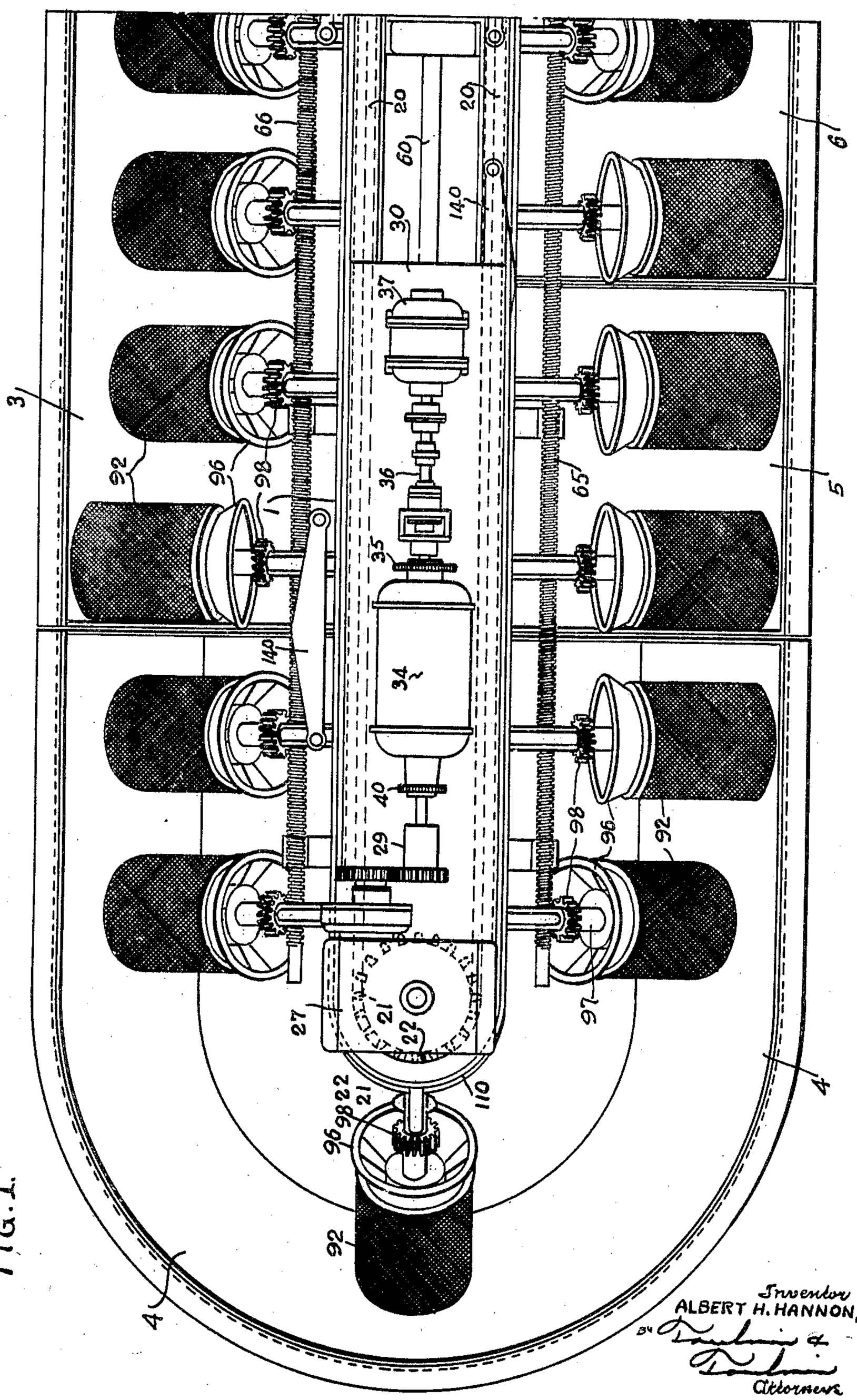

FIG. 1.

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BARREL PLATING MACHINE

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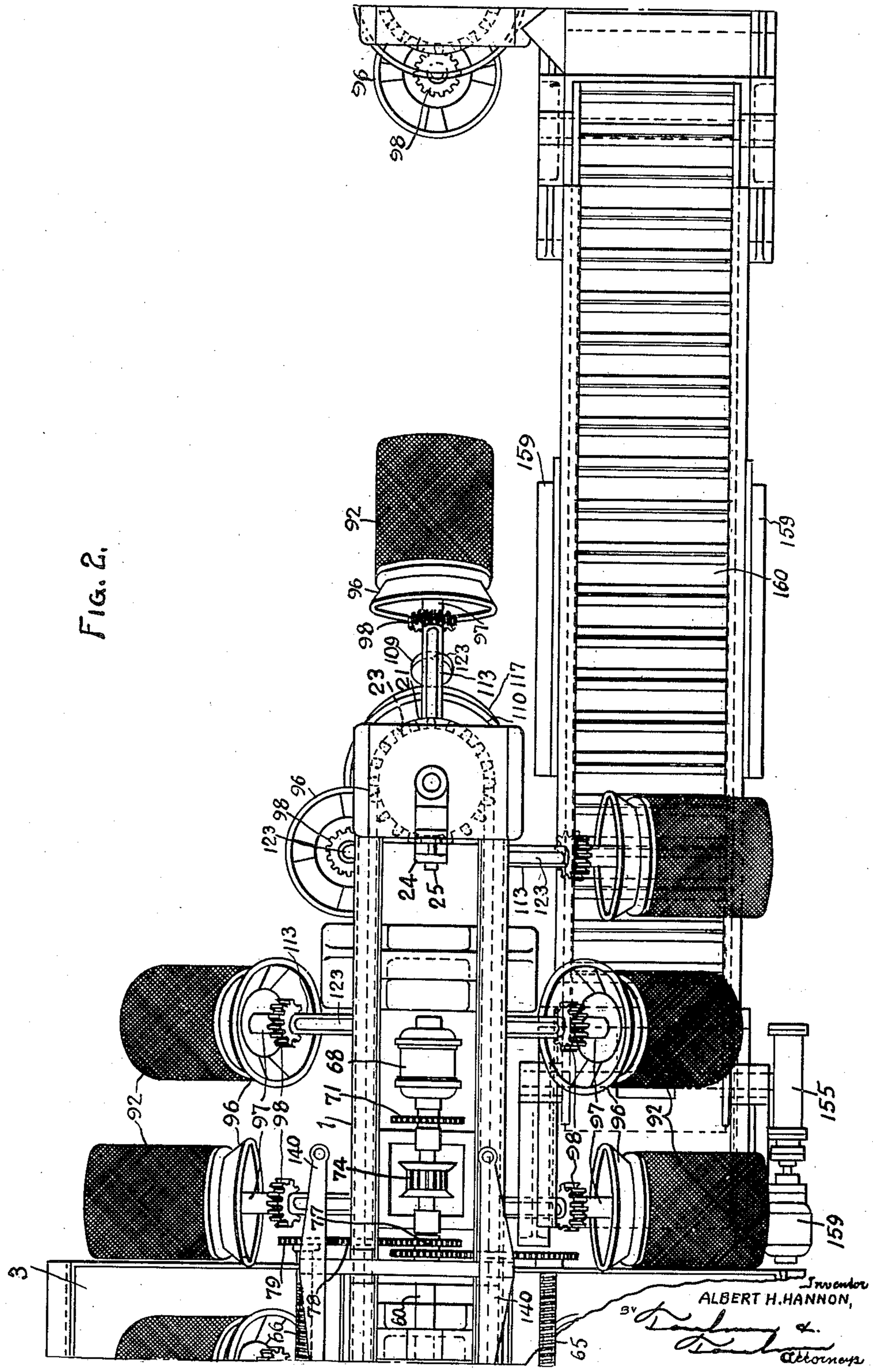
FIG. 2.



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BARREL PLATING MACHINE

Filed May 12, 1934 11 Sheets-Sheet 3

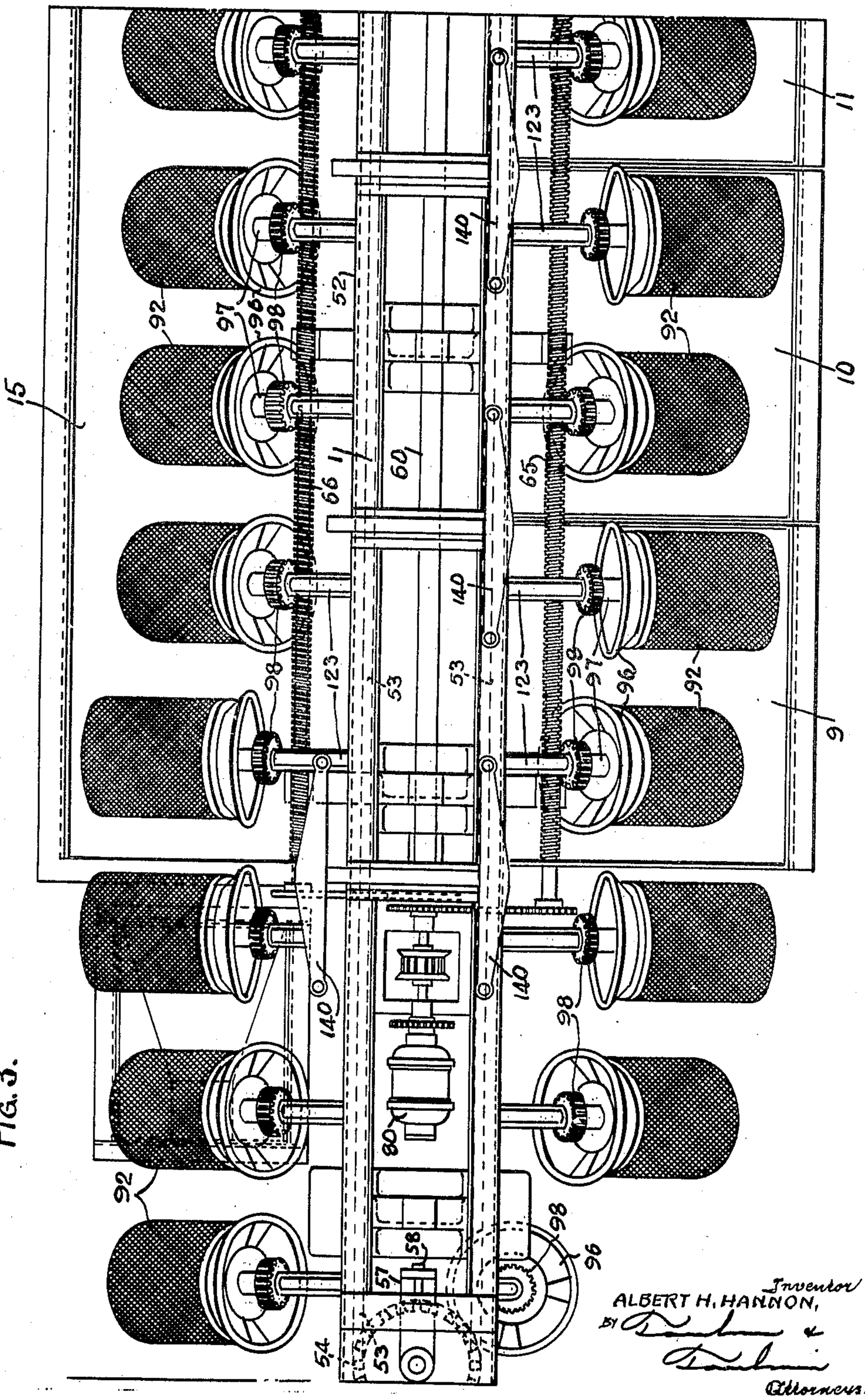

FIG. 3.

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BARREL PLATING MACHINE

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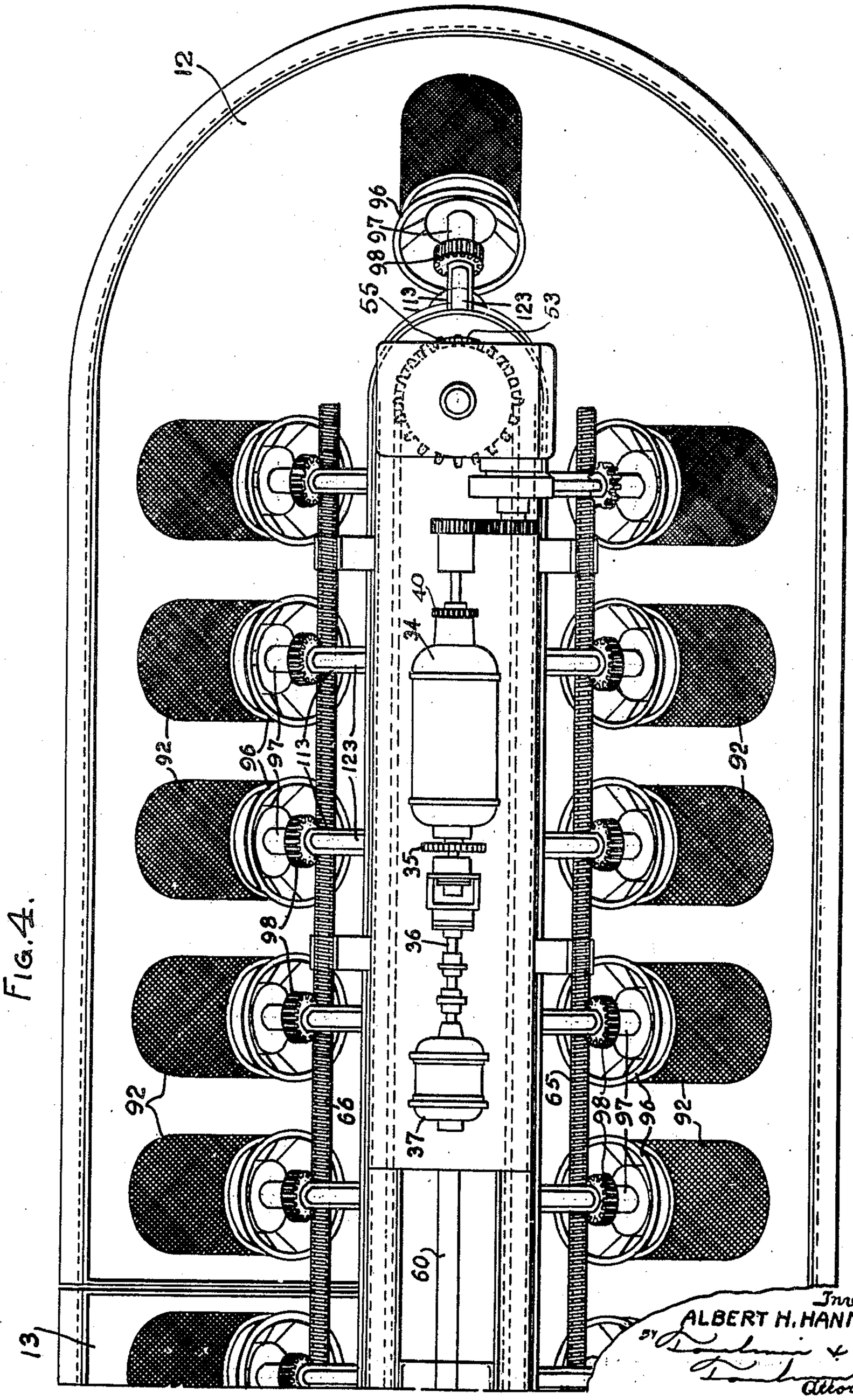

FIG. 4.

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BARREL PLATING MACHINE

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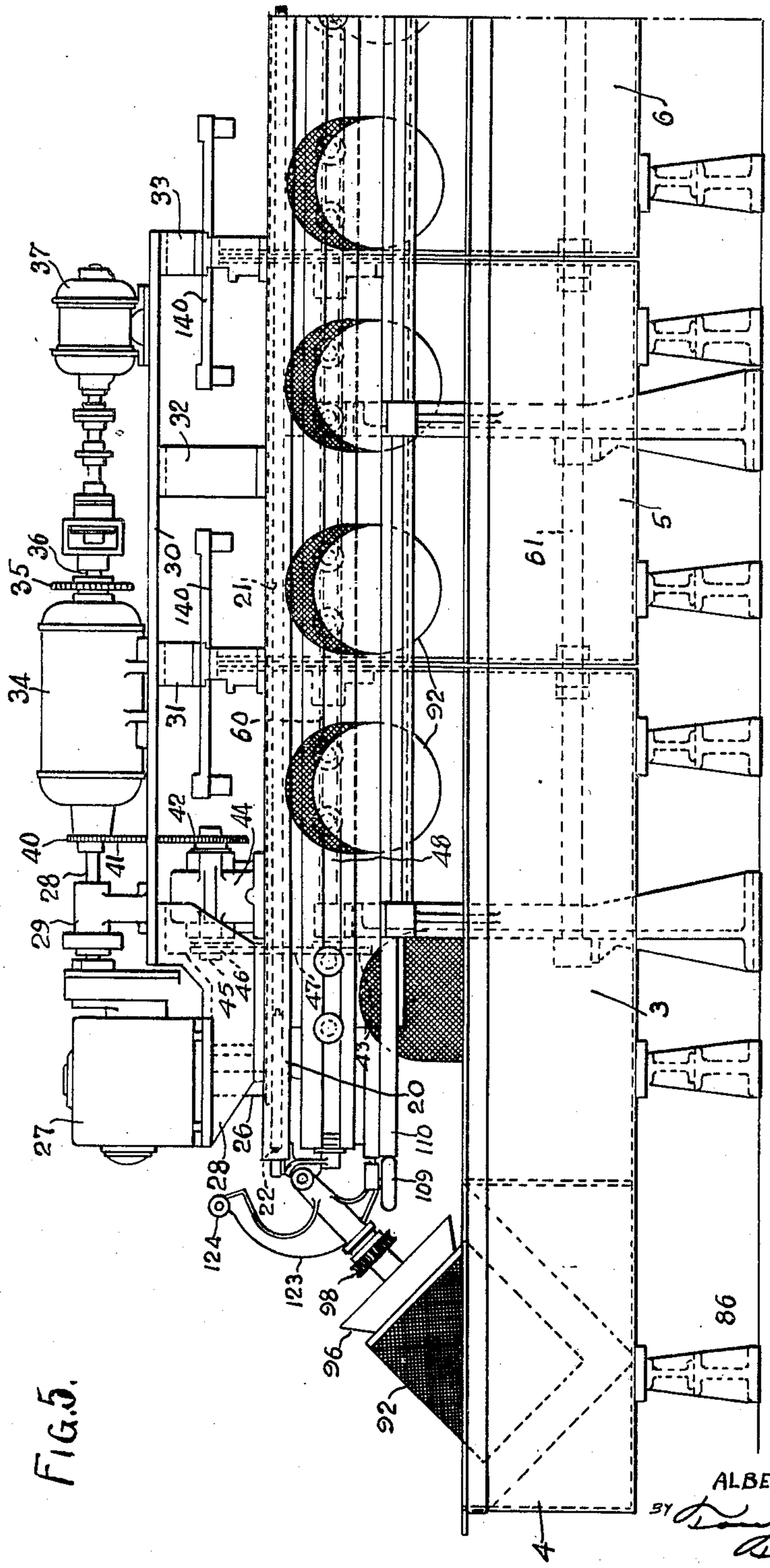

FIG. 5.

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BARREL PLATING MACHINE

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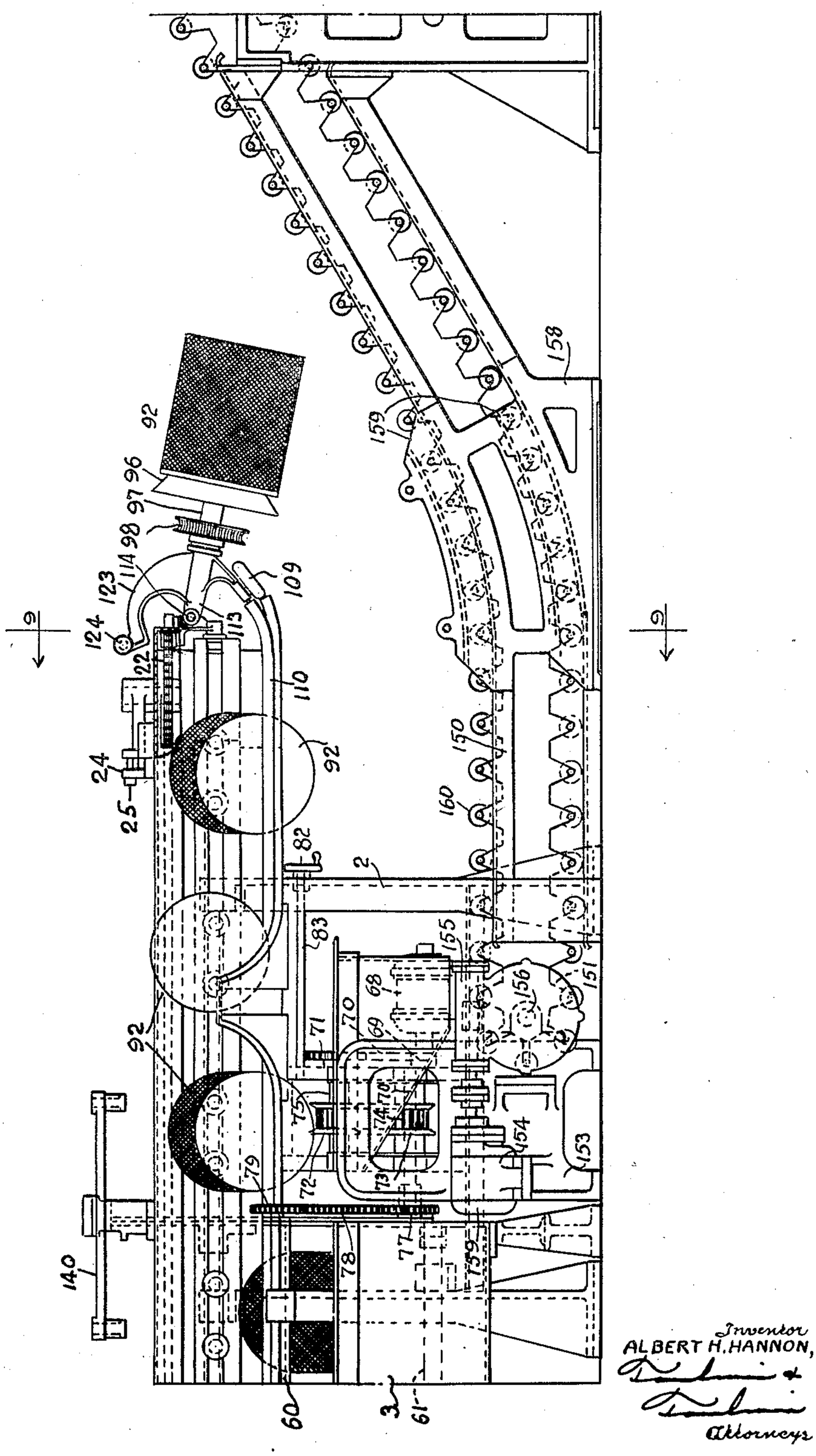

FIG. 6.

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BARREL PLATING MACHINE

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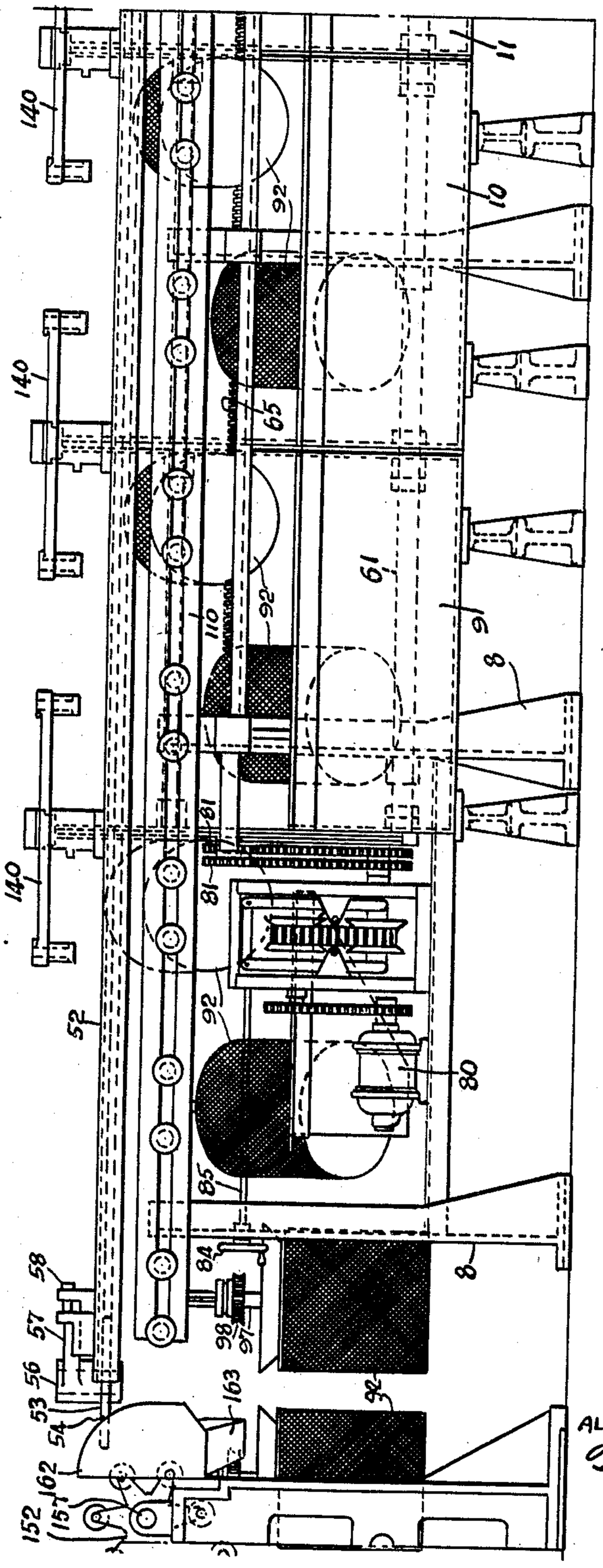

FIG. 7.

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BARREL PLATING MACHINE

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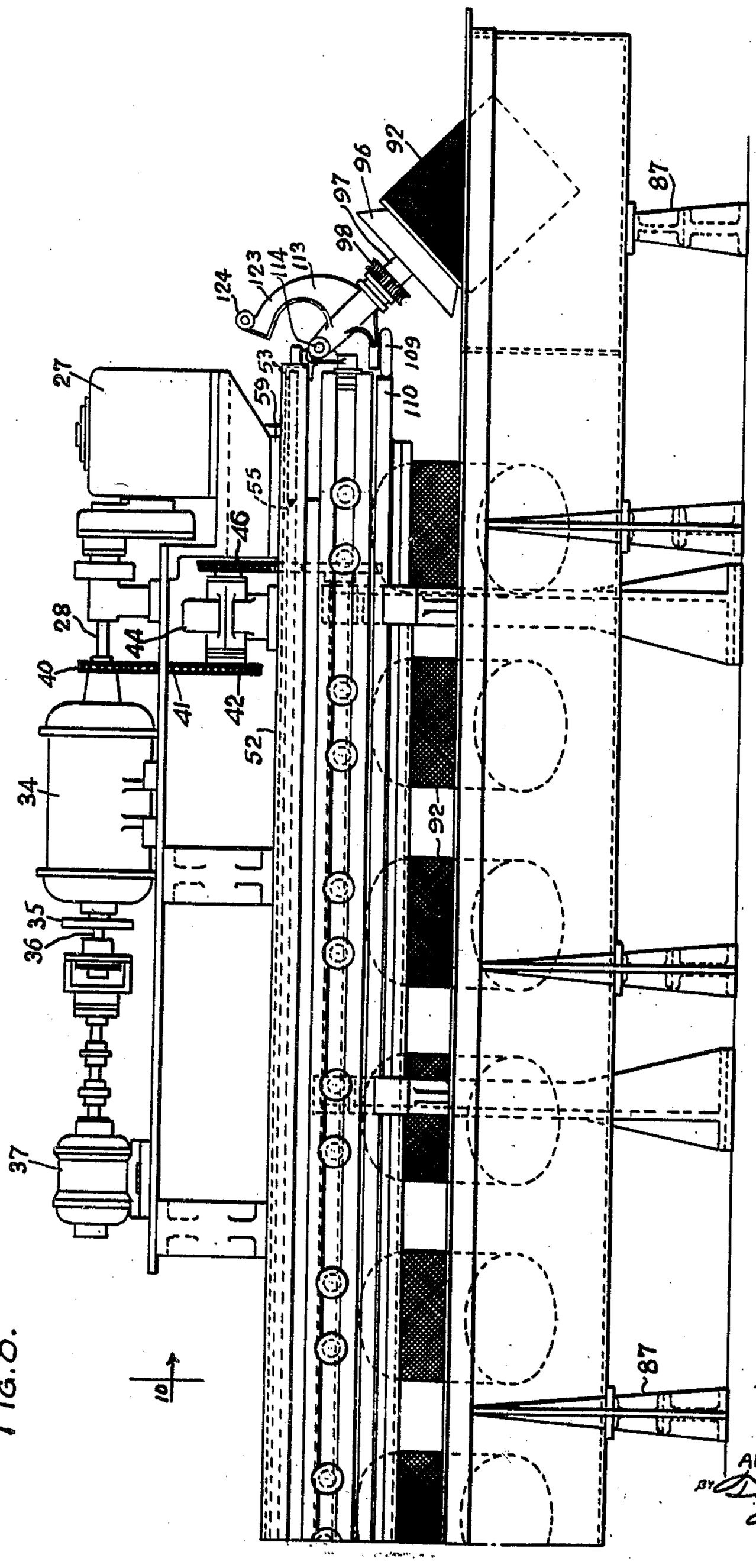

FIG. 8.

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BARREL PLATING MACHINE

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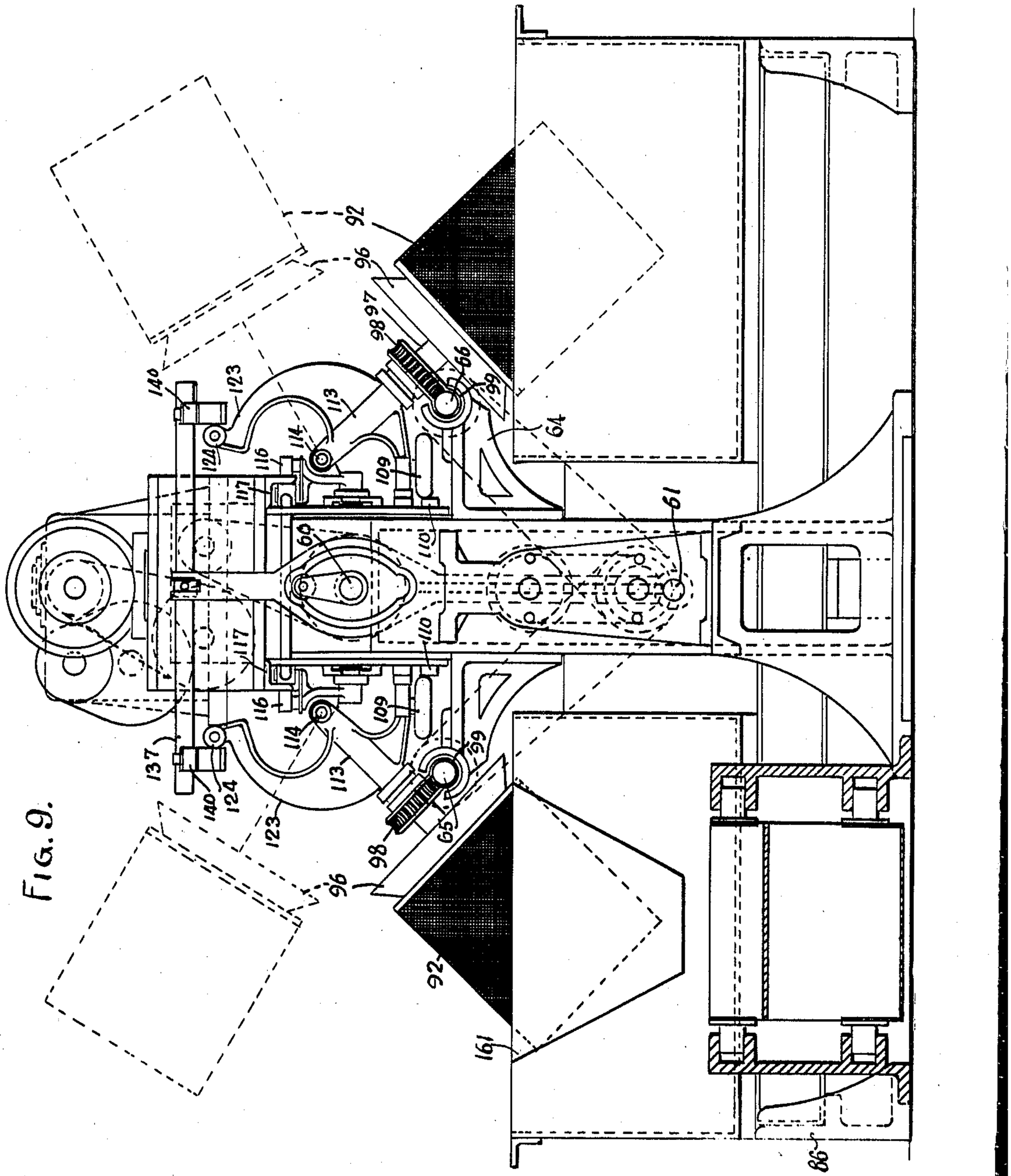

FIG. 9.

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BARREL PLATING MACHINE

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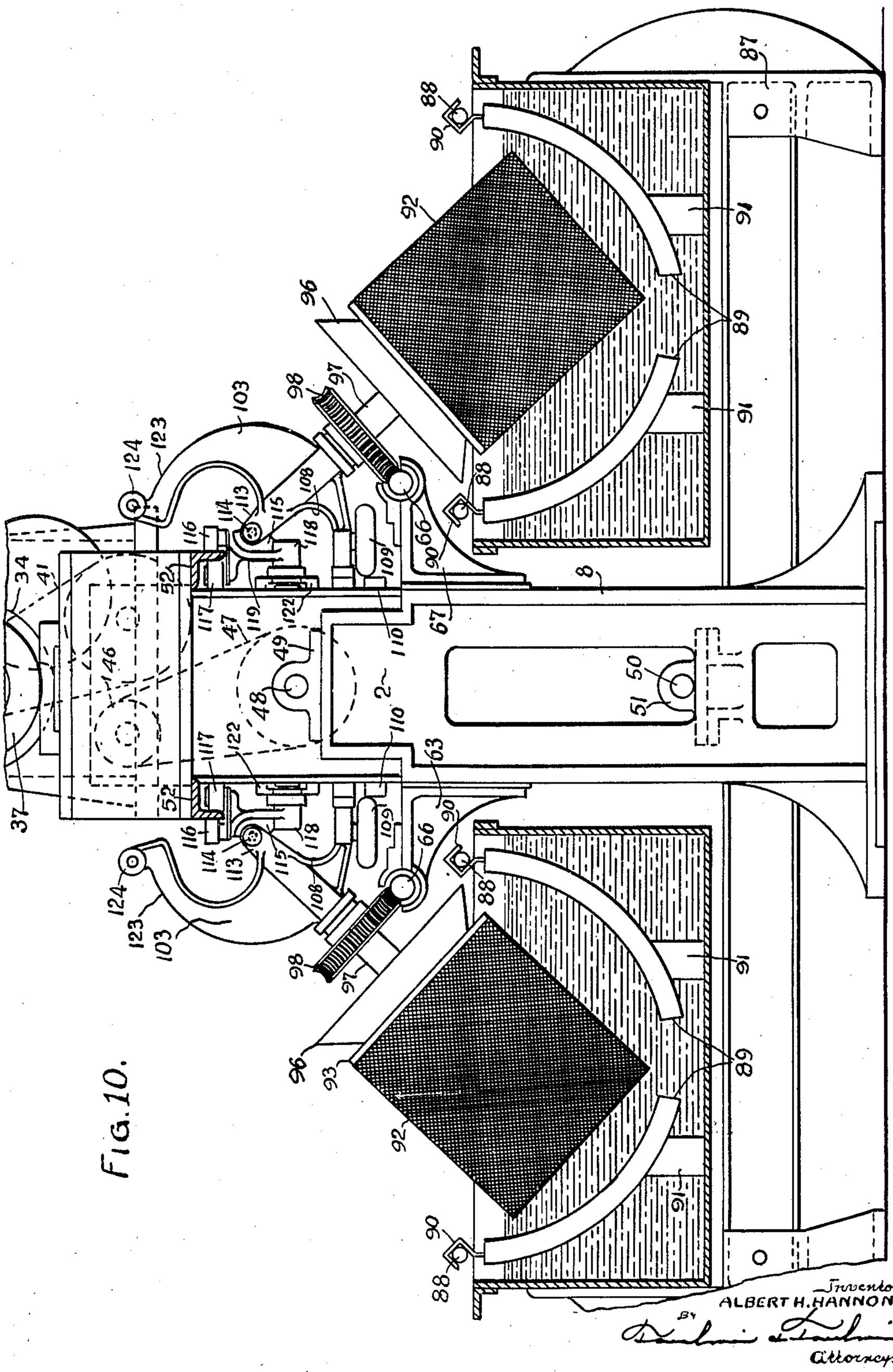

FIG. 10.

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BARREL PLATING MACHINE

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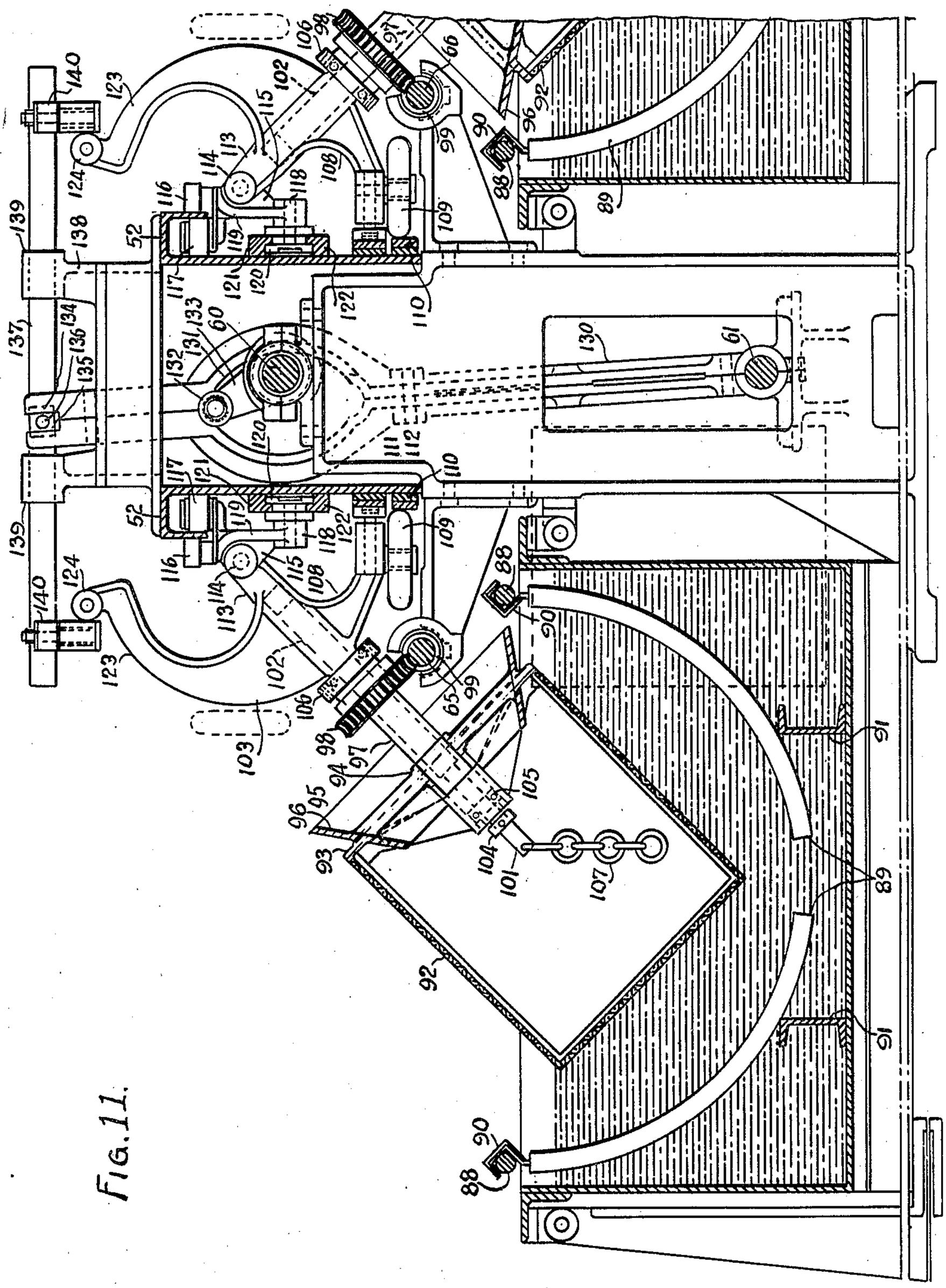

FIG. 11.

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Patented Feb. 28, 1939 2,148,552

UNITED STATES PATENT OFFICE

2,148,552

BARREL PLATING MACHINE

Albert H. Hannon, Springfield, Ohio

Application May 12, 1934, Serial No. 725,380

24 Claims. (Cl. 204—5)

This invention relates to electroplating apparatus and, in particular, to electroplating and electro-cleaning machines which move the article continuously through the various solutions while treating it.

One object of my invention is to provide plating apparatus including a cleaning section, a plating section, and devices for transferring the work from the cleaning section to the plating section.

Another object is to provide electroplating apparatus wherein the articles to be plated are carried through the various solutions within perforated drums, these drums being simultaneously rotated, moved horizontally through the solutions, and transferred vertically over the partitions or barriers between the tanks containing the various solutions.

Another object is to provide electroplating apparatus having a work holder of perforated drum-like form and associated with devices for causing it to occupy successively a vertical position for loading, a downwardly oblique position for immersing in the solutions, a horizontal position for passing over the partitions between the various solution tanks, and an upwardly oblique position for unloading.

Another object is to provide a container of drum-like form, which is pivotally mounted and associated with means for raising and lowering it so as to transfer it from one tank to another over the partition therebetween.

Another object is to provide electroplating apparatus wherein the machine is provided with a shaft running longitudinally through the machine, and transfer devices operated from this longitudinal shaft, these transfer devices being adapted to transfer the containers from tank to tank over the barriers therebetween.

Another object is to provide a container which is adapted to receive its contents when placed in a vertical position, and discharge its contents when caused to assume an upwardly oblique position.

Another object is to provide electroplating apparatus having a cleaning section and a plating section, together with drum-like containers movable through the various tanks of each section, and means for partially inverting the containers as they arrive over a moving conveyor, which serves to carry the articles thus cleaned upwardly to a position where they are dropped into other containers passing thereunder and associated with the plating section of the apparatus.

In the drawings:

Figure 1 is a plan view of the lefthand end of the electroplating apparatus of my invention, showing a portion of the cleaning section thereof.

Figure 2 is a plan view of the remaining portion of the cleaning section shown in Figure 1, together with the conveying devices for carrying the cleaned work articles to the plating section.

Figure 3 is a plan view, continuing from Figure 2, of the lefthand end of the plating section of the apparatus, beginning at the upper end of the conveyor.

Figure 4 is a plan view of the righthand end of the plating section of the machine, a portion thereof being broken away in the middle between the portions shown in Figures 3 and 4.

Figure 5 is a side elevation of the portion of the apparatus shown in Figure 1.

Figure 6 is a side elevation of the portion of the apparatus shown in Figure 2.

Figure 7 is a side elevation of the portion of the apparatus shown in Figure 3.

Figure 8 is a side elevation of the portion of the apparatus shown in Figure 4.

Figure 9 is a transverse vertical section, taken along the line 9—9 in Figure 6.

Figure 10 is a transverse vertical section taken along the line 10—10 of Figure 8.

Figure 11 is an enlarged view, partly in section, showing details of the containers and the associated mechanism for transferring them from tank to tank over the partitions therebetween.

The apparatus generally described comprises the sections shown in Figures 1, 2, 3, and 4, placed end to end in the order named. The mid-portion of the section between Figures 3 and 4 has been removed because of its excessive length and similarity to the remainder of that section. The apparatus includes a cleaning section for cleaning the articles prior to their being plated (Figs. 1 and 2); a conveying section for carrying the cleaned articles from the cleaning section to the plating section of the apparatus (Figure 2); and a plating section, comprising a series of tanks through which the articles are moved, while in the drum-like containers, and subjected to the electroplating action.

Frame and tank construction

The cleaning section of the machine (Figures 1 and 2) is provided with a frame, generally designated 1, and preferably consisting of structural steel members of channel or similar cross section. This frame is provided with vertical stanchions 2, which support it and elevate it from the floor. The cleaning section of the apparatus further in-

cludes the rectangular tanks 3, 5 and 6, on opposite sides of the frame 1, and having the U-shaped tank 4 with the ends of its arms adjoining them (Figure 1). The tank 3 is intended to contain a hot alkaline solution, the tank 4 an acid solution, the tank 5 a cold water rinsing bath, and the tank 6 a mild alkaline solution.

The plating section of the apparatus has a similar frame, generally designated 7, which in turn is mounted upon the vertical stanchions 8 which elevate it from the floor in the manner similar to that of the cleaning section (Figures 3 and 4). The plating section is likewise similarly provided with rectangular tanks 9, 10, 11, 13, 14, and 15, disposed on opposite sides of the frame 7. The plating section of the apparatus likewise contains a U-shaped tank 12, the ends of whose arms adjoin the ends of the oppositely-disposed rectangular tanks 11 and 13.

The tank 9 is preferably rubber-lined, and contains a mild acid solution, the tanks 10 and 11 contain cold water rinsing baths, the tank 12 contains the electro-plating solution, the tanks 13 and 14 contain cold water rinsing baths, and the tank 15 contains drying devices for drying the articles while they are yet in the containers. The tank 14 is identical in construction with the tank 13, and occupies a position between the tank 13 and the tank 15, but is omitted by reason of lack of space.

The various tanks of the cleaning section are supported and elevated above the floor by the frame members 86, whereas those of the plating section are similarly supported upon the frame members 87. The tanks of the plating section are provided with longitudinally disposed rods 88 (Figures 10 and 11), supported above the tanks and serving for the suspension of anode bars 89 through the hook portions 90 thereon. The anode bars 89 are curved and their lower extremities rest upon the supporting members 91 within the tanks.

Carrier and driving mechanism

The carrier and driving mechanism for the cleaning section of the apparatus is similar to that of the plating section. The frame 1 (Figures 5 and 10) is provided with longitudinal channel members 20, through which passes the driving chain 21. The latter is supported upon the sprockets 22 and 23 arranged at opposite ends of its run. The sprocket 23 is an idler sprocket and is mounted upon the bracket 24 having the adjustment screw 25, by which the chain 21 may be tightened.

The sprocket 22 is fixed to the vertical shaft 26, which passes upwardly into the reduction gear case 27, mounted upon the cross bracket 28. The reduction gear case 27 contains reduction gearing whereby the speed given the sprocket 21 is greatly reduced from that of the power source.

On the opposite side of the reduction gear casing 27, the shaft 28 emerges therefrom and is supported by the shaft hanger 29, mounted upon the bed frame 30, which in turn is supported upon the cross bracket 28 and upon other cross brackets 31, 32, and 33 respectively.

The shaft 28, at its opposite end, passes into the change-speed gear box 34, having the adjusting wheel 35. Beyond the adjusting wheel 35, the shaft 36 continues through various couplings to the driving motor 37. The change-speed gear box 34 and the driving motor 37 are likewise mounted upon the bed plate 30. By turning the adjusting wheel 35, the shaft 28 may be given different rates of rotation, as compared with the shaft 36 coming from the motor 37. In this manner the sprocket 22 and the sprocket chain 21 may be adjusted to have any desirable speed.

The shaft 28 is likewise provided with a sprocket 40, which communicates power through the sprocket chain 41 (Figure 5) to the sprocket 42 of the gear box 44. On the opposite side thereof, the shaft 45 carries the sprocket 46, which drives the sprocket chain 47. The latter drives the sprocket 43, secured to the main transfer drive shaft 48 (Figures 5 and 10). The shaft 48 is supported in the pillow blocks 49, mounted upon the stanchions 2.

Arranged parallel to the shaft 48 and placed below it is the shaft 50, which likewise passes longitudinally through the apparatus. The shaft 50 is supported upon the pillow blocks 51, likewise secured to the stanchions 2 (Figures 5 and 10). The mechanism beyond these shafts and driven by them will be described later in detail.

The plating section of the apparatus is provided with similar channel members 52 (Figures 7 and 11), which serve to guide a sprocket chain 53, supported upon the sprockets 54 and 55 (Figures 7 and 8) at opposite ends of the run thereof. The sprocket 54 is mounted to rotate loosely upon the stub shaft 56 mounted in the bracket 57 (Figure 7), which in turn is adjustable by means of the adjusting screw 58, in order to take up slackness in the sprocket chain 53. The sprocket 55 is mounted upon the vertical shaft 59, which passes into and is driven by similar mechanism to that of the cleaner section, previously described: similar numerals are accordingly employed for this mechanism in both sections, and a single description suffices for both. The main drive shaft 60 of the plating section of the apparatus is thus driven in a similar manner to the main shaft 48 of the cleaning section. In a similar manner the shaft 61 below and parallel to the shaft 60 is supported, as previously described for the shaft 50.

The cleaning section of the machine is additionally provided with a pair of longitudinal shafts 62 and 63, rotatably supported on the brackets 64, attached to the stanchions 2 (Figure 9); and the plating section of the machine has similar shafts 65 and 66 rotatably supported upon the brackets 67 attached to the stanchions 8. The shafts 62 and 63 of the cleaning section are driven by the motor 68 (Figure 6) through the intermediate mechanism comprising the sprocket 69, the sprocket chain 70, the sprocket 71, the variable speed driving pulleys 72 and 73 joined by their belt 74 between their respective shafts 75 and 76; the sprockets 77, the sprocket chains 78, and the sprockets 79 mounted upon the shafts 62 and 63. Similarly the sprockets 81 on the shafts 65 and 66 of the plating section of the machine are driven from the motor 80 (Figure 7) through similar mechanism, consisting of similar parts bearing similar reference numerals to those of the driving unit for the cleaning section, just described. The variable speed drive 72 to 74 of the cleaning section is adjusted by means of the hand wheel 82, mounted upon the shaft 83 (Figure 6), whereas that of the plating section is adjusted by the hand wheel 84 mounted upon the shaft 85 (Figure 7).

Containers and transfer mechanism for lifting the containers from tank to tank

The work pieces to be plated are carried in perforated containers 92, which are drum or barrel-shaped. These are secured to the container heads

93, which in turn are joined to the sleeve 94 by the spider members 95 (Figure 11). The container head 93 is provided with a conically flared portion 96, which serves as a funnel to direct the work pieces into the container during the loading operation.

The sleeves 94 of the containers 92 are mounted upon hollow shafts 97, which carry the worm gears 98, meshing with the worms 99 upon the shafts 65 and 66, previously described. The containers for the cleaning section of the machine are similarly driven from the worms 100 (Figure 9), mounted upon the shafts 62 and 63, previously described.

The hollow shaft 97 rotates upon the fixed shaft 101, which is secured in the socket 102 of the bracket 103 (Figure 11). The lower end of the shaft 101 is provided with the lock collar 104. The ball bearings 105 and 106 provide free rotation for the containers 92 upon the shafts 101. Passage of electricity through the shaft 101 to the work articles is insured and assisted by the flexible chain-like member 107.

The bracket 103 is provided with a downwardly extending arm 108, which carries the roller rotors 109, making contact with the rail 110 (Figure 11); and also carries the slider 111, which slidingly engages the cathode rail 112. In this way the electricity is conducted from the cathode rail 112 through the bracket 108 and the shaft 101 to the work pieces in the container 92 by way of the chain 107.

The arm 113 of the bracket 103 is provided with the pivotal connection 114, by which it is pivotally mounted upon the base 115. The latter upon its upper portion carries the rollers 116 and 117, which engage the outer and inner surfaces respectively of the channel members 52. The lower portion of the base 115 is provided with the stub shaft 118, which carries the collars 119 and 120, which engage the outer and inner flanges respectively of the upper and lower guide rails 121 and 122 (Figures 7 and 11). The upwardly extending arm 123 of the bracket 103 is provided with the roller 124, which is adapted to engage the transfer mechanism, which will now be described.

The transfer mechanism for lifting the containers 92 over the partitions between the various tanks consists of an assembly of parts, one assembly being mounted adjacent to each partition or end wall of the tanks. This transfer assembly consists of a vertical arm 130 which is pivotally mounted upon the shaft 61 (Figure 11), and in this manner is adapted to swing to and fro like an inverted pendulum. The mid-portion of the vertical arm 130 is provided with an elliptical opening 131, which is engaged by a cam follower 132 mounted upon the crank 133, whose opposite end is secured to the shaft 60. The upper end of each vertical arm 130 is provided with a slotted portion 134, which engages a stud 135, mounted upon the pin 136. The latter is secured in the transverse horizontal shaft 137, which is mounted in the shaft hanger 138 having the bearing portions 139, through which the shaft 137 slidably passes. The outer ends of each shaft 137 are provided with cross bars 140, secured thereto, each end of the cross bars 140 (Figures 3 and 11) being adapted to engage the rollers 124 on the brackets 103 of the containers 92.

Consequently, when the shaft 60 is rotated, the vertical arm 130 oscillates like a pendulum, reciprocating the horizontal shafts 137 and moving the cross bars 140 transversely. The rotation is synchronized so that the cross bars start moving at the exact instant that the containers 92 arrive at the various partitions between the tanks, or at the end walls of the tanks. The reciprocation of the shaft 137 and consequently the height to which the container 92 will be raised around its pivot 114, will be regulated by the amount of reciprocation given to the shaft 137, and this in turn is regulated by the throw of the crank 133.

The container bracket bases 115 are attached to the sprocket chains 21 or 53, depending upon whether they are mounted upon the cleaning section or the plating section of the apparatus. The horizontal orbital motion of the sprocket chains carries the containers horizontally through the tanks, while being simultaneously rotated around their shafts 101 and lifted over the partitions between the tanks by the transfer mechanism, just described. The rotating of the containers 92 gives a tumbling action to the work pieces and also insures their being completely plated upon all sides. Contact with the cathode rail 112 is broken when the transfer mechanism lifts the container 92 out of the tanks.

Depending upon the adjustment of the transfer mechanism, the containers 92 are adapted to occupy any one of the four positions, namely, the loading, immersing, transfer and unloading positions. In the loading position, the axis of the shaft 101 is vertical and the funnel-shaped mouth 96 of the container head 93 is ready to receive articles dumped therein, as shown in the center of Figure 2. In the immersing position, the container head is still upward, but the shaft 101 is in an oblique position. In the transfer position, while passing over the partitions or ends of the tanks, the shaft 101 is still oblique, but in a more nearly horizontal position. In the unloading position, the shaft 101 is raised to an oblique position above the horizontal level, so that the mouth 96 of the container head 93 is directed downward, and so that the contents of the containers 92 may be discharged therethrough. The various positions of the containers 92 are shown in Figure 9.

Conveying mechanism between cleaning and plating sections of apparatus

In order to carry the cleaned work pieces to the plating section of the machine, conveying apparatus is provided. This consists of an endless conveyor 150, arranged to travel in an orbital path and supported at its opposite ends upon the rotatable drums 151 and 152 respectively (Figures 6 and 7). The drum 151 is mounted upon the frame member 153 and is rotated by the motor 154 through the worm gearing 155. The drum 152 rotates loosely around the shaft 157, whereas the drum 151 is fixed to the shaft 156. The mid-portion of the conveyor 150 is guided from a horizontal to an upwardly inclined direction by the frame member 158, having the arcuate portions 159 for accomplishing this object. The conveyor 150 is provided with rollers 160, which engage the arcuate portions 159 and assist in this change of direction.

Adjacent to the drum 151 is a conical funnel 161, having its mouth open upward (Figure 9) and arranged to discharge its contents on to the conveyor 150. Adjacent to the drumb 152 is a hopper 162, having a spout 163, projecting downwardly so as to discharge the contents of the hopper into the containers 92.

Thus when the containers 92 holding the cleaned articles arrive above the funnel 161, the transfer mechanism tilts the container into the un-

loading position so that it discharges its contents downward through the funnel 161 on to the conveyor 150. The latter carries the work pieces upward until these arrive at the drum 152, when they are dumped into the hopper 162 and pass downwardly into the containers 92, the latter being in the loading position as they pass beneath the spout 163.

Operation

The operation of the apparatus has been already indicated, while the various parts were being described. The work articles are loaded into the containers 92 at the loading station immediately above the sprocket 23 in Figure 2. The transfer mechanism then carries each loaded container over the partition and immerses it in the hot alkali bath of the tank 3. The containers rotate and move longitudinally through this bath, while all grease is thereby dissolved from the surfaces of the work pieces. The transfer mechanism then carries the containers 92 over the end of the hot alkali tank 3 and into the acid tank 4, where the surfaces of the work pieces are thoroughly cleaned and pickled by the action of the acid. This acid imparts a roughened surface to the work article which assists in the retention of the plated deposit. On arriving at the end of the acid tank 4, the containers 92 are lifted over the partitions and immersed successively into the cold water rinsing tank 5 and the mild alkali tank 6, the latter being intended to neutralize any acid remaining upon the work pieces. The containers 92 then pass over the opposite end of the mild alkali tank 6 and are swung upward into the unloading position (Figures 2 and 9), dumping their contents into the funnel 161, and thence on to the conveyor 150.

The work pieces move upward on the conveyor 150 and are discharged into the hopper 162 and through the spout 163 into the containers 92 of the plating section of the apparatus (Figures 3 and 10). These move over the end wall into the mild acid tank 9 by the aid of the transfer mechanism, where the surfaces of the work pieces are reactivated immediately prior to their being plated. Any trace of oxide remaining upon the surfaces is thereby removed. The tank 9 is preferably lined with rubber.

Passing over the partition, the articles in the containers 92 are then immersed in the cold water rinsing tanks 10 and 11, whereupon they pass into the plating tank 12. Here they are subjected to the action of the electroplating current and solution, as they pass in an orbital path through this tank. Beyond the plating tank 12, the containers 92 are lifted over the various partitions and immersed in the cold water rinsing tanks 13 and 14 (Figures 4 and 12), and thence pass though the drying chamber 15, where the moisture on the articles is removed. After passing out of the drying chamber, the containers 92 are lifted upward into the unloading position (Figure 3) and discharge the now-plated articles into any suitable carriers, such as trucks or tote boxes.

It will be understood that I desire to comprehend within my invention such modifications as may be necessary to adapt it to varying conditions and uses.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In combination, tanks for cleaning fluids, containers for holding articles to be cleaned, means for moving said cleaning containers through said tanks, containers for holding articles to be plated, a moving conveyor for carrying said cleaned articles to said plating containers, means automatically responsive to the arrival of said cleaning containers at said conveyor for unloading said containers and depositing said articles upon said conveyor, means for receiving and guiding said cleaned articles from said conveyor into said plating containers, tanks for holding plating fluids, and means for moving said plating containers through said plating fluid tanks.

2. In combination, tanks for cleaning fluids, containers for holding articles to be cleaned, means for moving said cleaning containers through said tanks, containers for holding articles to be plated, a moving conveyor means for carrying said cleaned articles to said plating containers, means automatically responsive to the arrival of said cleaning containers at said conveyor for unloading said containers and depositing said articles upon said conveyor, means for receiving and guiding said cleaned articles from said conveyor into said plating containers, tanks for holding plating fluids, means for moving said plating containers through said plating fluid tanks, and means for rotating said cleaning containers and said plating containers during said motion through said tanks.

3. In combination, tanks for cleaning fluids, containers for holding articles to be cleaned, means for moving said cleaning containers through said tanks, containers for holding articles to be plated, a moving conveyor means for carrying said cleaned articles to said plating containers, means automatically responsive to the arrival of said cleaning containers at said conveyor for unloading said containers and depositing said articles upon said conveyor, means for receiving and guiding said cleaned articles from said conveyor into said plating containers, tanks for holding plating fluids, means for moving said plating containers through said plating fluid tanks, means for rotating said cleaning containers and said plating containers during said motion through said tanks and means for lifting said containers over the walls between said tanks.

4. In combination, tanks for cleaning fluids, containers for holding articles to be cleaned, means for moving said cleaning containers through said tanks, containers for holding articles to be plated, a moving conveyor means for carrying said cleaned articles to said plating containers, means automatically responsive to the arrival of said cleaning containers at said conveyor for unloading said containers and depositing said articles upon said conveyor, means for receiving and guiding said cleaned articles from said conveyor into said plating containers, tanks for holding plating fluids, means for moving said plating containers through said plating fluid tanks, means for rotating said cleaning containers and said plating containers during said motion through said tanks and means for lifting said containers over the walls between said tanks, and means automatically responsive to the arrival of said plating containers at said conveyor for presenting said containers in a loading position for receiving the cleaned articles from said conveyor.

5. In combination, tanks for cleaning fluids, containers for holding articles to be cleaned, means for moving said cleaning containers through said tanks, containers for holding articles to be plated, a moving conveyor means for carry-

ing said cleaned articles to said plating containers, means automatically responsive to the arrival of said cleaning containers at said conveyor for inverting said containers to deposit the articles on said conveyor, means for receiving and guiding said cleaned articles from said conveyor into said plating containers, tanks for holding plating fluids, means for moving said plating containers through said plating fluid tanks, means for rotating said cleaning containers and said plating containers during said motion through said tanks and means for lifting said containers over the walls between said tanks.

6. In combination, tanks for cleaning fluids, containers for holding articles to be cleaned, means for moving said cleaning containers through said tanks, containers for holding articles to be plated, a moving conveyor means for carrying said cleaned articles to said plating containers, means automatically responsive to the arrival of said cleaning containers at said conveyor for inverting said containers to deposit the articles on said conveyor, means for receiving and guiding said cleaned articles from said conveyor into said plating containers, tanks for holding plating fluids, means for moving said plating containers through said plating fluid tanks, means for rotating said cleaning containers and said plating containers during said motion through said tanks and means for lifting said containers over the walls between said tanks, and means automatically responsive to the arrival of said plating containers at said conveyor for presenting said containers in a loading position for receiving the cleaned articles from said conveyor.

7. Apparatus for electrolytically treating articles comprising a tank, a container, means for moving said container through said tank, means for lifting said container over the walls of said tank, means for rotating said container; said lifting means including mechanism for moving said container into a vertical position for loading, a downwardly inclined position for immersing in said tank, a more nearly horizontal position for passing over the walls of said tank, and an upwardly inclined position for unloading.

8. Apparatus for electrolytically treating articles comprising a tank, a container, means for moving said container through said tank, means for lifting said container over the walls of said tank, means for rotating said container; said lifting means including mechanism for moving said container into a vertical position for loading, into a downwardly inclined position for immersing in said tank, into a more nearly horizontal position for passing over the walls of said tank, and into an upwardly inclined position for unloading, said moving means for said container comprising an endless flexible member moving in an orbital path.

9. Apparatus for electrolytically treating articles comprising a tank, a container, means for moving said container through said tank, means for lifting said container over the walls of said tank, means for rotating said container; said lifting means including mechanism for moving said container into a vertical position for loading, into a downwardly inclined position for immersing in said tank, into a more nearly horizontal position for passing over the walls of said tank, and into an upwardly inclined position for unloading, and a power source, said rotating means for said container comprising a power connection operative to connect said container to said power source while said container is in a downwardly inclined position.

10. Apparatus for electrolytically treating articles comprising a tank, a container, means for moving said container through said tank, means for lifting said container over the walls of said tank, means for rotating said container; said lifting means including mechanism for moving said container into a vertical position for loading, into a downwardly inclined position for immersing in said tank, into a more nearly horizontal position for passing over the walls of said tank, and into an upwardly inclined position for unloading, and a power source, said rotating means for said container comprising a power connection operative to connect said container to said power source while said container is in a downwardly inclined position and to disconnect said container therefrom while in an upwardly raised position.

11. Apparatus for electrolytically treating articles comprising a tank, a container, means for moving said container through said tank, means for lifting said container over the walls of said tank, means for rotating said container; said lifting means including mechanism for moving said container into a vertical position for loading, into a downwardly inclined position for immersing into said tank, into a more nearly horizontal position for passing over the walls of said tank, and in an upwardly inclined position for unloading, a source of electric current, and means for conducting electric current from said source to said work articles within said container.

12. Apparatus for electrolytically treating articles comprising a tank, a container, means for moving said container through said tank, means for lifting said container over the walls of said tank, means for rotating said container; said lifting means including mechanism for moving said container into a vertical position for loading, into a downwardly inclined position for immersing into said tank, into a more nearly horizontal position for passing over the walls of said tank, and into an upwardly inclined position for unloading, a source of electric current, and means for conducting electric current from said source to said work articles within said container, said conducting means being operative to connect said work articles to said current source while said containers are in a downward position.

13. Apparatus for electrolytically treating articles comprising a tank, a container, means for moving said container through said tank, means for lifting said container over the walls of said tank, means for rotating said container; said lifting means including mechanism for moving said container into a vertical position for loading, into a downwardly inclined position for immersing into said tank, into a more nearly horizontal position for passing over the walls of said tank, and into an upwardly inclined position for unloading, a source of electric current, and means for conducting electric current from said source to said work articles within said container, said conducting means being operative to connect said work articles to said current source while said containers are in a downward position and to disconnect said work articles from said current source while said containers are in an upwardly raised position.

14. Apparatus for electrolytically treating articles comprising a frame, a tank beside said frame, a container for articles to be treated, means for moving said container through said tank and for

lifting it over the walls thereof, said lifting means comprising a source of power, a shaft connected thereto and running longitudinally relative to said frame, devices for transmitting said power from said shaft to said container, said moving means for said container comprising an endless flexible member moving in an orbital path, and means for rotating said container, said rotating means comprising a second longitudinal shaft with devices for transmitting the rotation of said shaft to said container.

15. In combination, tanks for holding fluids, a container for holding articles to be treated by the fluids, a central column having supports on the opposite sides thereof, rotatable parallel screws mounted in said supports, a bracket for holding said container, means for moving said bracket and said container horizontally, a gear operatively connected to said container and adapted to mesh with one of said screws, and means for lifting said container out of said tanks with said gear out of mesh with said screw.

16. In combination, tanks for holding fluids, a container for holding articles to be treated by the fluids, a central column having supports on the opposite sides thereof, rotatable parallel screws mounted in said supports, a bracket for holding said container, means for moving said bracket and said container horizontally, a gear operatively connected to said container and adapted to mesh with one of said screws, means for lifting said container out of said tanks with said gear out of mesh with said screw, said bracket having an upwardly extending portion and said lifting means comprising a horizontally movable member adapted to engage said upwardly extending portion, a shaft rotatably supported on said column, and means operatively interconnecting said shaft with said movable member for actuating said member to engage and move said bracket, whereby to engage and move said upwardly extending portion to lift said container.

17. Apparatus for electrolytically treating articles comprising a frame, a tank beside said frame, a rotatable container for articles to be treated, a screw rotatably mounted upon said frame and extending longitudinally therealong, a shaft attached to said container, a bracket for holding said shaft, a gear operatively connected to said shaft and adapted to mesh with said screw, means to rotate said screw, means to move said bracket longitudinally along said frame, and means for engaging said bracket to lift said container out of said tank at predetermined positions therealong.

18. Apparatus for electrolytically treating articles comprising a frame, a tank beside said frame, a rotatable container for articles to be treated, a screw rotatably mounted upon said frame and extending longitudinally therealong, a shaft attached to said container, a bracket for holding said shaft, a gear operatively connected to said shaft and adapted to mesh with said screw, means to rotate said screw, means to move said bracket longitudinally along said frame, and means for engaging said bracket to lift said container out of said tank at predetermined positions therealong, said lifting means comprising a horizontally movable member adapted to engage said bracket, a shaft rotatably mounted in said frame and means operatively interconnecting said shaft and said member to move said member horizontally.

19. Apparatus for electrolytically treating articles comprising a frame, a tank beside said frame, a rotatable container for articles to be treated, a screw rotatably mounted upon said frame and extending longitudinally therealong, a shaft attached to said container, a bracket for holding said shaft, a gear operatively connected to said shaft and adapted to mesh with said screw, means to rotate said screw, means to move said bracket longitudinally along said frame, and means for engaging said bracket to lift said container out of said tank at predetermined positions therealong, said bracket-moving means comprising an endless chain adapted to move in an orbital path, an orbital track and rollers adapted to engage said track on opposite sides thereof to sustain the weight of said bracket and said container and means for engaging said bracket to lift said container out of said tank at predetermined positions therealong.

20. Apparatus for electrolytically treating articles comprising a frame, a tank beside said frame, a rotatable container for articles to be treated, a screw rotatably mounted upon said frame and extending longitudinally therealong, a shaft attached to said container, a bracket for holding said snaft, a gear operatively connected to said shaft and adapted to mesh with sid screw, means to rotate said screw, means to move said bracket longitudinally along said frame, and means for engaging said bracket to lift said container out of said tank at predetermined positions therealong, said screw extending continuously along said frame and adapted to receive said gear in mesh at a plurality of points therealong.

21. Apparatus for electrolytically treating articles comprising a frame, a tank beside said frame, a rotatable container for articles to be treated, a screw rotatably mounted upon said frame and extending longitudinally therealong, a shaft attached to said container, a bracket for holding said shaft, a gear operatively connected to said shaft and adapted to mesh with said screw, means to rotate said screw, means to move said bracket longitudinally along said frame, and means for engaging said bracket to lift said container out of said tank at predetermined positions therealong, said lifting means comprising a horizontally movable member adapted to engage said bracket, a shaft rotatably mounted in said frame and means operatively interconnecting said shaft and said member to move said member horizontally, said screw extending continuously along said frame and adapted to receive said gear in mesh at a plurality of points therealong.

22. Apparatus for electrolytically treating articles comprising a frame, a tank beside said frame, a rotatable container for articles to be treated, a screw rotatably mounted upon said frame and extending longitudinally therealong, a shaft attached to said container, a bracket for holding said shaft, a gear operatively connected to said shaft and adapted to mesh with said screw, means to rotate said screw, means to move said bracket longitudinally along said frame, said bracket-moving means comprising an endless chain adapted to move in an orbital path, an orbital track and rollers adapted to engage said track on opposite sides thereof to sustain the weight of said bracket and said container and means for engaging said bracket to lift said container out of said tank at predetermined positions therealong. said screw extending continuously along said frame and adapted to receive said gear in mesh at a plurality of points therealong.

23. Apparatus for electrolytically treating articles comprising a frame, a tank beside said frame, a rotatable container for articles to be treated, a screw rotatably mounted upon said frame and extending longitudinally therealong, a shaft at-

tached to said container, a bracket for holding said shaft, a gear operatively connected to said shaft and adapted to mesh with said screw, means to rotate said screw, means to move said bracket longitudinally along said frame, and means for engaging said bracket to lift said container out of said tank at predetermined positions therealong, said lifting means comprising a horizontally reciprocable member adapted to engage a portion of said bracket, a vertically directed arm engaging said horizontally movable member and pivoted at the opposite end therefrom and means for moving said vertical arm to and fro to reciprocate said horizontal member, whereby to raise and lower said bracket and said container.

24. In combination, a frame, a rotatable container for articles to be electrolytically treated, a tank, a shaft for rotating said container, a bracket for rotatably receiving said shaft, a conveyor for moving said bracket and said container horizontally, and means for raising and lowering said container at predetermined positions along said frame, said bracket having an upwardly extending portion adapted to be engaged by said lifting means and a downwardly extending portion having a roller adapted to engage said frame, said bracket being pivotally mounted upon a support connected to said conveyor.

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