

E. T. GREENFIELD.

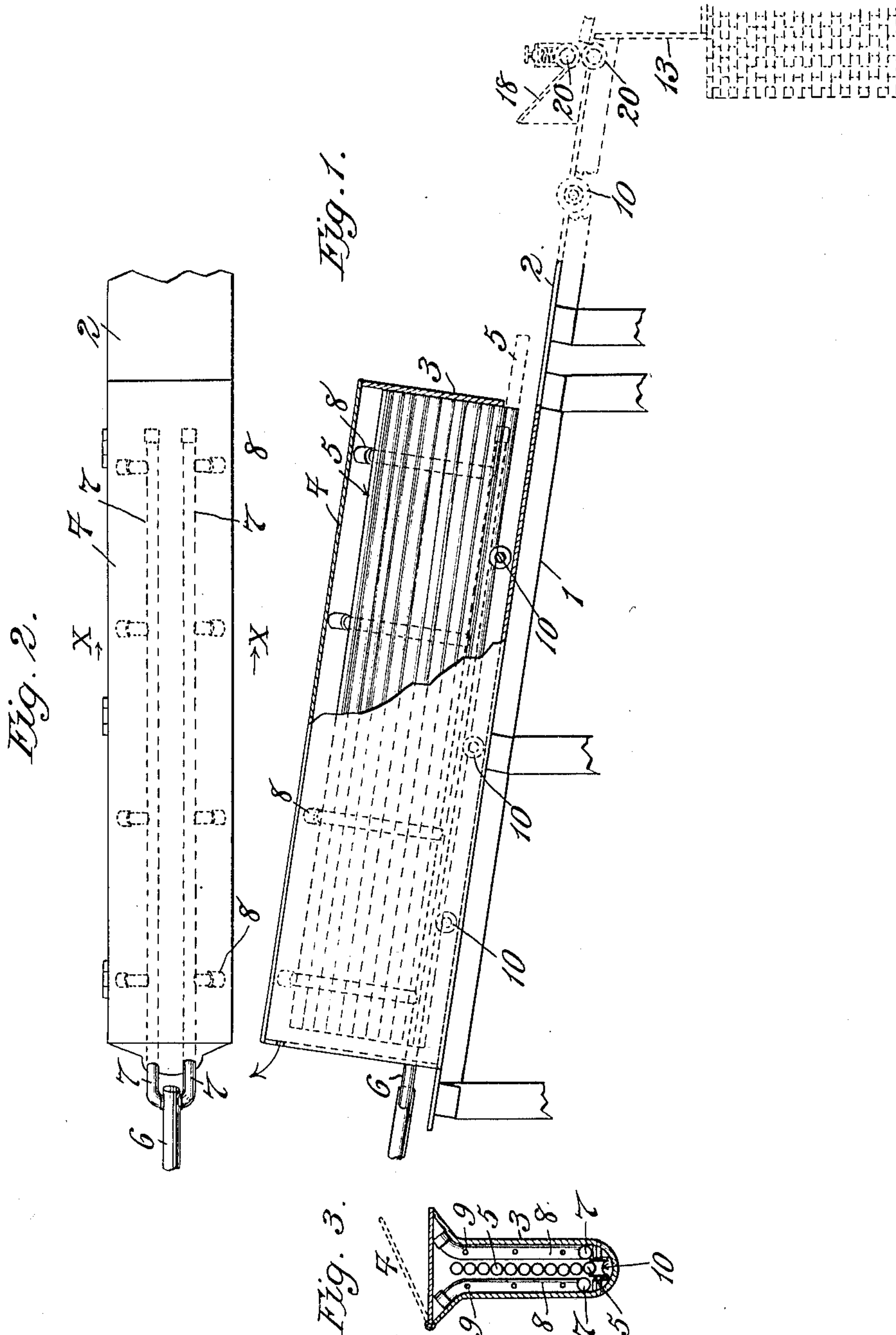
MECHANISM FOR TREATING METAL AND OTHER TUBES OR RODS.

APPLICATION FILED MAR. 25, 1909.

947,440.

Patented Jan. 25, 1910.

4 SHEETS—SHEET 1.



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By Attorney  
Charles J. Kintner

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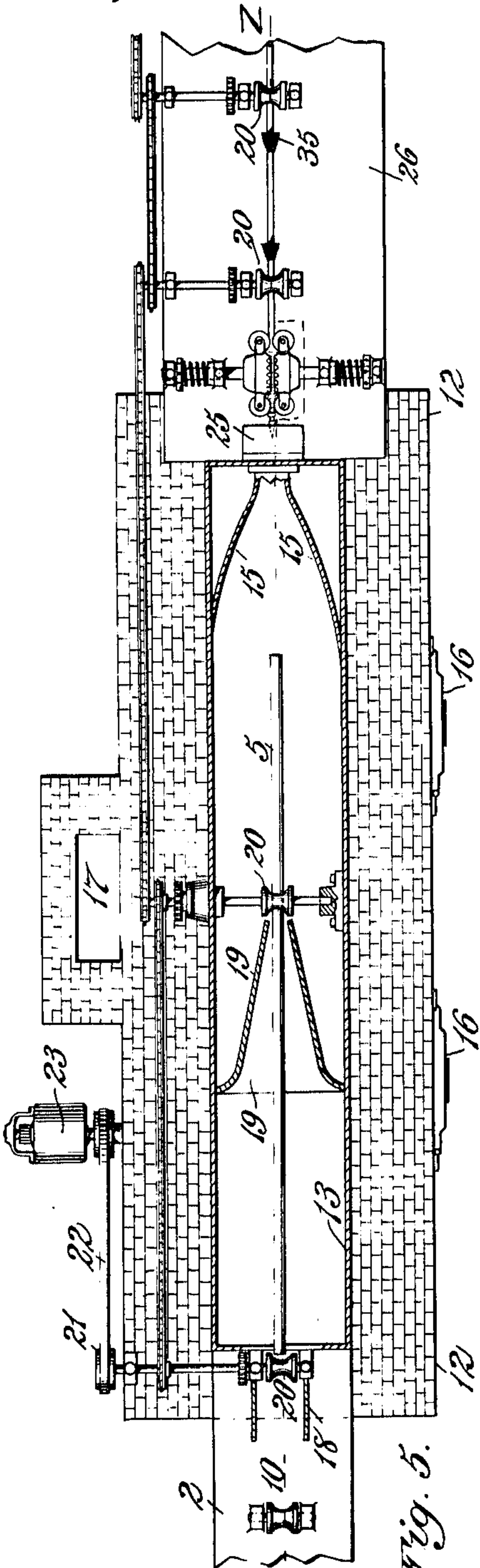


Fig. 5.

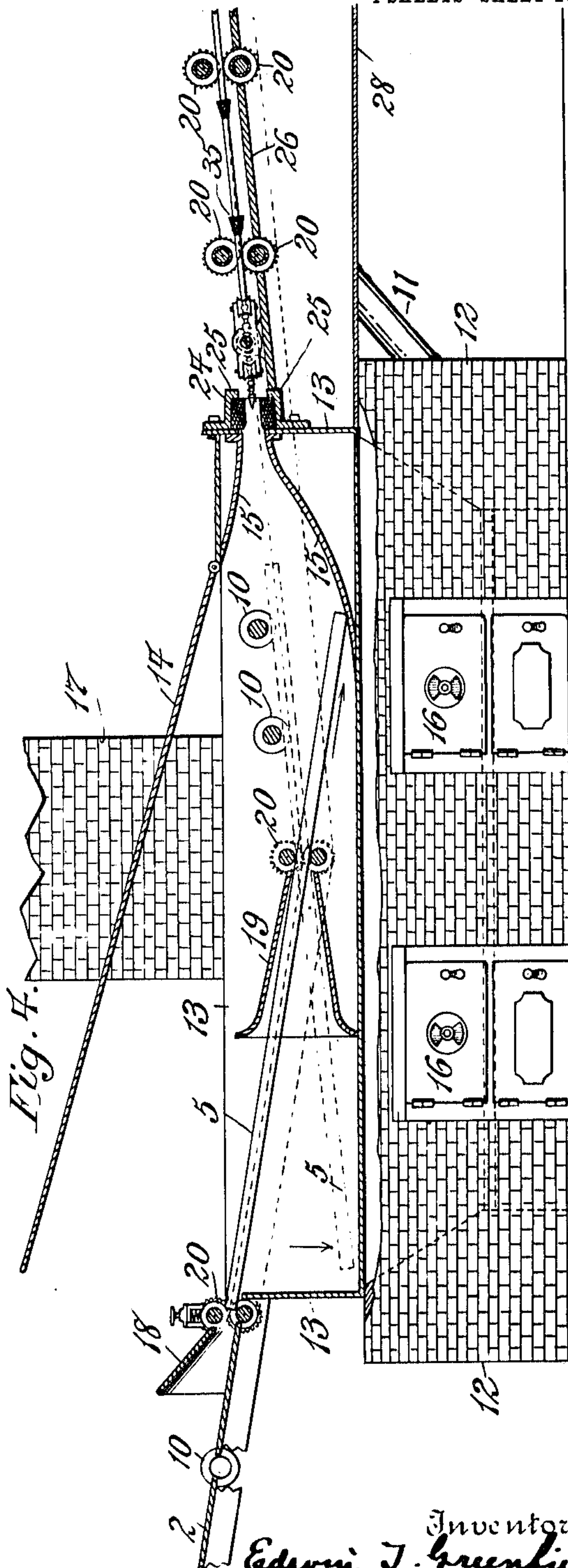


Fig. 4.

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Fig. 7.

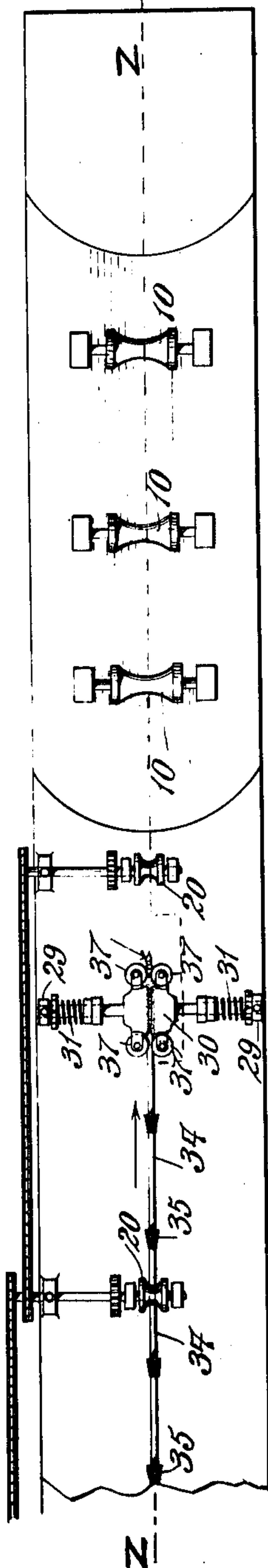
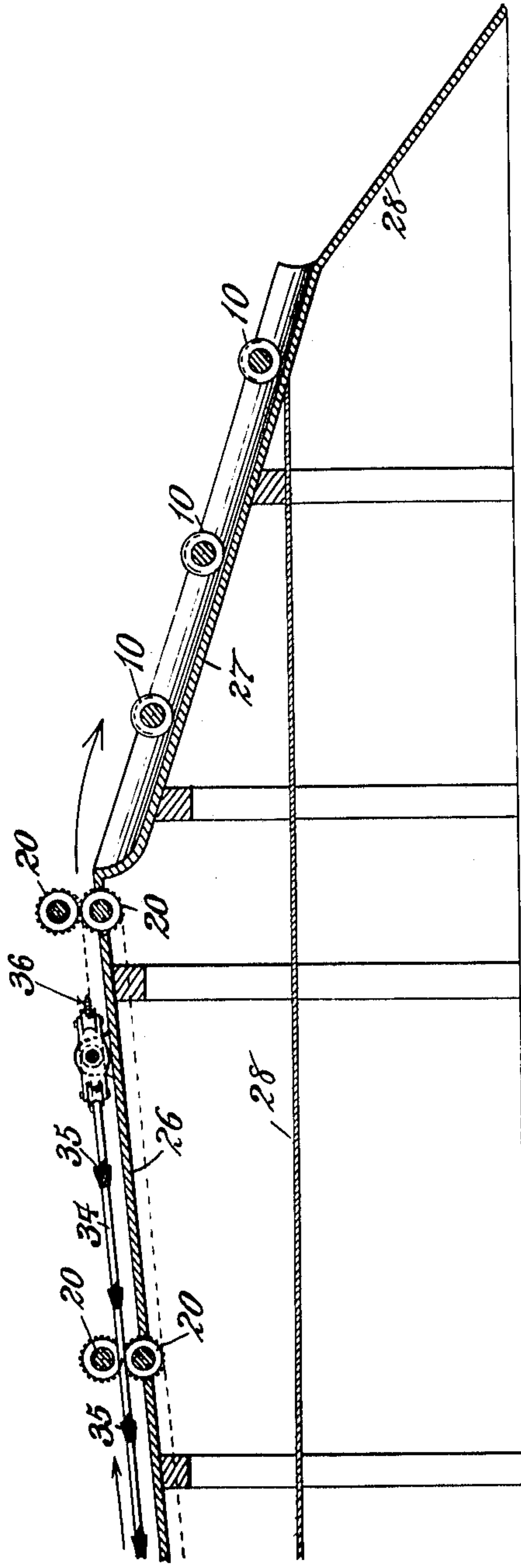


Fig. 6.



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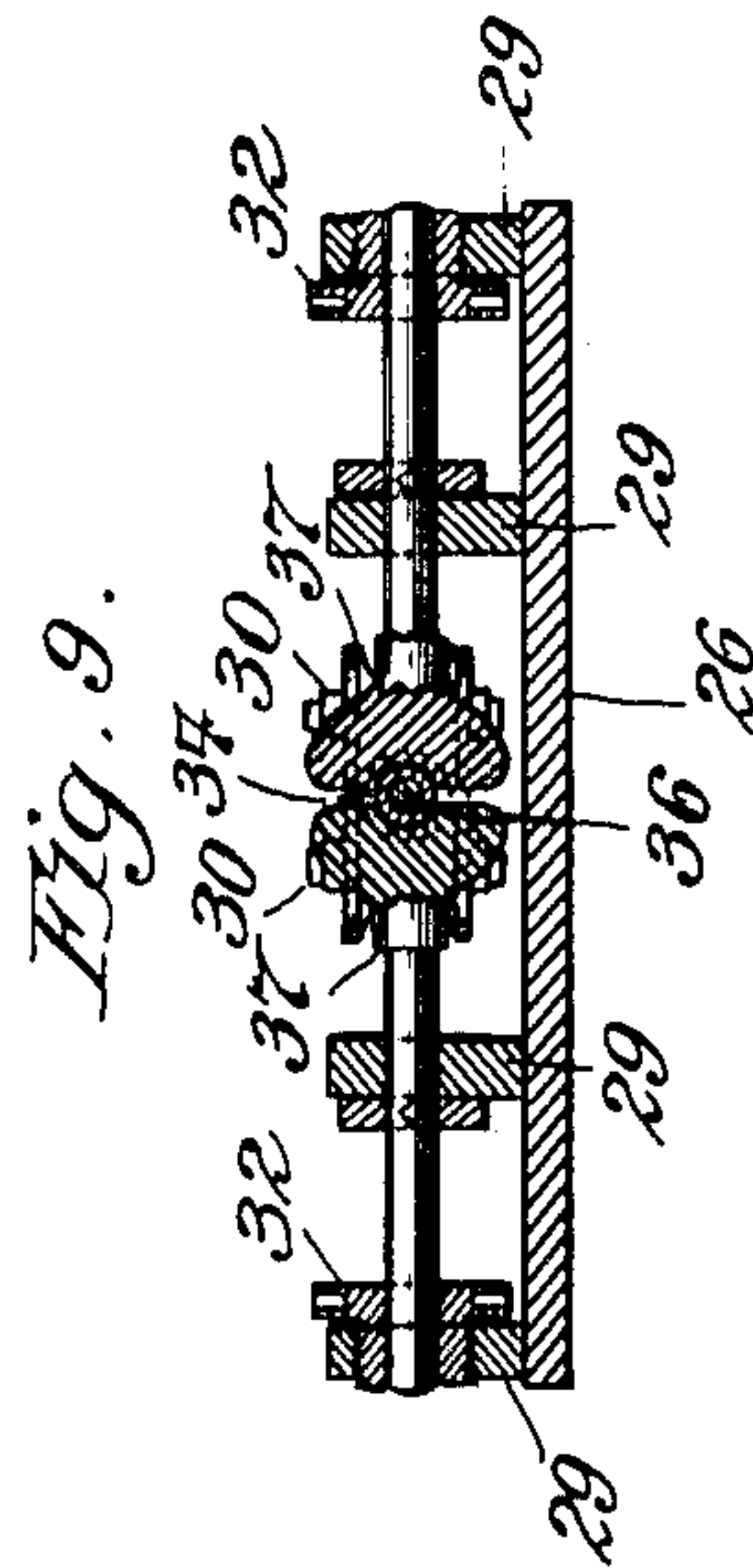
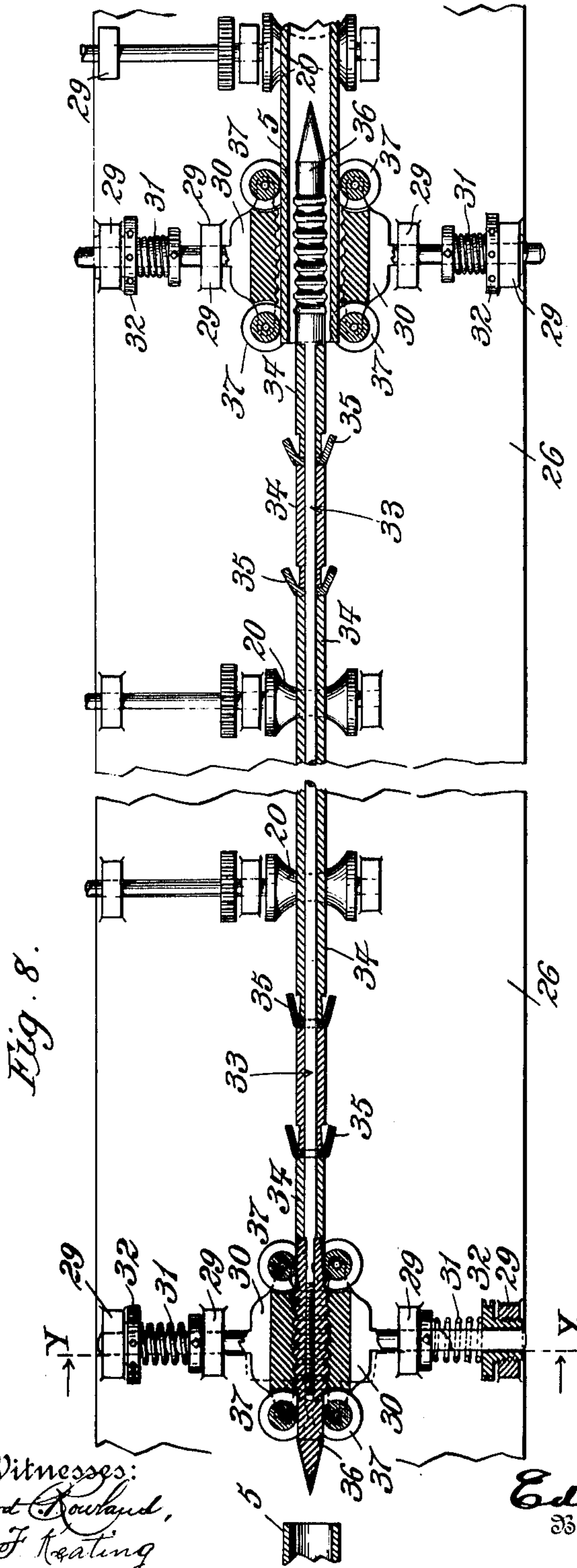


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4 SHEETS—SHEET 4.



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# UNITED STATES PATENT OFFICE.

EDWIN T. GREENFIELD, OF KIAMESHA, NEW YORK.

MECHANISM FOR TREATING METAL AND OTHER TUBES OR RODS.

947,440.

Specification of Letters Patent.

Patented Jan. 25, 1910.

Application filed March 25, 1909. Serial No. 485,735.

*To all whom it may concern:*

Be it known that I, EDWIN T. GREENFIELD, a citizen of the United States, and resident of Kiamesha, county of Sullivan, and State of New York, have made a new and useful Invention in Mechanism for Treating Metal and other Tubes or Rods, of which the following is a specification.

My invention is directed particularly to novel mechanism for treating metal tubes or rods with liquid coatings and it has for its objects, first, to effect such coating automatically and with great speed; second, to effect the interior coating of tubes of this nature in such manner as to give a smooth lining thereto which will afford little or no skin friction or resistance to the flow of gas, water, or other liquids; third, to provide novel means for effectually drying and seating the treating liquid as applied by my novel method to tubes or rods.

For a full and clear understanding of my invention, such as will enable others skilled in the art to construct the mechanism hereinafter described and claimed, reference is had to the accompanying drawings, in which Sheets 1, 2 and 3 should be placed end to end with Sheet 1 upon the left of Sheet 2 and Sheet 2 upon the left of Sheet 3.

Figure 1 of the drawings represents a side elevational view of that portion of the apparatus in which the tubes or rods to be treated are first heated to the desired temperature and then fed forward to the treating bath, one end of the heater being shown in broken sectional view for the purpose of illustrating the interior structure thereof, the dotted lines on the extreme right illustrating that portion of the apparatus through which the tubes or rods are successively fed to the treating bath. Fig. 2 is a plan view of Fig. 1 as seen looking thereat from the top toward the bottom of the drawing. Fig. 3 is a transverse sectional view taken through Fig. 2 on the line X—X as seen looking thereat from left to right in the direction of the arrows, the top or inclosing door being shown in this figure in closed position in full lines and in open position in dotted lines. Fig. 4 is a part side elevational, part sectional view (on the line Z—Z Figs. 5 and 7) of that portion of the treating bath by which the coating is effected and the liquid coating medium heated; the hinged top of the treating chamber being shown in open position, one of

the tubes being treated and fed forward and in two different positions, as shown in full lines and dotted lines; a portion of the mechanism by which the tubes are successively wiped, both exteriorly and interiorly, and fed forward after treatment, being shown on the right hand end of said figure. Fig. 5 is a part plan, part longitudinal sectional view of the mechanism shown in Fig. 4, the sectional view being taken through the treating chamber alone. Fig. 6 is a further sectional view on the line Z—Z Fig. 7, illustrating the continuation of that portion of the wiping and feeding mechanism shown on the right of Fig. 4. Fig. 7 is a plan view of Fig. 6. Fig. 8 is a part horizontal sectional and part plan view on an enlarged scale of that portion of the apparatus which effects the interior wiping of the tubes and the interconnected mechanism by which the same are successively fed forward after treatment; and Fig. 9 is a transverse sectional view taken through Fig. 8 on the line Y—Y and as seen looking thereat from left to right in the direction of the arrows.

My invention is particularly designed to effect a treatment of metal tubes by subjecting the same to a heated bath of some liquid which will effectually coat the same both exteriorly and interiorly, and with the greatest possible speed, and will subsequently wipe and polish the same; the entire mechanism being preferably automatic in its operation and so arranged that such tubes are first subjected to sufficient heat to seat or set the coating as they are advanced through a treating bath, which bath is in turn subjected to heat from a furnace or the like. The tubes are then automatically advanced in sequence and successively wiped, both exteriorly and interiorly while still hot, the exterior wiping being effected by means in the nature of a stationary wiper of proper softness and flexibility, the interior wiping being subsequently effected through the agency of what I term a "floating wiper" which is so devised that as the tubes are successively fed forward the interior is given a polished surface which will be practically as frictionless as that of porcelain lined tubes.

Prior to my invention it has been customary to treat metal tubes, such as iron or the like, to so-called galvanizing coatings, by immersing such tubes in a bath of molten zinc, tin and like liquids, and then removing



the same from the bath and successively wiping them first on the exterior surface and subsequently, interiorly. Such methods are slow and unsatisfactory and the tubes cool too quickly after the bath to obtain the best results. My novel apparatus for treating metal tubes in the manner hereinafter described gives marked improved results over such old methods, in that I am enabled to avoid practically all loss of heat units from the time that the tube leaves the bath until it is effectually wiped, both exteriorly and interiorly.

Referring now to the drawings in detail, in all of which like numerals of reference represent like parts, and first to Figs. 1 to 3, (Sheet 1) 1 represents a frame or structure embodying a series of inclined members supported by vertical standards, as shown, and carrying in turn a floor 2 upon which is supported a metal heating chamber 3 provided with a pivoted door 4 at its top. This chamber is of the desired length and capacity to subject the tubes 5 to be treated to the usual preliminary necessary heat before advancing the same to the treating bath. 6 represents a tube connected with a source of fuel supply, as gas, and 7, 7, are two branches entering at the bottom of the heating chamber 3 and extending the entire length thereof. 8, 8, are vertically disposed tubes extending therefrom upward within the inner walls of the chamber, there being four such sets of tubes which are provided with gas-jets or openings 9, 9, 9. 10, 10, 10 represent a series of rolls utilized generally throughout the apparatus for reducing the friction in the movement of the tubes 5 as they are successively advanced, it being apparent that the chamber 3 is open longitudinally at its bottom so that these tubes while being heated rest the first one upon the friction rolls and each successive tube upon the top of the other. They may be located on side ledges in pairs and released in any preferred way, thus minimizing their weight on the bottom tubes.

Referring now to Figs. 4 and 5 (Sheet 2) and in connection therewith to that portion of Fig. 1 illustrated in dotted lines on the right thereof, 12 represents the brick work of a furnace of proper dimensions and strength to support upon its top a liquid containing treating chamber 13, said chamber being preferably of box form and of metal or such other material as will withstand the relatively great heat of the furnace. 14 represents the pivoted lid or cover of such chamber, shown in this figure as in open position for permitting of the examination of the treating bath. 15 represents a throat at one end of the treating chamber for aiding in the movement of the tubes for properly focusing the ends thereof as they are successively advanced through the chamber and

to the wiping mechanism exterior thereto. 16, 16 represent the doors of the furnace and 17 the chimney for conveying away the products of combustion. This heating chamber may be heated by steam, gas, or any other source of heat, having sufficient capacity to heat the liquid treating agent to the desired temperature. 18 is a cone-shaped throat for guiding the tubes into the treating bath and 19 represents a similar throat located near the center thereof. 20, 20 represent, wherever used throughout the drawings, pairs of grooved feeding rolls located in alinement with each other and in direct alinement with all of the tubes 5, as they are being fed from the primary heating chamber 3, Fig. 1, there being shown six such pairs of rolls interconnected by gearing and sprocket wheels and chains, as clearly illustrated in Figs. 5 and 7, that pair on the left of Fig. 5 being operatively connected with a shaft carrying a pulley 21 which is connected in turn by a belt 22 with a driving source of energy, as an electric motor 23. It will also be understood that each pair of feeding rolls is provided with the necessary yielding adjusting means for varying the feed pressure between the rolls and tubes 5, so as to give the desired tractive effect upon the tubes, such adjustable means being shown on one pair of the rolls at the extreme left of Figs. 4 and 5. 24 shown at the extreme right hand end of Fig. 4 represents a flexible wiper having the same interior conformation as the exterior conformation of the tube or rod to be wiped; such wiper being secured in front of the outlet of the throat 15 by a tubular retaining collar 25 detachable from the chamber 13 through the agency of screws or bolts.

Referring now to Figs. 6 and 7 (Sheet 3) and to the extreme right hand portion of Figs. 4 and 5 (Sheet 2) 26 represents a floor similar in a general way to the floor 2 and secured to the extreme right hand end of the treating chamber 13, so that its upper surface is inclined as shown and practically in vertical alinement with the outlet of the throat 15, said floor being sustained at its outer end by standards, as shown in Fig. 6. 27 is an extension of this floor in the nature of a chute preferably curvilinear in cross section and having an inclination the reverse of that of the floor 26. 28 represents an additional floor secured at one end directly to the top of the brick work of the furnace 12 and at the other at a point near the outer end of the chute 27. The material of this floor 26, 27 and side walls, not shown but secured thereto, is preferably of iron for the purpose of constituting a heat retaining chamber adapted to be supplied with heat from the furnace 12 through a pipe 11, the function of this chamber being to give additional heat for the purpose of further dry-



ing or curing the tubes or rods as they are fed forward.

Referring to Figs. 8 and 9 (Sheet 4) in connection with the description already had as to Figs. 4, 5, 6 and 7, I will describe the structural parts of the apparatus by which the tubes or rods are successively fed forward as they are treated and successively wiped or polished interiorly, the structural features of this apparatus being illustrated in detail in these figures of the drawings. 29, 29, 29, 29 represent two pairs of vertical standards secured directly to the floor 26, the distance between these two pairs of standards being somewhat greater than the lengths of the individual tubes or rods 5 to be treated. To these pairs of standards are slidably secured two pairs of internally corrugated clutching or holding devices 30, 30, adapted to be forced forward toward each other by strong spiral springs 31, 31, 31, 31, which springs are made adjustable through the agency of screw-threaded adjusting devices 32, 32, 32, 32. 33 represents the supporting rod of the floating wiper, one end of which rod is enlarged and corrugated as shown and provided with a cone-shaped guiding point or head, the other end thereof being screw-threaded and adapted to be secured directly to an entirely similar corrugated and cone-shaped end, said corrugated and cone-shaped ends being both represented by the numeral 36. These corrugations correspond in turn with the like corrugations in the curvilinear opposite faces of the pairs of holding devices 30. To the opposite ends of said holding devices are secured pairs of guide-rolls 37, 37, there being two such pairs at each end of the floating wiper. 34, 34 represent respectively sectional tubular sleeves and 35, 35, wipers of soft or flexible material adapted to be threaded upon the rod 33 between the respective tubular sections 34 and having the conformation or shape shown. These wipers and the wiper 24, Fig. 4 may be made of such material as asbestos, cotton or other cloth; or, in fact of any yielding material which will give the desired interior surface polish or finish to the tubes being treated. This rod 33 and attached parts are combined in the manner clearly illustrated in the drawings and secured in place normally with the curvilinear corrugated faces of the holding devices 30, firmly but yieldingly gripping or clamping the same in the manner shown on the left of Fig. 8, both ends of such rod being normally held as shown on the left when no tube is being fed forward. As illustrated in Fig. 8, the incoming end of a tube 5 which has just been treated in the bath, is shown as approaching the cone-shaped end 36 of the floating wiper and the retiring end of a preceding tube is shown on the right as having been previously wiped

exteriorly and interiorly and as it is being advanced onward toward the chute 27 through the feeding rolls 20.

The manner of treating tubes with my novel invention will now be described, it being understood that a proper quantity of the liquid bath with which the tubes are to be treated has been placed in the treating chamber, as for instance, a liquid embracing the usual materials constituting a bath for the so-called galvanizing of iron tubes, and that the same is kept heated to the desired temperature by heat from the furnace 12. The desired number of tubes 5 having been previously pickled by treatment with a diluted acid of the proper character to remove the scales, oils and other extraneous substances, the same are placed in the heating chamber 3 and the gas having been ignited they—the tubes—are heated to the proper temperature to effect treatment in the bath. The motor 23 (Fig. 5) is then set in motion so as to effect the feed of the tubes through the agency of the interconnected sprocket chains and gear-wheels, in the direction shown by the arrows. The lower tube 5 is then, either manually or by driving rolls like those numbered 20, advanced over the rolls 10 until the outer right hand end thereof enters the first pair of feeding rolls on the left of Fig. 4. It is then immediately advanced in this heated condition into the heated bath in the treating chamber 13 and is again fed forward through the cone-shaped throat 19 to the second set of feeding rolls 20, which rolls, it will be noted, are sufficiently far in advance at the right hand end of the chamber to permit the rear end of the tube to drop by its own weight, when it is fully within said chamber, in the direction of the arrow, and into the position shown in dotted lines. It is aided further in this movement, in the event of its failure to drop by its own weight, by the inclination of the throat 15. As the tube advances and passes outward under the under side of the guide-rolls 10, 10 in the bath it is wiped exteriorly by the wiper 24, and the cone-shaped end 36 of the rod 33 enters the inner end thereof, while the outer surface passes between the ends of the guide-rolls 37 forcing the holding devices 30, 30 apart from each other to an extent equal to the diameter of the outer wall, thus liberating this end of the rod 33 and permitting the tube to be advanced through the first pair of feeding rolls 20 on the right of the heating chamber. As the tube is further advanced, therefore, by this pair of feeding rolls and is released from the last pair of such rolls within the chamber, its inner surface is successively wiped or polished by the series of wipers 35, 35, and these wipers being of proper material and individually so constructed as to give the best possible polish



to the inner surface of the tube, will act in accordance with such conditions and completely wipe or polish the interior thereof, it being understood that the holding devices 30, 30 on the right for the rod 33 and its interconnected parts will be held in gripping mechanical connection with the corrugations on the end 36, so that during the time that the holding devices 30, 30 on the extreme left hand end are held apart and the wiping is being effected, said rod will be mechanically held at its right hand end, and that after the tube is advanced over the wipers and the left hand end thereof released from the holding devices 30, 30 on the left, the right hand end of said tube will separate the holding devices 30, 30 on the extreme right in the same manner as it separated the like devices on the extreme left. In the meantime the holding devices on the extreme left will have been released as the left hand end of the tube passes from between them, so that now the floating rod and its attached parts will be held by the holding devices on the extreme left. It is thus apparent that each pair of holding devices successively holds this floating rod and accompanying parts as the tubes are being advanced. As the rod 5 is finally advanced under the pair of feeding rolls 20 at the extreme right of Fig. 8 and is again seized by the next pair of such rolls, the last pair of holding devices 30, 30 will assume the holding position shown by the pair on the extreme left, thus holding said floating rod and parts. Finally such tube passes outward in the direction of the arrows shown in Fig. 6 over the heating chamber which is heated from the furnace through the pipe 11 and in dried condition is released from the last pair of rolls on the extreme right of Fig. 6 and permitted to slide down the chute 27 over the rolls 10, 10 in its completed treated condition.

If the apparatus described and shown be used for treating and wiping rods, obviously the interior wiping device would be dispensed with, the feed rolls, however, shown in connection with Figs. 8 and 9, being retained for the purpose of advancing the rods until finally delivered over that part of the apparatus shown in Fig. 6.

I do not limit my invention to the details of construction illustrated in the accompanying drawings and hereinbefore described, the invention being directed generically to means for effecting the described treatment regardless of the structural nature of the parts by which this result is attained. Nor do I limit myself to the treatment of tubes, as obviously solid rods may be treated in this manner, or hollow tubes may be simply treated externally and wiped in the manner described without applying the interior wiping treatment where it is desired

to construct either tubes or rods having a polished exterior surface, it being apparent that in this instance the interior wiping mechanism illustrated in Figs. 8 and 9 of the drawings may be dispensed with, and in which event the exterior heating chamber would be of especial utility; as, for instance, in cases where tubes or rods are being treated with various types of bronze paints or liquid surfacing agents to which it is desired to give a finished appearance, my invention being directed generically to mechanism for the treatment of either tubes or rods in the manner described and for uses generally in the arts, the same having especial utility in treating tubes or rods with lacquering liquids; or, in all such uses where tubes or rods are treated with surfacing coatings.

No claim is made hereinafter to the method of treating metal tubes or rods with liquid coatings in the manner hereinbefore described, as such method constitutes the subject matter of an application filed by me in the United States Patent Office on the 17th day of July, 1909, bearing Serial No. 508,133.

I am aware that it is broadly old in the art of galvanizing iron or analogous wire to subject it to a bath of molten metal and draw the same therefrom through one or more masses of flexible wiping material, such as cotton waste, asbestos, and the like, thus giving to the wire a polished galvanized coating, and I make no claim hereinafter broad enough to include such methods or appliances, my invention being directed to the coating of rigid metallic tubes, either exteriorly or interiorly, or both, and the wiping of such tubes, exteriorly, or both exteriorly and interiorly, as they are forced forward from the bath.

Having thus described my invention what I claim and desire to secure by Letters Patent of the United States is—

1. Mechanism for coating tubes or rods, embracing means for heating the tubes, a liquid bath, and means for heating the bath; means for forcing the tubes or rods successively into the bath and out of the same; together with means for automatically wiping them as they leave the bath.

2. Mechanism for successively subjecting tubes to the treatment of a liquid coating agent and simultaneously wiping the same, consisting of means for heating the tubes; a liquid bath; means for heating the bath; means for drawing the tubes through and out of the bath in sequence; means for wiping the tubes on the exterior surfaces, and additional means for wiping them on their interior surfaces.

3. Tube treating mechanism, embracing means for heating the tubes, a bath, means for heating the bath, feeding rolls for successively advancing the tubes through and



out of the bath, stationary wiping means for wiping and polishing the exterior surfaces of the tubes as they advance, and additional wiping means for simultaneously wiping  
5 their interior surfaces.

4. A tube treating machine, embracing a liquid bath, means for heating said bath, means for heating the tubes, means for forcing the tubes through the bath in succession,  
10 and means for polishing the tubes as they emerge from the bath.

5. An apparatus for subjecting a tube to the treatment of a bath in the nature of a liquid coating agent, consisting of a contain-  
15 ing chamber for the coating agent, means for automatically removing the tube therefrom after it has been immersed in the bath a sufficient time, and additional sets of means for automatically wiping the exterior  
20 and interior surfaces of the tube after it is withdrawn from the bath.

6. Means for treating tubes to a liquid surfacing agent consisting of a liquid bath, and exterior and interior wipers operatively  
25 connected with means for removing the tube from the bath and simultaneously subjecting it as it is advanced to the action of said wipers.

7. In a tube treating apparatus a liquid  
30 bath; means for automatically removing the tube from the bath; means for wiping the exterior surface thereof as it leaves the bath; and additional means for wiping the interior thereof, said wiping means being  
35 operatively controlled by the same source of energy which feeds the tube through the bath.

8. An apparatus for wiping or polishing the interior surface of a tube embodying  
40 means for feeding said tube automatically forward; in combination with one or more wipers operatively supported by a rod, which rod is operatively connected in turn with stationary holding means in such man-  
45 ner that the said rod is alternately released from and connected to the holding means as the tube is advanced.

9. An apparatus for successively automati-  
50 cally wiping or polishing the interior of tubes, consisting of feeding mechanism for the tubes, a wiper supported by a rod of greater length than any of the tubes to be

wiped, and provided at its opposite ends with means for alternately connecting it to and disconnecting it from the stationary  
55 holding means.

10. An apparatus for treating tubes or rods with a coating agent, embracing means for heating the tubes, a treating chamber  
60 containing a liquid coating agent, a source of heat for heating said agent, means for successively feeding the tubes forward through the treating chamber and out of the same, means for wiping both the ex-  
65 terior and interior surfaces of the tubes, and inter-connections between the feeding means and the wipers whereby the tubes are successively treated and wiped or polished and finally delivered at a definite point  
70 ready for use.

11. A tube wiping machine embracing a plurality of feed rolls, one or more wipers and a floating rod therefor of greater  
75 length than any of the tubes to be wiped; in combination with stationary holding de- vices located at opposite ends of the rod; together with mechanical connections where-  
80 by, as the tubes are advanced, the floating rod, and hence the wiper or wipers carried thereby, is caused to remain stationary and the tubes are successively wiped or polished  
interiorly.

12. A tube wiping machine embracing an external wiper secured to a stationary means  
85 of support, an internal wiper carried by a rod of greater length than the tube to be wiped; together with stationary holding means at each end of the rod adapted to alternately hold the same at its opposite  
90 ends as the tube is fed forward.

13. An apparatus for wiping the interior of a tube embracing a wiping rod of greater  
95 length than the tube, stationary holding means at each end of the rod, said holding means being so constructed that they are successively detached from the opposite ends of said rod as the tube is fed forward.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWIN T. GREENFIELD.

Witnesses:

C. J. KINTNER,  
M. F. KEATING.