April 20, 1954 F. J. KENNEDY 2,675,813

APPARATUS FOR CONVEYING PIPE THROUGH AN ELECTROLYTE

Filed Dec. 15, 1950 6 Sheets-Sheet 1

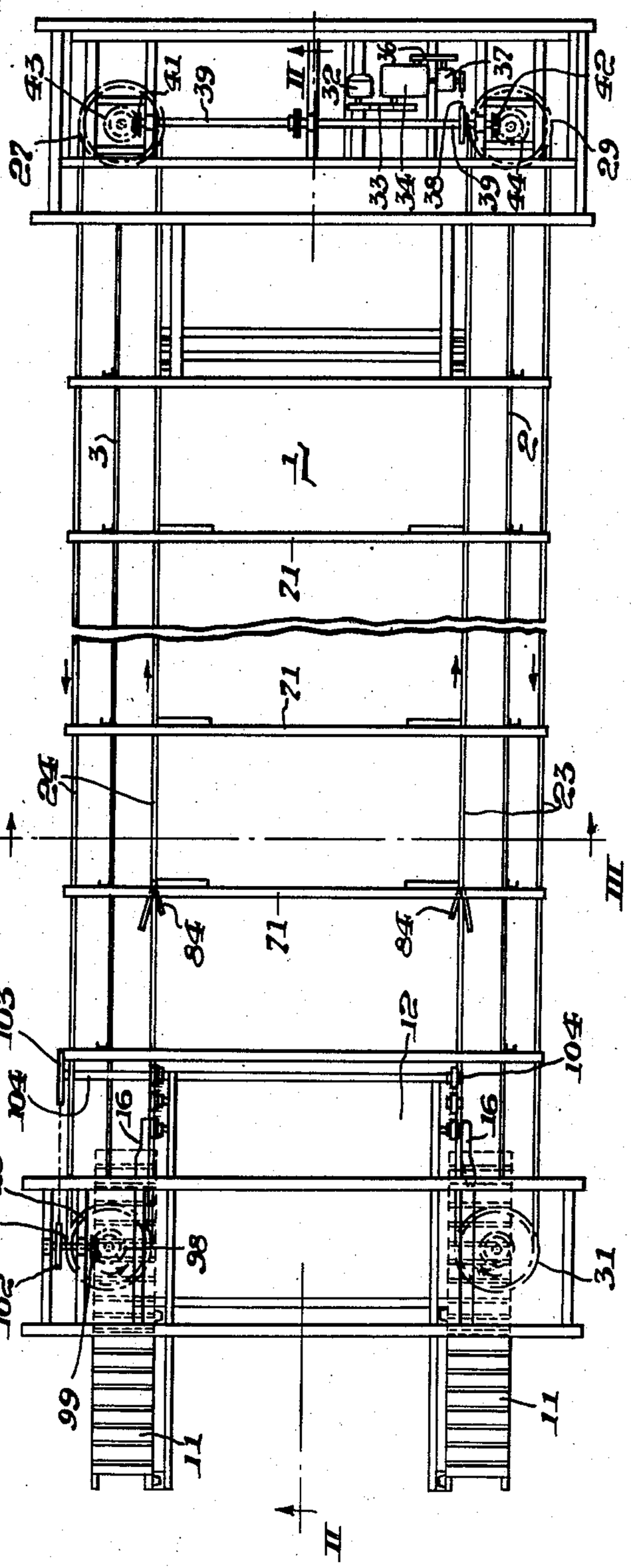


Fig. 1.

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Filed Dec. 15, 1950 6 Sheets-Sheet 2

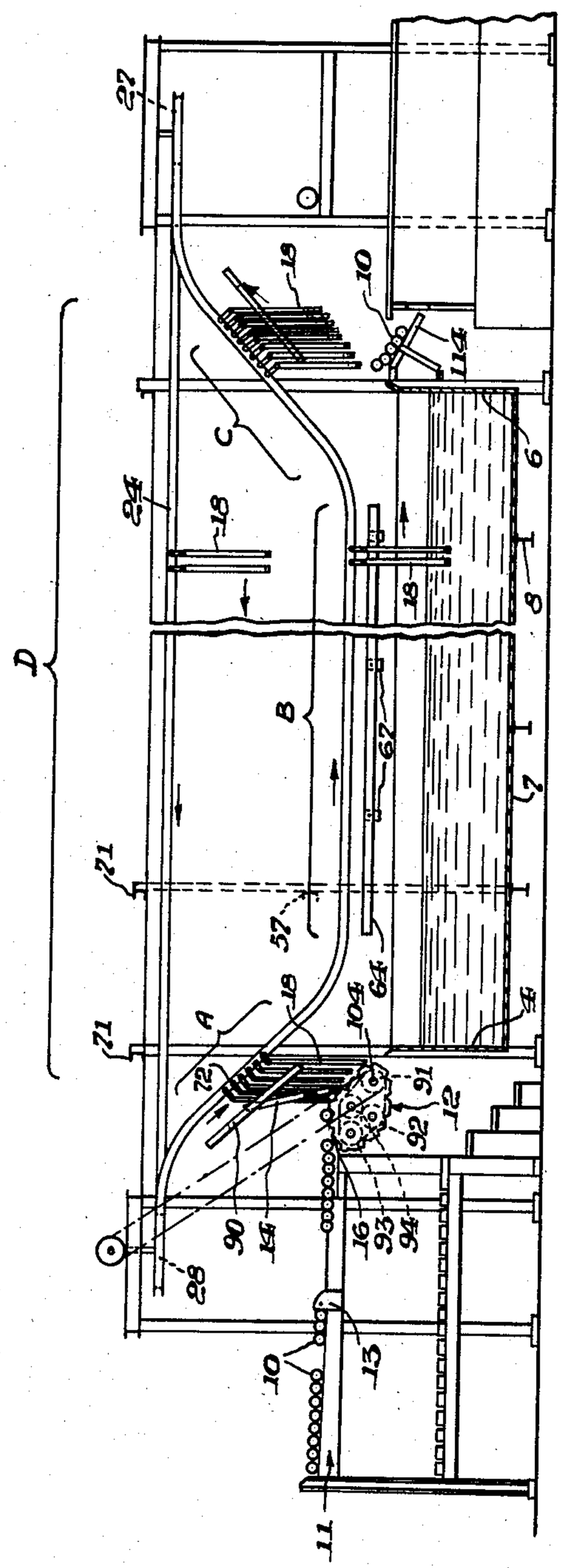


Fig. 2.

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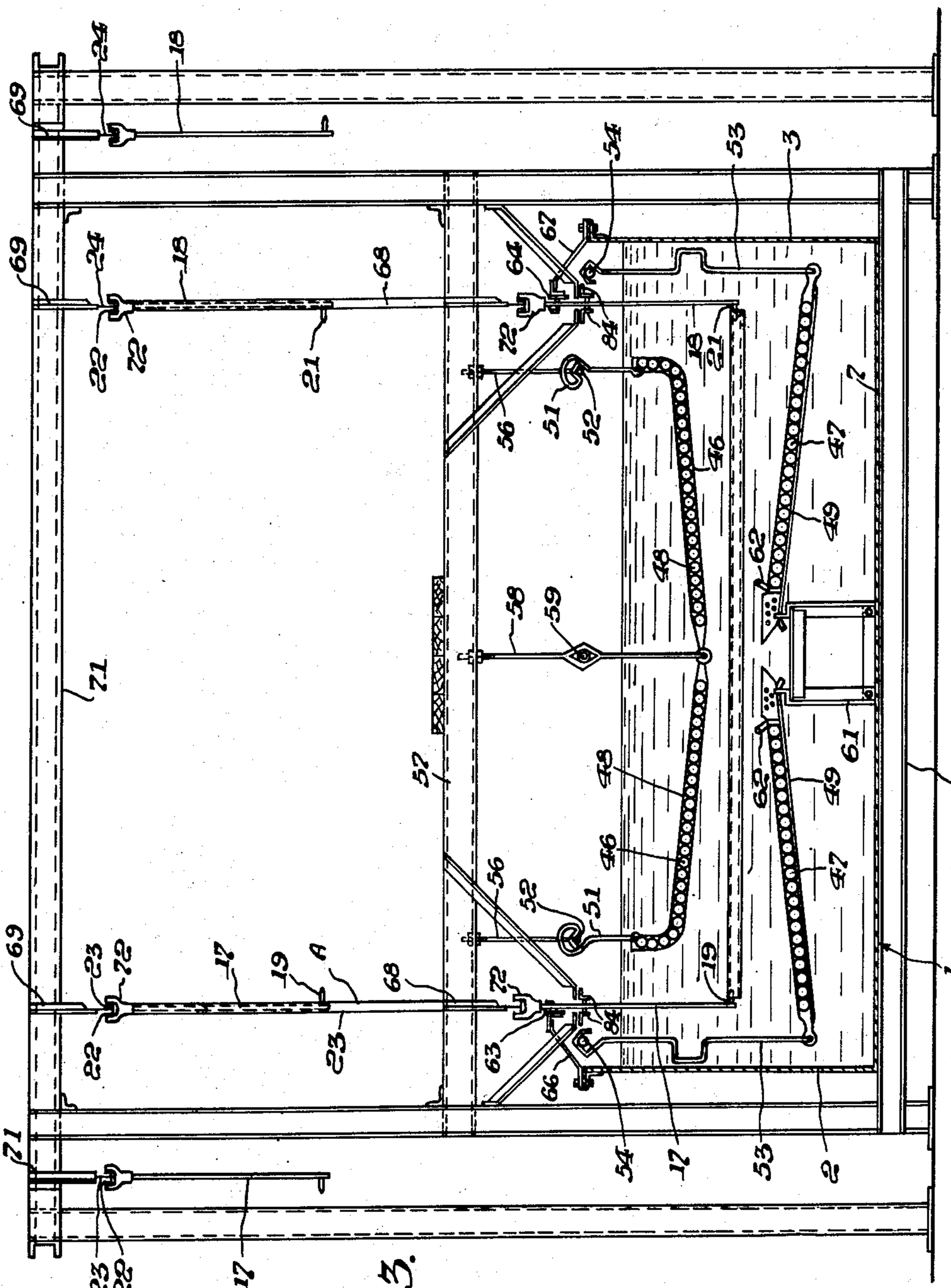


Fig. 3.

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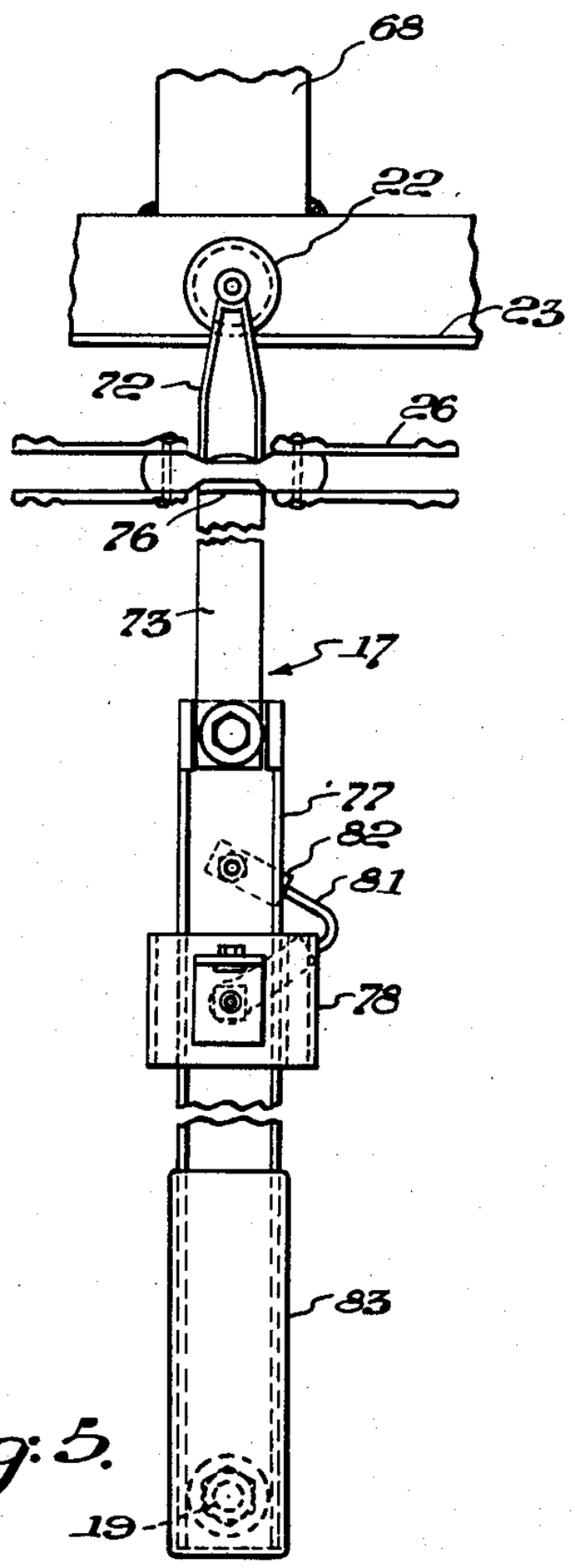


Fig. 5.

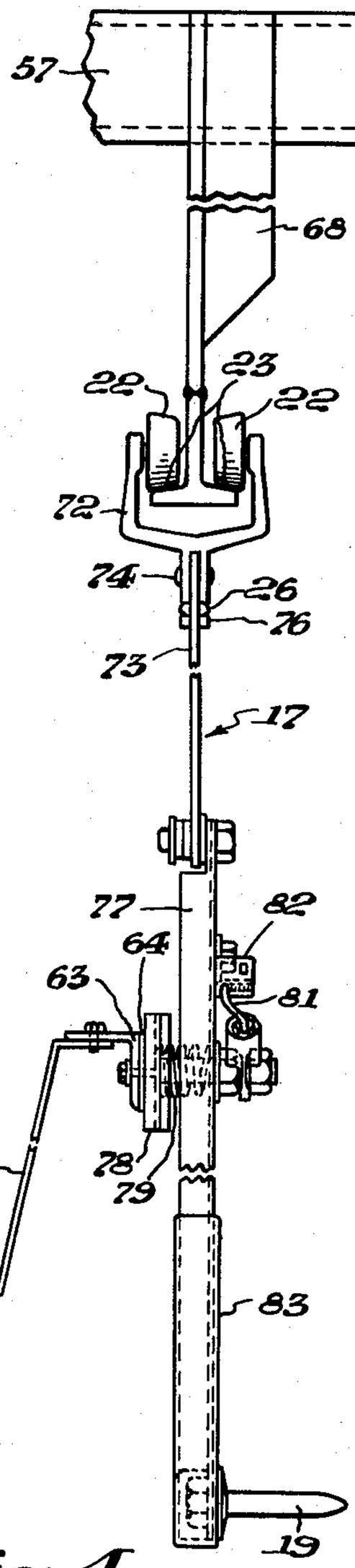


Fig. 4.

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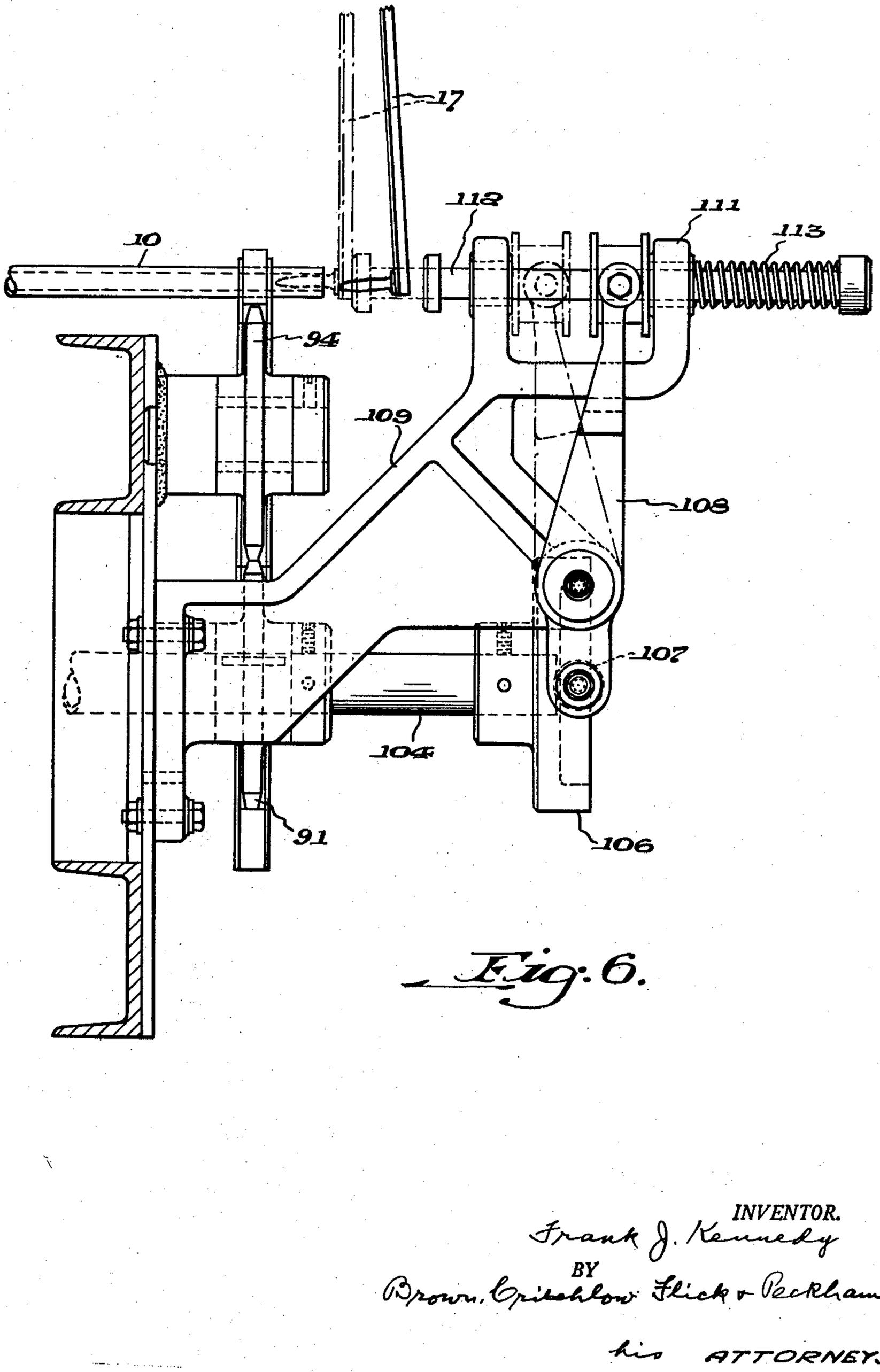


Fig. 6.

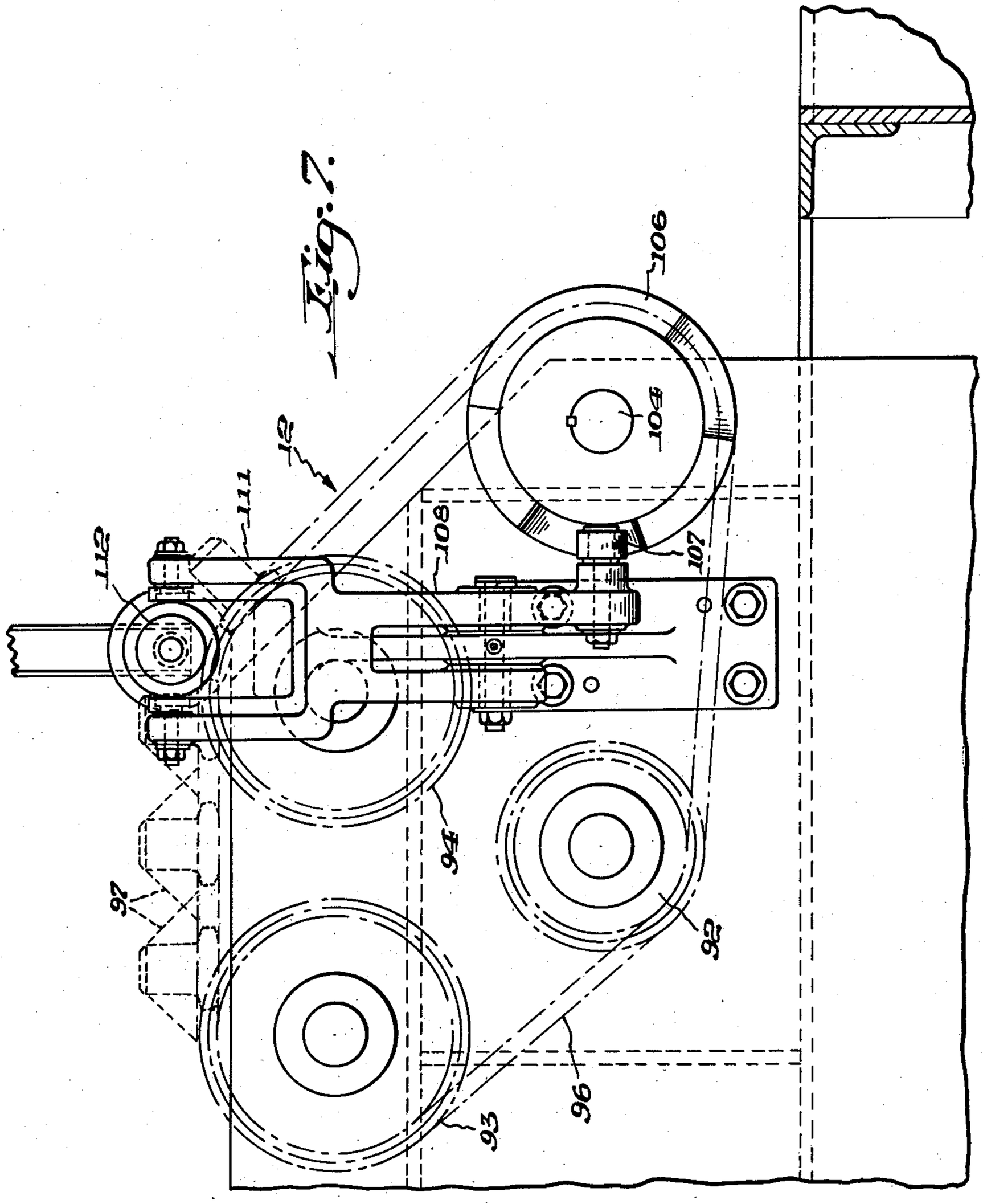
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APPARATUS FOR CONVEYING PIPE THROUGH AN ELECTROLYTE

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Fig. 7.



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UNITED STATES PATENT OFFICE

2,675,813

APPARATUS FOR CONVEYING PIPE THROUGH AN ELECTROLYTE

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Application December 15, 1950, Serial No. 200,968

11 Claims. (Cl. 134—125)

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This invention relates to apparatus for conveying pipe through a liquid, and, in particular, to apparatus for conveying the pipe through a bath in which it is plated.

A troublesome problem in the manufacture of pipe has been to provide an efficient manner of carrying the pipe through the electroplating bath. Customarily, the pipe simply is rolled through the electrolyte with its ends riding on bus bars which are the cathodes of the plating circuit, there also being arranged in the bath the usual anodes. Such procedure, however, often produces a plating on the pipe which is defective, or inferior, because the portions of the pipe which ride on the bus bars do not receive sufficient protective coating. Also, the known practices require considerable manual handling of the pipe, both in feeding the pipe into and removing it from the bath; such manual operations, of course, increasing the ultimate cost of the pipe, as well as reducing its production rate.

It is therefore among the objects of this invention to provide apparatus for conveying the pipe through an electroplating bath, the apparatus being fully automatic in the sense that no manual operations are required in feeding the pipe to or removing it from the bath.

A further object is to provide such fully automatic apparatus which carries the pipe through the bath in such a manner that all of its surfaces are evenly coated with the plating material.

Broadly considered, the conveying apparatus is particularly adapted for carrying pipe through an elongate tank that contains the electrolyte, such tank being commonly used in galvanizing and other electroplating processes. The apparatus includes a pair of endless tracks carried one at each side of the tank above the liquid of the bath, and from each of these tracks is suspended a series of longitudinally spaced pipe carrying arms, the arms of each of these series being so spaced longitudinally that each arm of one of the series is substantially transversely aligned with an arm of the other series, whereby transversely aligned pairs of arms are formed. The lengths of pipe are carried through the bath by being suspended, or hung, on these transversely aligned pairs of arms, and for this purpose, the lower portion of each of the arms carries pipe-engaging and supporting members, which, preferably, are inturned fingers adapted to be received in each end of each length of pipe. The arms are movably mounted in the tracks, most suitably, being suspended from the tracks on rollers, and to move the arms about the tracks, a conveyor, such as an endless

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chain, links together the suspended arms of each of the series of arms. The tracks at each side of the bath preferably follow identical courses and these courses are such that the arms are carried first past a loading station as they automatically are engaged with the pipe. Following the loading, the courses of the tracks cause the arms to move the pipe into and through the bath, then out of the bath to an unloading station which may be in any desirable location, and, finally back to their loading station.

Suitable anodes are mounted within the bath, and the electroplating circuit is completed by cathode bus bars, preferably carried by and extending longitudinally of and near to each of the side walls; the upper portions of the arms having a wiping contact with the bus bars, so that the negative current for the electroplating flows from the bus bars through the arms and through the pipe.

Further features of this invention, such as automatic arm loading and unloading means, as well as desirable driving connections for coordinating the actuation of the arm loading means with the rate of travel of the arm conveyors, will be described later in the specification.

The preferred embodiment of the invention is illustrated in the accompanying drawings of which Fig. 1 is a plan view of the electroplating tank and the conveying apparatus; Fig. 2 a vertical section along lines II—II of Fig. 1, there being certain details of construction omitted for purposes of clarity; Fig. 3 an enlarged transverse vertical section along lines III—III of Fig. 1; Figs. 4 and 5 still further enlarged end and side views, respectively, of one of the pipe-carrying arms and its supporting members; and Figs. 6 and 7 enlarged end and side views respectively, of the arm loading mechanism provided by the invention.

Referring initially to Figs. 2 and 3, the bath is contained in an open topped, metal tank 1 formed of side walls 2 and 3, end walls 4 and 6 and a bottom 7, the bottom being supported by transversely extending I-beams 8. Pipe 10, which is to be plated, or galvanized, is carried by a crane (not shown) from a previous pipe-treating bath onto a roll-down, pipe-feeding table 11 (Fig. 2), from which it rolls onto an endless, looped rack conveyor 12, to be described later, there being suitable stops 13 and 14 and pipe guiding members 16 to regulate and insure proper delivery of the pipe to this conveyor.

From the rack conveyor the individual lengths of pipe each are picked up and carried through and out of the bath by the conveying mechanisms

which form an important part of this invention, and which generally considered, include pipe-carrying arms 17 and 18 (Figs. 3, 4 and 5) the lower ends of which are formed as inwardly projecting fingers 19 and 21 adapted to be thrust into the ends of the pipe as the pipe is being carried by rack conveyor 12; the fingers subsequently being pressed out of pipe end engagement at the discharge end of the tank. The location at which the pipes are connected to the arms 17 and 18 is the "loading station" of the apparatus.

These arms 17 and 18 mount rollers 22 that ride on a pair of endless tracks 23 and 24 which run longitudinally along each side wall of the tank, each of the tracks paralleling one another in a course designed to cause the arms to move downwardly past their loading station (Fig. 2) and then to cause the fingers 17 and 18 and the pipe supported by them to dip into the galvanizing bath. Following this, the course of the tracks runs horizontally to cause the pipe to be moved through the bath, then upwardly to effect removal of the pipe from the bath. As contemplated, the arms release the pipe during their upward movement, and then the tracks loop back horizontally to cause the arms to be returned to their loading zone. For purposes of description, the downwardly inclined extents of the tracks are termed A (Fig. 2), the horizontal galvanizing extents B, the upward pipe-removing extents C and the horizontal arm-return extents D, the return extents D running for the most part, outside of the tank side walls 2 and 3, while extents A, B and C are within the vertical planes of these side walls.

From the above, it will be recognized that each track mounts a series of longitudinally spaced arms 17 and 18, the spacing being such that transversely aligned pairs of arms are formed, or, in other words, each arm 17 is transversely aligned with an arm 18 to form a pair that functions to grip and convey a single length of pipe delivered to it by rack conveyor 12. The correct spacing of the arms is achieved and maintained by chains 26 (Figs. 4 and 5) which link the arms of each series together in a manner to be described; these chains also being driven to provide the motive power for rolling the arms along tracks 23 and 24.

To drive chains 26 sprockets 27, 28, 29 and 31 (Fig. 1) are provided, the chain for track 24 passing around sprockets 27 and 28, while the chain for track 23 passes around sprockets 29 and 31. Motor 32 is the source of power for the apparatus, and, as seen in Fig. 1, its output is transmitted by a V-belt 33 to a variable speed unit 34, and from that unit by another V-belt 36 to a speed reducer 37 from which it is finally transmitted by belt 38 to horizontally and transversely extending drive shaft 39. On the ends of shaft 39 are mounted pinions 41 and 42 which mesh with bevel gears 43 and 44 mounted on the shafts of sprockets 27 and 29, so that the motor has direct driving connections only with these two sprockets.

As stated, the principal purpose of the invention is to carry pipe through a tank in which it is galvanized, and such a tank must provide a galvanizing circuit, or, in other words, a negative cathode, and a positive anode. Referring to Fig. 3, the anodes, preferably, are soluble metal balls 46 and 47, formed of zinc, or the like, and carried in baskets 48 and 49 which, preferably, are formed of helically wound steel wire. To the

outer ends of each of baskets 48 is secured a conductor 51 which is hooked over metal rods 52 that extend longitudinally from one end of the tank to the other. Similarly, to the outer ends of baskets 49 are secured hook-shaped conductors 53 which engage metal rods 54 also extending the length of the tank. These rods 52 and 54, in turn, are suspended by bolts 56 that are secured to transverse, structural channels 57, of which there are a plurality, spaced longitudinally of the tank. Also, baskets 48 are connected together at their inner ends and they are provided central support by elongate bolts 58 also secured to channel 57, bolts 58 being split at their central portions to receive another metal rod 59, which is similar to rods 52 and 54.

Baskets 49, however, differ from baskets 48 in that their inner ends rest on a platform 61, these inner ends being provided with loops or bails 62 adapted to be engaged by a suitable tool so that the inner ends of these baskets can be pulled upwardly out of the tank when the soluble zinc balls require replenishing. When the zinc balls of baskets 46 need replenishing, the outer or free ends of the baskets can be pulled upwardly simply by gripping the loops of wires 51 and pulling these free ends upwardly out of the bath, and, to permit lower baskets 49 to be pulled upwardly for replenishing, baskets 48 are staggered vertically with respect to baskets 49 throughout the length of the tank; it being appreciated that only one upper and one lower pair of these baskets are shown in Fig. 3, and that actually there are any number of such pairs carried by rods 52, 54 and 59 throughout the length of the tank. As will be understood, the positive current of the galvanizing circuit is supplied to the zinc balls through metal rods 52, 54, as well as conductors 51 and 53, and wire baskets 48 and 49.

The negative current for the galvanizing circuit is supplied by copper bus bars 63 and 64 which extend longitudinally of the tank as shown in Fig. 2 and which are disposed above the bath and near each tank side wall (Fig. 3). Also, as shown in Figs. 3 and 4, bus bars 63 and 64 are carried on a series of longitudinally spaced brackets 66 and 67, these brackets being bolted to and insulated from the top edges of tank side walls 2 and 3. Also, insulation is provided between the bus bars and their supporting brackets.

From bus bars 63 and 64, the negative current flows into pipe carrying arms 17 and 18, these arms having members which wipe against the bus bars as the arms travel through the tank. From the arms, the current flows into the length of pipe so that, as the pipe moves through upper and lower anode baskets 48 and 49, the galvanizing or electroplating takes place.

Plate carrying arms 17 and 18 are specially constructed and supported in the manner best seen in Figs. 3, 4 and 5. It has been pointed out previously that the arms are supported on tracks 23 and 24 by means of their rollers 22. Tracks 23 and 24, in turn, are supported by track-suspension brackets 68 and 69, brackets 68 being welded to transverse channel beams 57 and brackets 69 being welded to upper transverse beams 71. As will be seen in Fig. 2, downwardly inclined extents A of tracks 17 and 18, as well as their upwardly inclined extents C are unsupported by the transverse channel beams, but such support at these points is unnecessary. As to the specific construction of the arms, each mounts a pair of rollers 22 in a yoke member 72

which is centrally slotted at its lower portion to receive the upper end of a chain hanger member **73**, this member being inserted into the slot and secured therein by means of a rivet **74** or the like. As has been stated, chains **26** hold the arms at the proper longitudinal spacing for forming transversely aligned pairs of arms to engage the opposite ends of the lengths of pipe. To achieve this, the upper portion of chain hangers **73** are inserted upwardly through the desired link of the chain and the chain hangers are made approximately the width of the link opening so as to prevent such play of the hanger in the links as would destroy this transverse alignment. Also, chain hangers **73** carry lugs **76** which press upwardly against the bottom of the links through which the hangers project, this arrangement clamping the links between the bottom edges of yoke **72** and the upper edges of lugs **76**.

The lower portions of the arms carry the negative current to the pipe, and these portions are formed of channels **77** which, at their upper ends are bolted to and insulated from chain hangers **73**. The mechanisms for contacting copper bus bars **63** and **64** are the wiper plates **78** which are carried by channel portions **77** of the arms and are spring pressed outwardly by a coil spring **79** into flush engagement with the bus bars. The current from the bus bars is delivered to the arms through a conductor **81** and a connector **82**, and as stated, this current flows downwardly and through the pins into the pipe. Also, it is preferable to sheath the lower portions of channels **77** with a rubber sheathing **83**, or the like.

From the above description, it will be appreciated that the pipe-carrying arms are suspended in a relatively freely swinging fashion, and this manner of suspension greatly facilitates the automatic loading and unloading of the pipe. However, before discussing the loading and unloading mechanism, it should be noted that as the arms pass through the tank, they are held against excessive swinging, which might release the pipe within the tank, by means of guide rails **84** (Fig. 3), these rails being supported by suitable braces welded to structural members of the apparatus.

Considering first the loading mechanism, it can be noted from Fig. 2 that as the transversely aligned pairs of arms commence their travel downwardly along inclined track extents A, each arm of the pairs is contacted by a cam **90** the purpose of which is to spread or swing each pair of arms apart a sufficient distance to permit a length of pipe to come between its pipe-carrying fingers. Accordingly, two cams **90** are provided one being mounted so as to contact the inner sides of arms **17** and the other to contact the inner sides of arms **18**. Further, both cams are formed with beveled leading, or left, ends (Fig. 2) which the arms strike initially, and as the arms move along the cams they are pressed laterally outwardly to the desired extent. It is believed that such a cam will be readily understood, and that no further description is necessary.

After a pair of transversely aligned arms has been so spread, rack conveyor **12** moves a length of pipe into a position in which the pipe is aligned with the fingers of the arms, and, at this precise moment, plunger mechanism (Figs. 6 and 7) disposed at each side of the rack conveyor operates to press the transversely aligned arms one toward the other and insert the fingers of the arms into the pipe. The construction of rack conveyor **12** is best shown in Figs. 2, 6 and 7, and it consists of a set of four sprockets **91**, **92**, **93** and **94** around

which a belt **96** travels, the belt carrying rack projections **97** between which the lengths of pipe are carried. The drive for the sprockets is taken directly from sprocket **28** (Fig. 1) and, for this purpose, sprocket **28** mounts a bevel gear **98** that meshes with a pinion **99** mounted on a shaft **101**. Also mounted on shaft **101** is a sheave **102** which has a belt connection with another sheave **103** mounted on a shaft **104**, this shaft **104** being the one to which rack conveyor sprocket **91** is splined. It will readily be recognized that, by means of this rack conveyor drive, the rate of delivery of pipes by the rack conveyor can be closely coordinated with the speed of travel of the arm conveyors about their tracks, because both arm conveyors have a common source of power and the rack conveyor movement is controlled by the travel of the conveyor for arms **18**.

The plunger arm loading mechanism is cam-operated and also is actuated by the rotation of shaft **104** of rack conveyor sprocket **91** so that its operation is controlled by the rate of travel of the rack conveyor. As stated, a plunger mechanism is mounted in a suitable position at each side of the rack conveyor, and although only one such mechanism is illustrated in Figs. 6 and 7, it is believed that the manner in which both of these mechanisms are mounted and function should be clear. Referring to Figs. 6 and 7, it is seen that a cam wheel **106** is splined onto the end of rack conveyor sprocket shaft **104** and that this wheel contacts a cam roller **107** which is carried at the lower end of a pivotally mounted arm **108**; this arm being pivotally carried on a suitable frame **109** secured to structural members of the apparatus. Frame **109** also is formed at its upper portion into a yoke **111** which provides bearings for a plunger **112**. Also, the upper end of pivotal arm **108** is secured to the plunger and, as seen in Fig. 6, the plunger normally is held in a retracted position by means of a coil spring **113**. Cam wheel **106** is formed with suitable alternate protrusions so that, as it rotates, it alternately presses outwardly upon cam wheel **107** and thereby rocks arms **108** so as to move plunger **112** from its full line to its dotted line position and, when the wheel is not so pressed outwardly, the plunger returns to its full line position. Of course, the cam wheel projections are so formed and positioned that when the rack conveyor, which is operating in a timed relation with the arm conveyors, brings a length of pipe into alignment with the fingers of a pair of transversely aligned arms, the plunger is actuated to push the fingers into the ends of the pipe.

The pipe being supported on these fingers, the arms then continue their movement downwardly along track extents A to immerse the pipe in the tank, the pipe then being carried horizontally through the tank to receive its plating. Of course, the tracks and the length of the arms are so arranged that the pipe is carried through the electrolyte at a depth which places it between anode baskets **46** and **47** (Fig. 3). After the plating is completed, the arms commence their travel up track extents C, during which travel the arms are spread apart by cams **113** (Fig. 2) a sufficient amount to disengage the fingers from the pipe ends, whereupon the pipe drops freely onto a chute **114** which customarily leads to another conveyor that carries the plated pipe through subsequent washing tanks; this other conveyor and washing tanks forming no part of this invention. The location at which the pipes are removed from

the fingers is the "unloading station" of the apparatus.

Cams 113 are similar to cams 90 in that they are arranged inside of the path of travel of the arms and are so formed that when a pair of arms strikes them, the arms are gradually pressed out due to beveled surfaces formed on the cams. Such a cam arrangement is an unusually simple manner of effecting release of the pipe, and its use is rendered possible due to the relatively freely swinging manner in which the arms are supported or suspended. After the arms pass over the cams, they swing back into their normal vertical position and travel along track extents D and back down track extents A to repeat the cycle.

It is believed that the operation of the various mechanisms of the invention, as well as the complete operative cycle of the endless conveying apparatus should be clear from the above description. One of the principal advantages of the apparatus lies in the simplicity with which the pipe is automatically picked up, carried through the electrolyte and then released, this, as stated, being due primarily to the freely swinging, suspended pipe arms. Also, it is important to note that all the surfaces of the pipe receive the same amount of coating, since the lengths of pipe are gripped only by the narrow fingers which hook into and suspend the pipe. In contrast to this, other conventional practices require that the pipe be rolled along bus bars so that the surfaces contacting the bus bars may not receive sufficient protective coating. Another important advantage which has been described is the ability to closely coordinate the drive of the arm conveyors with the drive of rack conveyor 12 and also with the actuation of the arm loading plunger mechanism. This close coordination is an important factor in automatically loading the relatively long pipe carrying arms, since to insure engagement of the pins of the arms, the axis of the pipe must be aligned with the pins at the precise moment that the pins align with the plungers of the plunger mechanism. Further, the arrangement as a whole provides considerable flexibility insofar as varying the speed of the galvanizing operations in that it has been found that the rate of travel of the hanger arms can be varied from between about four to sixteen feet or more per minute. Other advantages, such as the structural simplicity and inexpensiveness, will be apparent to those skilled in this art.

According to the provisions of the patent statutes, I have explained the principle, preferred embodiment and mode of operation of my invention, and have illustrated and described what is now considered to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. Apparatus for conveying pipe through a tank containing an electroplating bath, said apparatus comprising a pair of endless tracks carried one at each side of the tank, each track having its reversal at each end about an axis having at least a component extending vertically, a series of arms movably mounted on and swingably suspended from one of said tracks, another series of arms movably mounted on and swingably suspended from the other track and structurally independent of the arms of the first series, said arms of each series being held in such a longitudinally spaced relationship that each arm of one of the series is aligned with an arm of the other series whereby aligned pairs of arms are formed, a separate conveyor connected to each series of the arms for moving them along said tracks, means driving said conveyors at equal speeds, in-turned pipe-carrying fingers carried at the lower portion of each arm, said fingers of each aligned pair of arms being adapted to be inserted in and support the ends of a pipe length, a pair of cams for spreading apart the fingers of each of said aligned pairs of arms a distance greater than a pipe length, arm-loading plunger mechanisms for pressing said fingers towards one another to engage a length of pipe, and a second conveyor for bringing said pipe into alignment with said plunger mechanisms, said tracks guiding said arms past said arm-loading mechanisms into and through said bath and back to said loading mechanisms, said plunger mechanisms having driving connections with and being operated in timed relationship with the rate of travel of said second conveyor, and said second conveyor being driven by and in timed relationship with the rate of travel of an arm conveyor whereby each length of pipe can be aligned with said plunger mechanisms simultaneously with the alignment of a pair of arm fingers with the mechanisms.

2. Apparatus for conveying pipe through a tank containing an electroplating bath, said apparatus comprising a pair of endless tracks carried one at each side of the tank, each track having its reversal at each end about an axis having at least a component extending vertically, a series of arms movably mounted on and swingably suspended from one of said tracks, another series of arms movably mounted on and swingably suspended from the other track and structurally independent of the arms of the first series, said arms of each series being held in such a longitudinally spaced relationship that each arm of one of the series is aligned with an arm of the other series whereby aligned pairs of arms are formed, a separate conveyor connected to each series of the arms for moving them along said tracks, means driving said conveyors at equal speeds, inwardly turned pipe-carrying fingers carried at the lower portion of each arm, said fingers of each aligned pair of arms being adapted to be inserted in and support the ends of a pipe length, a pair of cams for swingably spreading apart the fingers of said aligned pairs of arms a distance greater than a pipe length, loading mechanism comprising a pair of oppositely-disposed cam-actuated plungers one for each series of arms, said plungers being adapted to press said fingers towards one another to engage a length of pipe, an endless rack conveyor for bringing said pipe into alignment with said oppositely-disposed plungers, said tracks guiding the fingers of said arms past said plungers through and out of said bath and back to said loading mechanism, and a pair of cams formed and positioned to spread apart the fingers of said aligned pairs of arms as the fingers of the arms move out of the tank whereby the supported pipe is released.

3. Apparatus for conveying pipe through an elongate tank containing an electroplating bath, said apparatus comprising a pair of endless tracks carried one at each side of the tank, each track having its reversal at each end about an axis having at least a component extending ver-

tically, a series of arms movably mounted on and swingably suspended from one of said tracks, another series of arms movably mounted on and swingably suspended from the other track and structurally independent of the arms of the first series, said arms of each series being held in such a longitudinally spaced relationship that each arm in one of the series is transversely aligned with an arm of the other series whereby transversely aligned pairs of arms are formed, means for moving each series of the arms along its track, in-turned pipe-carrying members carried at the lower portion of each arm for engaging the ends of the pipe lengths at a loading station and supporting the pipe lengths during the travel through the tank to an unloading station at the other end of the tank, and means at the unloading station for swingably spreading each transversely aligned pair of arms a sufficient amount to release their engagement of the pipe lengths, said tracks guiding said pipe-carrying members past said loading stations into and through said electroplating bath, then out of the bath past said unloading station and back to said loading stations.

4. The apparatus for conveying pipe described in claim 3, characterized by rollers which support the arms from the endless tracks, and further characterized by having the endless tracks located entirely above the level of the electrolyte so that said rollers are never immersed in the electrolyte.

5. The apparatus for conveying pipe described in claim 3, characterized by guides along the tank on the outside of both series of arms in position to hold the arms from swinging outwardly away from the pipe lengths.

6. Apparatus for conveying pipe through an elongate tank containing an electroplating bath, said apparatus comprising a pair of endless tracks carried one at each side of the tank, each track having its reversal at each end about an axis having at least a component extending vertically, a series of arms movably mounted on and swingably suspended from one of said tracks, another series of arms movably mounted on and swingably suspended from the other track and structurally independent of the arms of the first series, said arms of each series being held in such a longitudinally spaced relationship that each arm in one of the series is transversely aligned with an arm of the other series whereby transversely aligned pairs of arms are formed, means for moving each series of the arms along its track, in-turned pipe-carrying members carried at the lower portion of each arm for engaging the ends of and supporting pipe lengths, means for swingably spreading each transversely aligned pair of arms a sufficient amount to permit a pipe length to be placed between their in-turned pipe carrying members, and automatic arm-loading means synchronized with the rate of travel of the arms for swingably pressing said spread pairs of arms back into engagement with said so-placed pipe length, said tracks guiding said pipe-carrying members past said arm loading means into and through said electroplating bath and then out of the bath and back to said loading means.

7. Apparatus for conveying pipe through an elongate tank containing an electroplating bath, said apparatus comprising a pair of endless tracks carried one at each side of the tank, each track having its reversal at each end about an axis having at least a component extending ver-

tically, a series of arms movably mounted on and swingably suspended from one of said tracks, another series of arms movably mounted on and swingably suspended from the other track and structurally independent of the arms of the first series, said arms of each series being held in such a longitudinally spaced relationship that each arm in one of the series is transversely aligned with an arm of the other series whereby transversely aligned pairs of arms are formed, means for moving each series of the arms along its track, in-turned pipe-carrying members carried at the lower portion of each arm for engaging the ends of and supporting pipe lengths, means for swingably spreading each transversely aligned pair of arms a sufficient amount to permit a pipe length to be placed between their in-turned pipe-carrying members, automatic arm loading means synchronized with the rate of travel of the arms for swingably pressing said spread pairs of arms back into engagement with said so-placed pipe length, and automatic arm-unloading means adapted to again swingably spread said pairs of arms a sufficient amount to release their engagement of the pipe lengths, said tracks guiding said pipe-carrying members past said loading means into and through said electroplating bath and then out of the bath and back to said loading means.

8. Apparatus for conveying pipe through an elongate tank containing an electroplating bath, said apparatus comprising a pair of endless tracks carried one at each side of the tank, each track having its reversal at each end about an axis having at least a component extending vertically, a series of arms movably mounted on and swingably suspended from one of said tracks, another series of arms movably mounted on and swingably suspended from the other track and structurally independent of the arms of the first series, said arms of each series being held in such a longitudinally spaced relationship that each arm in one of the series is transversely aligned with an arm of the other series whereby transversely aligned pairs of arms are formed, means for moving each series of the arms along its track, in-turned pipe-carrying members carried at the lower portion of each arm for engaging the ends of and supporting pipe lengths, means for swingably spreading each transversely aligned pair of arms a sufficient amount to permit a pipe length to be placed between their in-turned pipe-carrying members, a conveyor synchronized with the rate of travel of the arms for placing lengths of pipe between the pairs of arms, automatic arm-loading means also synchronized with the rate of travel of the arms for swingably pressing said spread pairs of arms back into engagement with the so-placed pipe length, and automatic arm-unloading means adapted to again swingably spread said pairs of arms a sufficient amount to release their engagement of the pipe lengths, said tracks guiding said pipe-carrying members past said loading means into and through said electroplating bath and then out of the bath and back to said loading means.

9. Apparatus for conveying pipe through an elongate tank containing an electroplating bath, said apparatus comprising a pair of endless tracks carried one at each side of the tank, each track having its reversal at each end about an axis having at least a component extending vertically, a series of elongate arms rollably mounted on and freely hanging from one of said tracks,

another series of elongate arms rollably mounted on and freely hanging from the other track and structurally independent of the arms of the first series, said arms of each series being held in such a longitudinally spaced relationship that each arm in one of the series is transversely aligned with an arm of the other series whereby transversely aligned pairs of arms are formed, a separate endless conveyor for moving each series of the arms along its tracks, in-turned pipe-carrying fingers carried at the free bottom end of each arm, said members of each aligned pair of arms being adapted to engage in the ends of and support a pipe length, a cam disposed in the path of travel of each series of arms for swingably spreading apart transversely aligned pairs a sufficient amount to permit a pipe length to be positioned between their in-turned pipe-carrying members, and automatic arm loading plunger means synchronized with the rate of travel of the arms for pressing said spread pairs of arms back into engagement with said positioned pipe length, said tracks guiding said pipe carrying members past said arm loading means into and through said electroplating bath and then out of the bath and back to said loading means.

10. Apparatus for conveying pipe through an elongate tank containing an electroplating bath, said apparatus comprising a pair of endless tracks carried one at each side of the tank, each track having its reversal at each end about an axis having at least a component extending vertically, a series of elongate arms rollably mounted on and freely hanging from one of said tracks, another series of elongate arms rollably mounted on and freely hanging from the other track and structurally independent of the arms of the first series, said arms of each series being held in such a longitudinally spaced relationship that each arm in one of the series is transversely aligned with an arm of the other series whereby transversely aligned pairs of arms are formed, a separate endless conveyor for moving each series of the arms along its tracks, in-turned pipe-carrying fingers carried at the free bottom end of each arm, said members of each aligned pair of arms being adapted to engage in the ends of and support a pipe length, a cam disposed in the path of travel of each series of arms for swingably spreading apart transversely aligned pairs a sufficient amount to permit a pipe length to be positioned between their in-turned pipe-carrying members, and automatic arm loading plunger means synchronized with the rate of travel of the arms for pressing said spread pairs of arms back into engagement with said positioned pipe length, and a pair of cams formed and disposed in position to again swingably spread said pairs of arms to release their engagement of the pipe length, said tracks guiding said pipe-carrying members past said arm loading means into and through said electroplating bath and then out of the bath and back to said loading means.

11. Apparatus for conveying pipe through an elongate tank containing an electroplating bath, said apparatus comprising a pair of endless tracks carried above said bath one at each side of the tank, each track having its reversal at each end about an axis having at least a component extending vertically, longitudinally-spaced series of elongate arms rollably movable on and freely hanging from one of said tracks, another series of elongate arms rollably mounted on and freely hanging from the other track and structurally independent of the arms of the first series, said arms of each series being held in such a spaced relationship that each arm in one of the series is transversely aligned with an arm of the other series whereby transversely aligned pairs of arms are formed, a conveyor connected to each series of the arms for moving them along said tracks, in-turned pipe-carrying fingers carried at the lower portion of each arm, said fingers of each aligned pair of arms being adapted to be inserted in and support the ends of a pipe length, a cam disposed in the path of travel of each series of arms for swingably spreading apart transversely aligned pairs of sufficient amount to permit a pipe length to be placed between their in-turned pipe-carrying fingers, automatic arm loading plunger mechanism for each series of arms, said plunger mechanism being disposed in position to swingably press said spread pairs of arms back into engagement with said positioned pipe length, said mechanism also having driving connection with and being operated in timed relationship with the rate of travel of an arm conveyor, and an arm-unloading cam also disposed in the path of travel of each series of arms for again swingably spreading apart said pairs of arms a sufficient amount to release their engagement of the pipe lengths, said tracks guiding said pipe-carrying members past said arm-loading means into and through said electroplating bath and then out of the bath and back to said loading means.

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