

No. 663,824.

Patented Dec. 11, 1900.

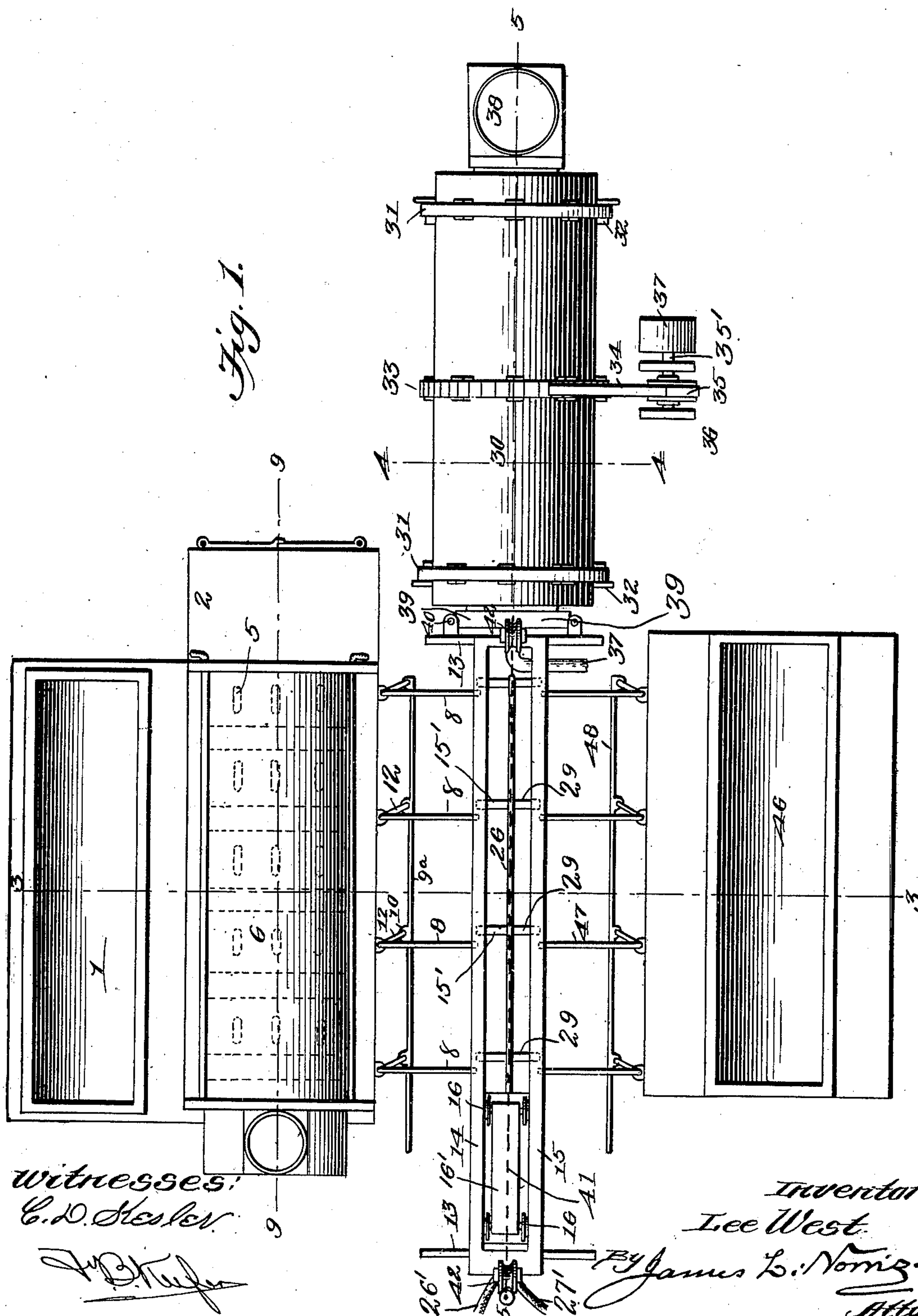
L. WEST.

APPARATUS FOR APPLYING COATINGS OF METAL TO BOILER TUBES OR
OTHER ARTICLES.

(Application filed June 7, 1900.)

(No Model.)

5 Sheets—Sheet 1.



Witnesses:

C. D. Hester

J. B. Kiefer

Inventor

Lee West

By James L. Norris
Atty.

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5 Sheets—Sheet 2.

Fig. 2.

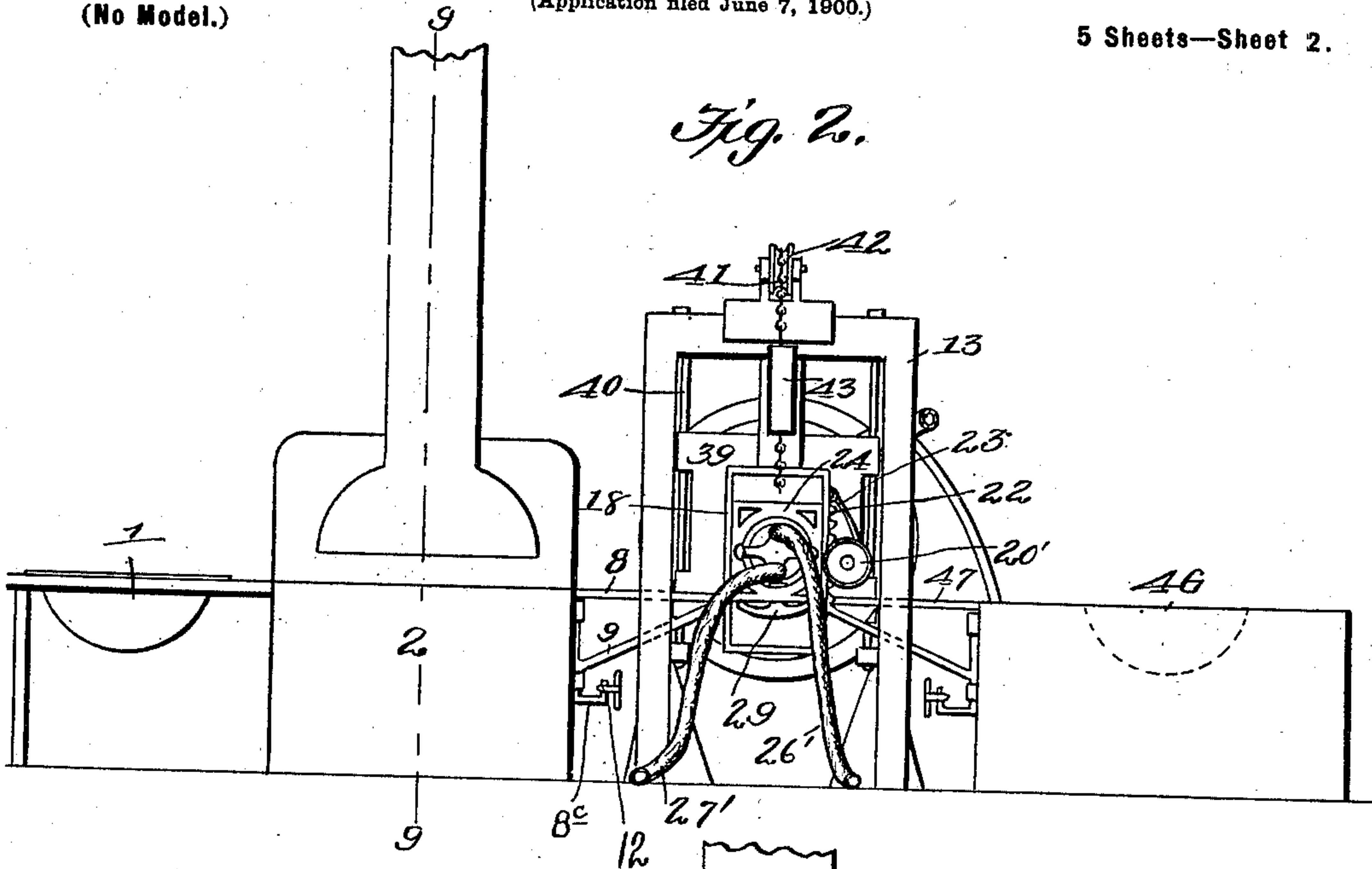


Fig. 3.

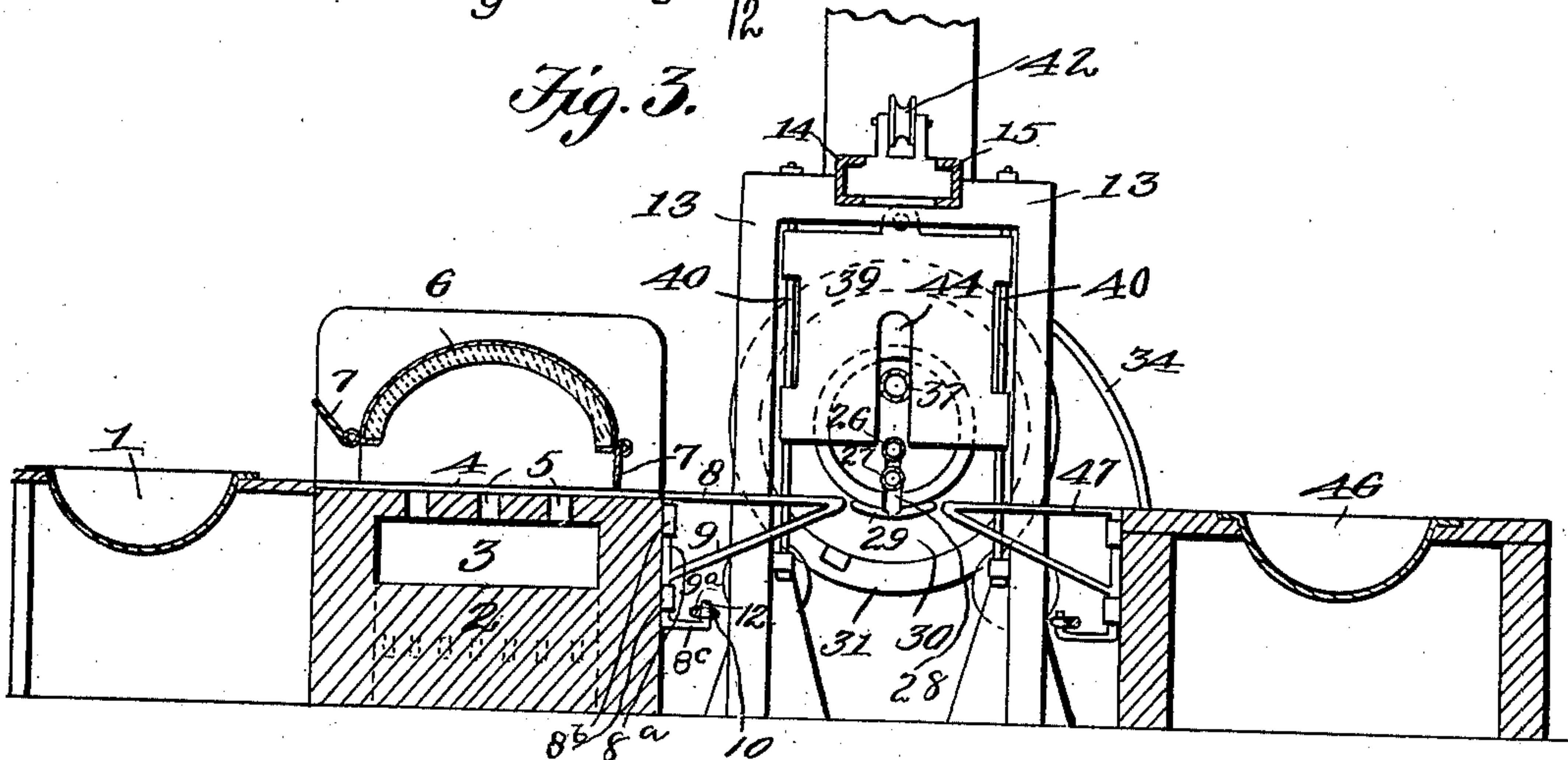
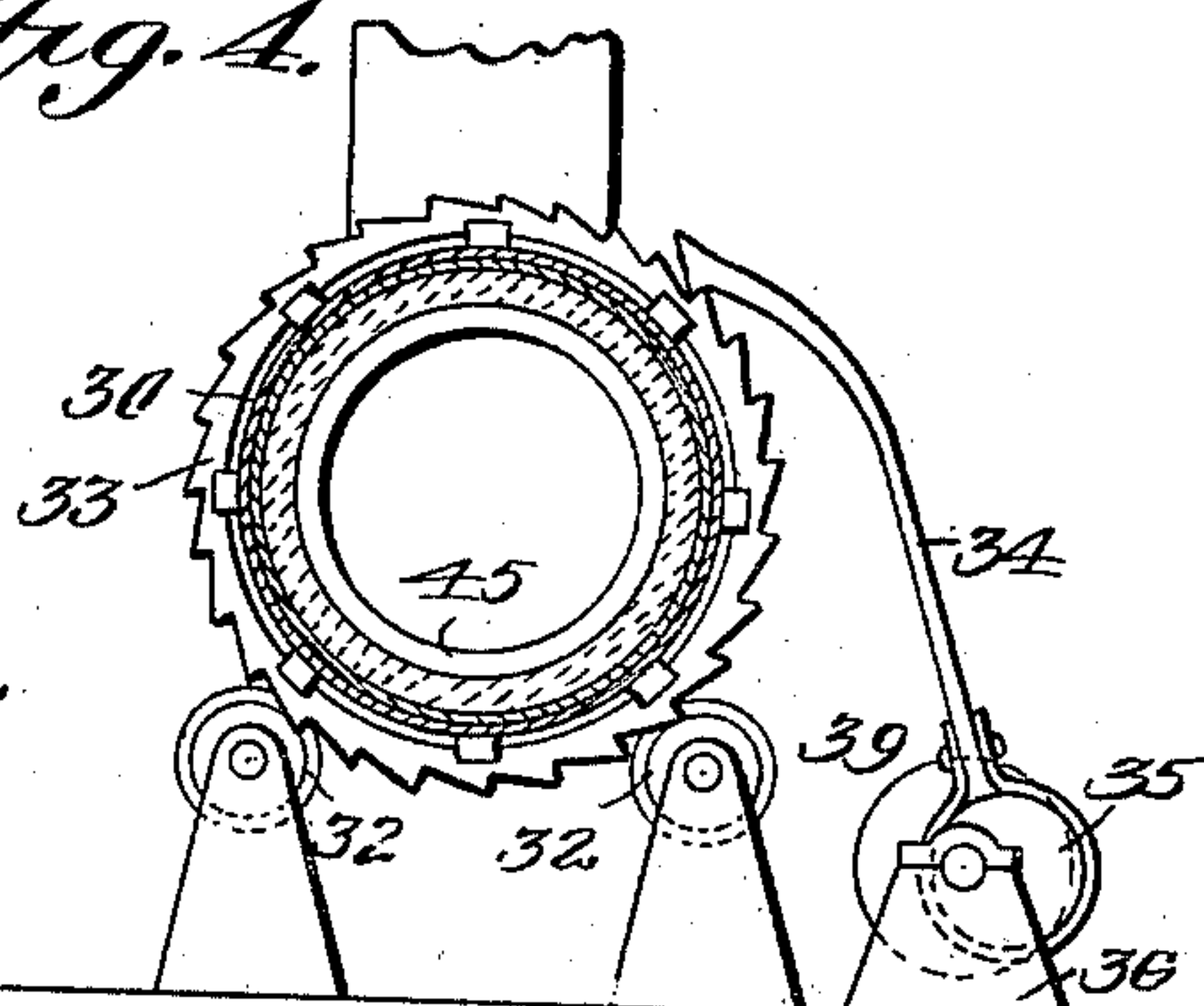


Fig. 4.



Witnesses:
E. D. Hesler
J. B. Keefe

Inventor
Lee West
By James L. Norris
Atty.

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L. WEST.

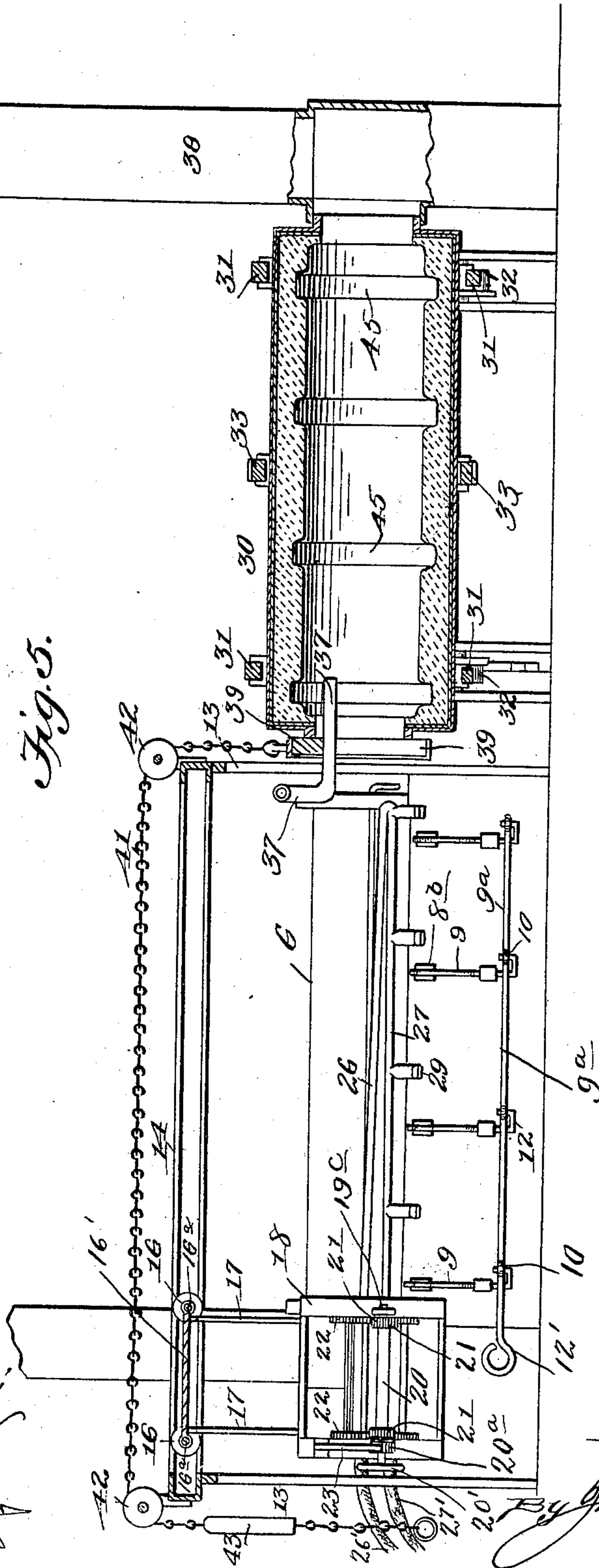
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5 Sheets—Sheet 3.

Fig. 5.



witnesses:
C. D. Herber
J. B. Kiefer

Inventor
Lee West

By James L. Norris
Att'y

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L. WEST.

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5 Sheets—Sheet 4.

Fig. 6.

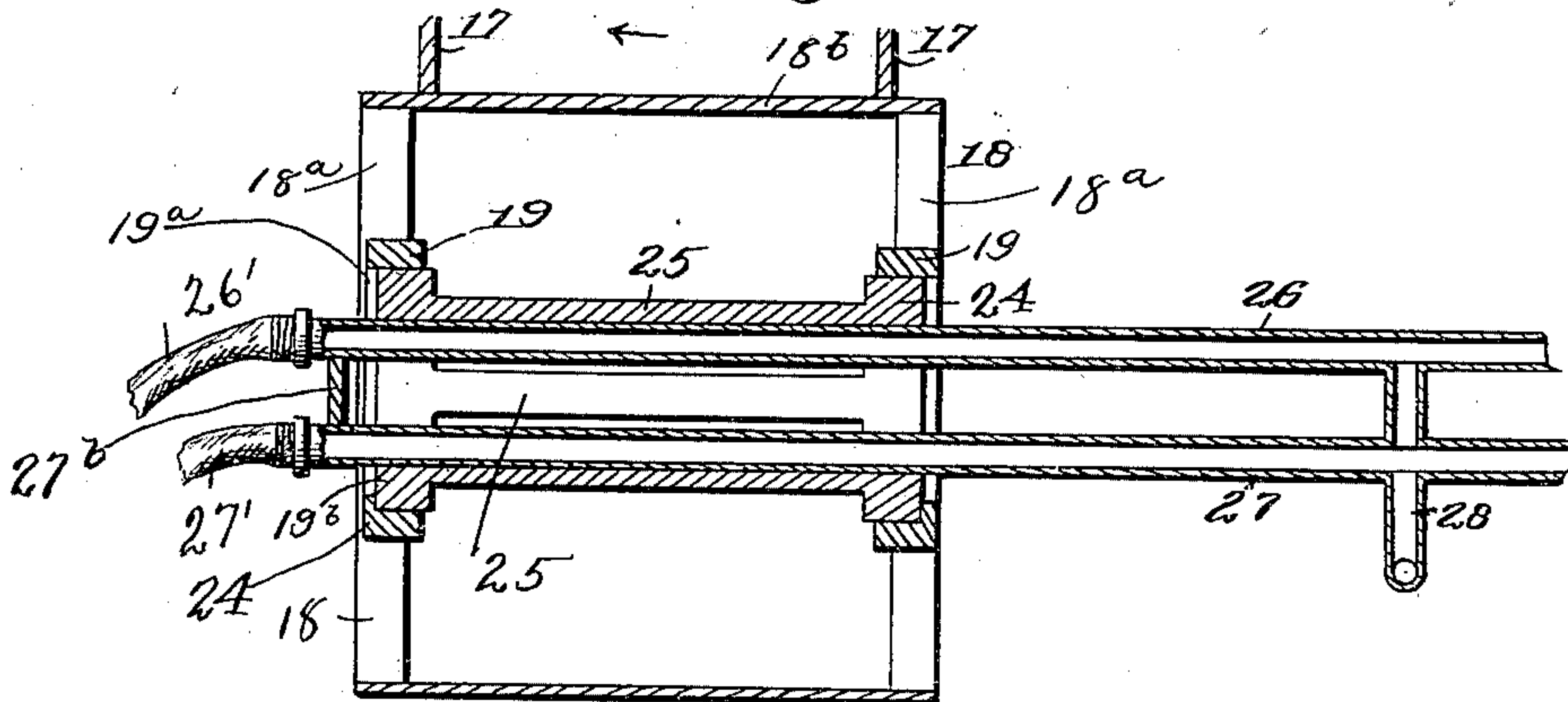


Fig. 7.

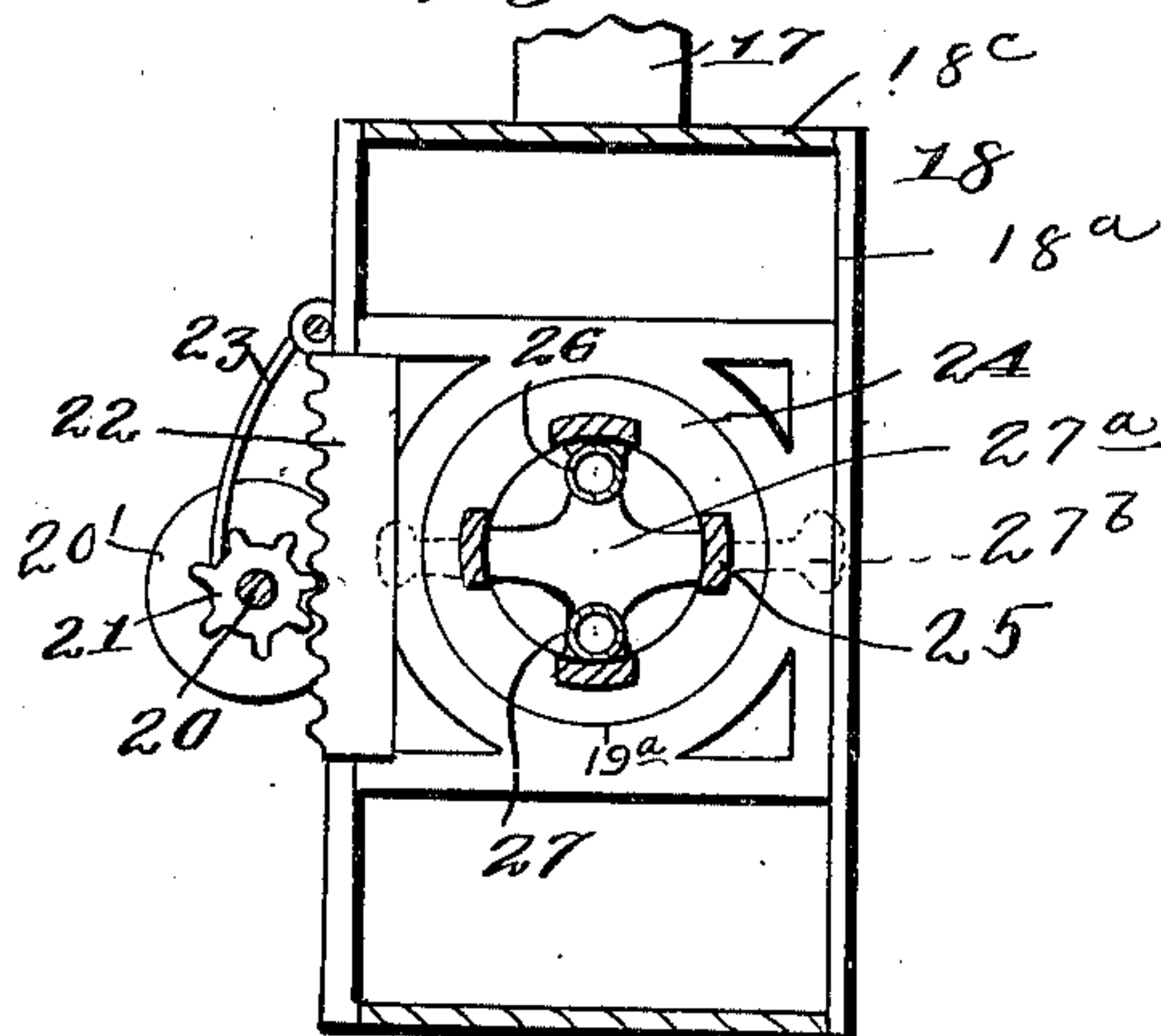


Fig. 8.

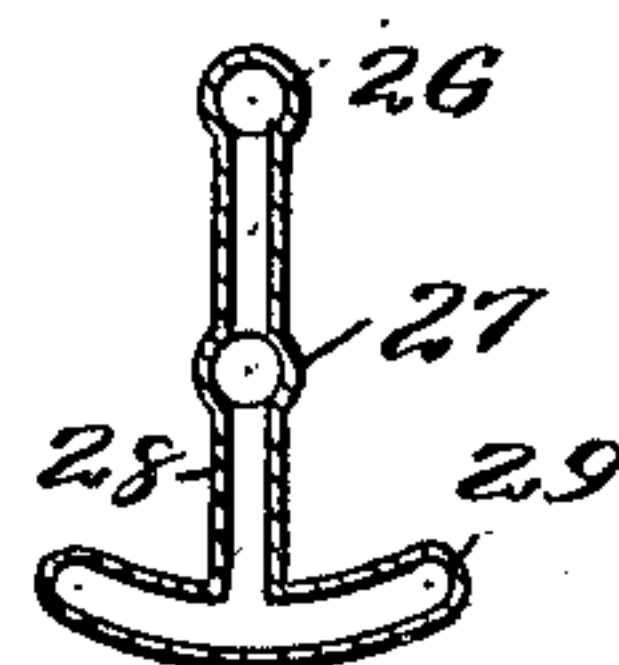
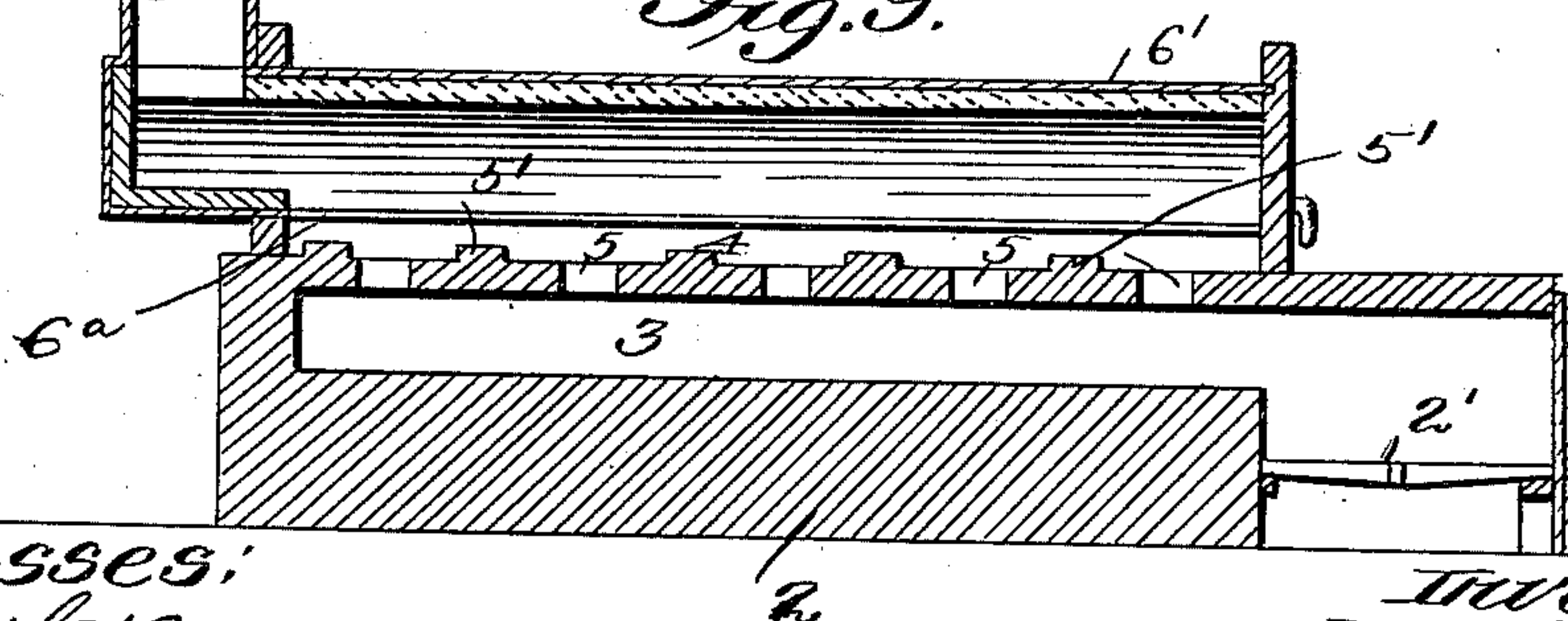


Fig. 9.



Witnesses:

E. D. Hester

J. B. Keefe

Inventor
Lee West

By James L. Norris
Atty

No. 663,824.

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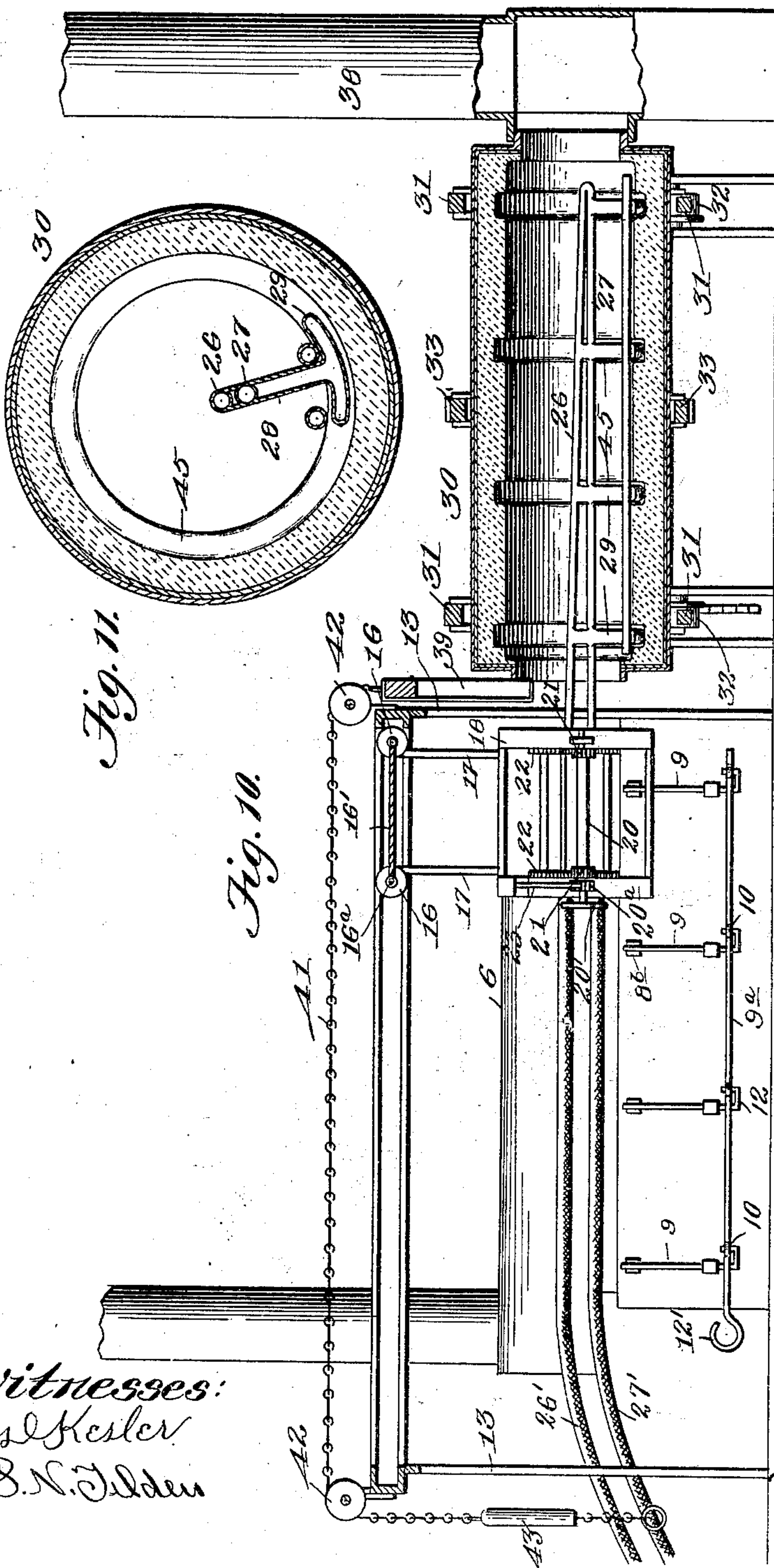
L. WEST.

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(No Model.)

(Application filed June 7, 1900.)

5 Sheets—Sheet 5.



Witnesses:
C. S. Kessler
B. N. Tilden

Inventor
Lee West

By James L. Norris
Atty.

UNITED STATES PATENT OFFICE.

LEE WEST, OF WELLSTON, OHIO, ASSIGNOR OF SEVEN-TWENTIETHS TO BENJAMIN F. KITCHEN, OF SAME PLACE, AND JOHN E. HARPER, OF GLEN ROY, OHIO.

APPARATUS FOR APPLYING COATINGS OF METAL TO BOILER-TUBES OR OTHER ARTICLES.

SPECIFICATION forming part of Letters Patent No. 663,824, dated December 11, 1900.

Application filed June 7, 1900. Serial No. 19,465. (No model.)

To all whom it may concern:

Be it known that I, LEE WEST, a citizen of the United States, residing at Wellston, in the county of Jackson and State of Ohio, have invented new and useful Improvements in Apparatus for Applying Coatings of Metal to Boiler-Tubes or other Articles, of which the following is a specification.

My invention relates to apparatus for applying a coating of metal to boiler-tubes and other articles. It is my purpose to provide novel means for the accomplishment of this object consisting of a tank for the cleansing solution and flux, a furnace to heat the tubes to dryness and melt the adhering films of fluxing material, a traveling crane and means for delivering the heated tubes thereto, a revolving furnace for the molten metal, in which the tubes are placed and from which they are removed by the traveling crane, and means for delivering the coated tubes from the crane to a tank containing a scouring solution, provision being made for cooling the arm of the crane which enters the revolving furnace by internal water circulation.

It is my object to provide a novel construction of each of the constituent parts named, whereby its functions shall be discharged in a novel and efficient manner and the final result attained with the least possible expenditure of time and labor.

I also aim to accomplish other novel and useful results, all of which will be fully explained hereinafter and then particularly pointed out and defined in the claims at the end of this specification.

For the purpose of the following description reference is had to the accompanying drawings, in which—

Figure 1 is a plan view of an apparatus constructed and arranged in accordance with my said invention. Fig. 2 is a front elevation. Fig. 3 is a vertical section on the line 3 3 in Fig. 1. Fig. 4 is a similar section on the line 4 4 of Fig. 1. Fig. 5 is a sectional side elevation of the revolving furnace. Fig. 6 is a vertical sectional view of the traveling and adjustable frames and a portion of the crane. Fig. 7 is a cross-sectional view of the traveling carriage looking in the direction of the

arrow, Fig. 6. Fig. 8 is a cross-sectional view of the crane. Fig. 9 is a longitudinal section of the furnace on the line 9 9, Fig. 1. Fig. 10 is a sectional side elevation of the revolving furnace and crane, showing the crane within the furnace. Fig. 11 is a cross-sectional view of the furnace, showing one position of the crane when delivering and withdrawing the pipes or tubes.

In the following specification the several parts of the mechanism will be referred to as nearly as possible in the order in which their individual functions are performed in the practice of my invention.

The reference-numeral 1 in said drawings indicates a tank, which may be constructed of cement or of boiler-plate, its length being such as to readily admit therein the sections of tubing to be treated. In this tank, which I term for convenience of reference the "fluxing-tank," is placed a solution consisting of twenty-five parts of pulverized borax, five parts of muriatic acid, and seventy parts of water. The tube or tubes to be treated are submerged in this solution.

Arranged adjacent to the fluxing-tank 1 is a furnace 2, provided at one end with a grate 2' and a combustion-chamber at the rear of and above the level of the grate. The chamber 3 is provided with a top 4, formed with a series of perforations 5 and having a series of ridges 5' upon its upper face on which the tubes rest. The furnace above the top 4 has mounted thereon an arched metallic hood 6, lined with refractory material 6', supported upon the inwardly-extending ridges 6². Pivotaly connected to each side of the dome 6 is a plate 7, extending from end to end of the hood and which can be turned so as to open or close the space between the horizontal edge of the hood 6 and the upper face of the top 4 of the chamber 3. The tank 1 is arranged alongside and parallel with one of the sides of the hood 6, so that the tubes, after being submerged in the solution in the tank 1, can be rolled upon the perforated top 4 under the hood 6 and the plate 7 dropped. Heat is produced by burning coal, oil, or gas in the fire-box, and the tubes are subjected to a heat of about 1,800°, which drives off

the water and melts the flux, forming a film or glaze over the tubes inside and out.

Upon the opposite side of the furnace, adjacent to the tank 1, are a series of horizontal bars 8, connected at their inner ends to a vertical support 8^a, pivotally connected to the keepers 8^b, secured to the side of the furnace. The outer ends of the bars 8 are suitably secured or formed integral with the outer ends of the inclined brace or supporting bars 9, secured at their inner ends to the vertical support 8^a. These bars 9 also form stops to prevent a downward movement of the vertical supports 8^a. The lower ends of each of the supports 8^a are bent at an angle, as at 8^c, and then vertically, forming a spur 12, upon which are mounted the eyes or loops 10 of the bar 9^a, provided with the handle 12'. The bar 9^a is adapted to swing the bars 8 and 9 and vertical supports 8^a parallel with and against the side of the furnace to which they are pivoted or to be turned outward at right angles to the same. The bars 8 9 and vertical support form brackets, and the bar 8 is on a line with the perforated wall 4, on which the tubes rest while heating, so that the latter can be readily rolled upon the former.

Parallel with and near the furnace is a framework consisting of vertical ends 13, supporting two elevated double rails 14 and 15, braced apart by means of the cross-stays 15' and between which run two pairs of grooved wheels 16, each pair mounted upon a separate axle 16^a, the axles being connected together by a platform 16', forming a carriage. Depending from the platform 16' is a series of hangers 17 for supporting a rectangular frame 18, constructed of the ends 18^a, connected together at their tops, bottoms, and sides by the horizontal and longitudinal braces 18^b 18^c, respectively.

Arranged within each end 18^a of the frame 18 is a vertically-adjustable frame 19, provided with a concentric opening 19^a. The lower part of the opening 19^a, near the outer edge thereof, is formed with a lug or shoulder 19^b, the function of which will be hereinafter described. Journaled in suitable brackets 19^c, secured to one side of the ends 18^a of the frame 18, is a shaft 20, rotated by the hand-wheel 20'. Mounted upon the shaft 20 is a pair of spur-gears 21, each of which is adapted to engage a vertical rack-bar 22, secured to the inner face of each of the frames 19 and projecting over the ends 18^a of the frame 18. By rotating the shaft 20 by means of the hand-wheel 20' the spur-gears meshing with the rack-bars 22 will vertically adjust the frame 19. The shaft 20 also carries a ratchet-wheel 20^a, which is engaged by the pawl 23, suitably connected to the frame 18. The pawl 23 by its engagement with the ratchet 20^a is adapted to retain the frame 19 in the desired position.

Arranged in the opening 19^a of each of the frames 19 is a swivel-support for the crane, and which consists of a pair of rings 24, con-

nected together by means of the supporting-rods 25. The rings 24 are mounted in the openings 19^a and retained therein by means of the lugs or shoulders 19^b. The swivel-support is adapted to revolve within the openings 19^a.

Extending through the swivel-support is the crane consisting of a pair of arms 26 27, formed of a hollow tube and bent in such a manner as to arrange the arms parallel with each other and which are suitably connected to two of the rods 25. The arms 26 27 are constructed of tubing to reduce their weight and bent in the manner shown to permit of the circulation of water therethrough to keep their temperature at the proper point and are therefore connected to suitable water supply and discharge pipes 26' 27', respectively. At the front of the crane, adjacent to the coupling connection 26^a of the water supply and discharge pipes, is a support 27^a, arranged between and suitably secured to the arms 26 27 and to the swivel-support and is provided with a handle 27^b for turning the same, arms 26 27, and swivel-support.

Depending from the arms 26 27 are a series of hollow rigid hangers 28, having at their lower ends anchor-shaped hooks 29, which lie in position to receive the tube lying on the bars 8, and by raising the arms of the crane the tube is lifted off said bars and sustained entirely by the hangers 28 and hooks 29.

At the end of the elevated railway is a cylindrical furnace 30, of heavy boiler-plate, lined with asbestos and then with fire-brick. It has exterior bands 31, of heavy metal, which rest upon antifriction-rolls 32. An intermediate ratcheted band 33 is engaged by a pawl 34, the lower end of which is connected to an eccentric 35, mounted on a shaft 35', having bearing in a floor-bracket 36. The shaft 35' is revolved by a pulley 37, driven by any suitable power. The furnace 30 is heated by gas, oil, or pulverized coal supplied through a pipe 37, the products of combustion passing off through a stack 38. The open end of the furnace 30 is provided with a gate 39, which slides upon vertical guides 40 and is raised and lowered by a chain 41, passing over grooved pulleys 42 on the end frames 13, the weight of the gate being counterbalanced by a weight 43. The fuel-feed pipe 37 passes through a slot 44 in this gate. The inner face of the furnace 30 is provided with grooves or channels 45 for the anchor-hooks 29.

On the other side of the elevated railway from the furnace 2 is a stripping or cleaning tank 46, the vertical walls of which, adjacent to the crane, are provided with a series of tube-supporting bars 47 similar to the bars 8 and supported to form brackets and operated in a like manner and are substantially opposite the bars 8 and in similar relation to the crane. They are extended or turned in against the tank 46 by a bar 48 and are about on a level with the top of the tank 46, so that the tubes deposited on them by the crane can be easily

rolled into the tank 45. The latter contains a solution consisting of zinc, five parts; sal-ammoniac, ten parts; muriatic acid, ten parts, and water, seventy-five parts.

5 The operation of the apparatus is as follows: Assume that a tube has been placed in the fluxing-tank 1 and submerged in the solution therein, after which it is removed and entered into the furnace 2 by elevating
10 the plate 7, the tube resting upon the perforated top 4 and being subjected to a heat of about 1,800°, which drives off the water and melts the flux, forming a film or glass upon the inner face and periphery of the
15 tube. The tube is then removed from the furnace in any desirable manner through the opposite plate 7 and placed upon the series of horizontal bars 8, the crane being lowered by means of the hand-wheel 20', shaft 20, and
20 spur-gears 21, operating upon the racks 22 of the frame 19. When the crane is lowered, the anchor-shaped hooks are carried therewith, so that the tube can be rolled from the bars 8 and be seated upon one arm at one side of
25 the hooks. The crane is then elevated, and the bars 8 are then swung away from the tube by means of the bar 9^a and its handle 12'. The door 39 of the furnace is elevated and the crane, with the tube, is pushed forward by
30 hand into the furnace 30. It will be evident by suspending the crane from the carriage mounted upon the rails 14 15 it will permit of the movement of the crane in the manner indicated. After the crane has entered the
35 furnace 30 it is then lowered by operation of the handle 20' and turned by means of its swivel connection to the frame 19, which causes the tube to roll from the hook into the molten metal within the furnace 30, and after
40 the tube has remained in the furnace the desired time the crane is lowered in such a manner that the opposite arm of the hooks will enter the grooves 45 beneath the tube. The crane is then elevated, causing the hooks to
45 engage the tube and be withdrawn from the furnace, carrying the former therewith. The bars 47 are swung outwardly, the tube rolled thereon and then submerged in the cleaning or stripping tank 46. When one tube has
50 been placed in the furnace, it is usually preferable to withdraw the crane to receive another tube from the furnace 2 or bars 8 and which is pushed forward into the furnace 30, and when lowered and dropped from one arm
55 of the anchor-hooks the opposite arm of the hooks when the crane is elevated will engage the tube that was first placed in the furnace. The crane is now withdrawn and during the removal of the tube to the bars 47 a new tube
60 is placed upon the arm of the hook from the bars 8, making a continuous operation. Of course it will be evident that the furnace 30 is constantly revolving and that the door 39 is lowered, closing the inlet to the furnace 30
65 when the crane is removed, and that the furnace 30 is heated by the pipe 37.

This mechanism is especially adapted for

plating boiler-tubes, water-pipes, and other metallic articles which are exposed to water containing lime, acids, and other substances
70 which are likely to cause deterioration of the tubes or pipes, which can be rapidly and perfectly plated with small expenditure of time and labor.

Having thus described my invention, what
75 I claim is—

1. In an apparatus for coating boiler-tubes or other articles, a fluxing-tank, a furnace arranged in suitable relation thereto, a per-
80 forated top wall for the said furnace, a hood mounted upon the said wall, and a hinged plate secured to each side of said hood and adapted to permit of the entrance and re-
removal of a tube or other article to the furnace.

2. In an apparatus for coating boiler-tubes
85 or other articles, a fluxing-tank, a furnace arranged in suitable relation thereto, a per- forated top wall for the said furnace, a hood mounted upon said wall, a hinged plate se-
90 cured to each side of said hood and adapted to permit of the entrance and removal of a tube or other article to the furnace, and a series of brackets suitably connected to said furnace.

3. In an apparatus for coating boiler-tubes
95 or other articles, a fluxing-tank, a furnace arranged in suitable relation thereto, a per- forated top wall for the said furnace, a hood mounted upon said wall, a hinged plate se-
100 cured to each side of said hood and adapted to permit of the entrance and removal of a tube or other article to the furnace, a series of brackets suitably connected to said fur-
105 nace, a cleaning-tank, a series of brackets suitably connected to said tank, a revolving furnace, and a crane arranged in suitable re-
lation to said revolving furnace.

4. In an apparatus for coating boiler-tubes or other articles, a fluxing-tank, a furnace
110 arranged in suitable relation thereto, a per- forated top wall for the said furnace, a hood mounted upon said wall, a hinged plate se-
115 cured to each side of said hood and adapted to permit of the entrance and removal of a tube or other article to the furnace, a series of brackets suitably connected to said fur-
120 nace, a cleaning-tank, a series of brackets connected to said cleaning-tank, a crane operating between the said series of brackets, and a furnace arranged in suitable relation to
said crane.

5. In an apparatus for coating boiler-tubes or other articles, a fluxing-tank, a furnace
125 arranged in suitable relation thereto, a per- forated top wall for the said furnace, a hood mounted upon said wall, a hinged plate se-
130 cured to each side of said hood and adapted to permit of the entrance and removal of a tube or other article to the furnace, a clean-
ing-tank, a series of horizontal bars connected to said cleaning-tank, a crane operating be-
tween the said series of horizontal bars, means for horizontally moving said crane, means for
vertically adjusting said crane, and a revol-

ing furnace arranged in suitable relation to said crane.

6. In an apparatus for coating boiler-tubes or other articles, a fluxing-tank, a furnace arranged in suitable relation thereto, a perforated top wall for the said furnace, a hood mounted upon said wall, a hinged plate secured to each side of said hood and adapted to permit of the entrance and removal of a tube or other article to the furnace, a series of brackets suitably connected to said furnace, a cleaning-tank, a series of brackets connected to said cleaning-tank, a crane operating between the said series of brackets, means for horizontally moving said crane, means for vertically adjusting said crane, a series of hooks suitably connected to said crane, and a revolving furnace arranged in suitable relation to said crane.

7. In an apparatus for coating boiler-tubes or other articles, a fluxing-tank, a furnace arranged in suitable relation thereto, a perforated top wall for the said furnace, a hood mounted upon said wall, a hinged plate secured to each side of said hood and adapted to permit of the entrance and removal of a tube or other article to the furnace, a series of brackets suitably connected to the said furnace, a cleaning-tank, a series of brackets connected to said cleaning-tank, a crane operating between the series of brackets, means for vertically adjusting said crane, a series of hooks carried by said crane, a traveling carriage connected to said crane, and a furnace arranged in suitable relation to said crane.

8. In an apparatus for coating boiler-tubes or other articles, a fluxing-tank, a furnace arranged in suitable relation thereto, a perforated top wall for said furnace, a hood mounted upon said wall, a hinged plate secured to each side of said hood and adapted to permit of the entrance and removal of a tube or other article to the furnace, a series of brackets suitably connected to the said furnace, a cleaning-tank, a series of brackets connected to said cleaning-tank, a crane operating between the series of brackets, means for vertically adjusting said crane, a series of hooks carried by said crane, a traveling carriage connected to said crane, a revolving furnace adapted to contain molten metal and arranged in suitable relation to said crane, and a vertically-adjustable gate therefor.

9. In an apparatus for coating boiler-tubes or other articles, a fluxing-tank, a furnace arranged in suitable relation thereto, a perforated top wall for said furnace, a hood mounted upon said wall, a hinged plate secured to each side of said hood and adapted to permit of the entrance and removal of a tube or other article to the furnace, a series of brackets suitably connected to the said furnace, a cleaning-tank, a series of brackets connected to said cleaning-tank, a crane operating between the series of brackets, means for vertically adjusting said crane, a series of hooks carried by said crane, a traveling

carriage connected to said crane, a furnace adapted to contain molten metal arranged in suitable relation to said crane, a fuel-feed pipe therefor, a vertically-adjustable gate therefor, and means for revolving said furnace.

10. In an apparatus for coating tubes or other articles, a fluxing-tank, a furnace arranged in suitable relation thereto, a cleaning-tank, a vertically-adjustable horizontally-movable crane interposed between said furnace and cleaning-tank, means for operating said crane, and a revolving furnace arranged in suitable relation to said crane.

11. In an apparatus for coating tubes or other articles, a fluxing-tank, a furnace provided with a perforated top wall above its combustion-chamber, and arranged in suitable relation to said fluxing-tank, a cleaning-tank, a vertically-adjustable, horizontally-movable hollow crane interposed between said furnace and cleaning-tank, means connected to said crane to permit of the circulation of a cooling medium therethrough, operating means for said crane, and a revolving furnace arranged in suitable relation to said crane.

12. In an apparatus for coating tubes or other articles, a fluxing-tank, a furnace arranged in suitable relation thereto, a cleaning-tank, a traveling carriage interposed between said furnace and said cleaning-tank, a vertically-adjustable hollow crane connected to said carriage, means connected to said crane to permit of the circulation therethrough of a cooling medium, a series of hooks connected to said crane, and a revolving furnace arranged in suitable relation to said crane.

13. In an apparatus for coating tubes or other articles, a fluxing-tank, a furnace arranged in suitable relation thereto, a cleaning-tank, a carriage interposed between said furnace and cleaning-tank, a vertically-adjustable hollow crane connected to said carriage, means connected to said crane to permit of the circulation therethrough of a cooling medium, a series of hooks connected to said crane, a cylindrical furnace, means for feeding fuel thereto and means for revolving the same.

14. In an apparatus for coating tubes or other articles, a vertically-adjustable crane, means connected to said crane and adapted to permit of a horizontal movement thereof, a series of hooks carried by said crane, and a revolving furnace arranged in suitable relation to said crane.

15. In an apparatus for coating tubes or other articles, a vertically-adjustable hollow crane, a traveling carriage connected to said crane, means connected to the crane to permit of the circulation therethrough of a cooling medium, a cylindrical furnace arranged in suitable relation to said crane, and means for revolving said furnace.

16. In an apparatus for coating tubes or other articles, a vertically-adjustable crane,

means connected thereto and adapted to permit of a horizontal movement thereof, a series of hooks connected to said crane, a cylindrical furnace arranged in suitable relation to said crane and provided on its inner face with a series of grooves, adapted to receive said hooks, and means for revolving said furnace.

17. In an apparatus for coating tubes or other articles, a vertically-adjustable crane, means connected thereto and adapted to permit of a horizontal movement thereof, a series of hooks connected to said crane, a cylindrical furnace provided on its inner face with a series of grooves and arranged in suitable relation to said crane, a vertically-adjustable gate connected to said furnace, and means for revolving said furnace.

18. In an apparatus for coating tubes or other articles, a traveling carriage, a vertically-adjustable hollow crane suspended therefrom, a series of hooks carried by the said crane, a water supply and discharge pipe connected to said crane, a cylindrical furnace arranged in suitable relation to said crane, operating means for revolving said furnace, and a fuel-feed pipe extending into the said furnace.

19. In an apparatus for coating boiler-tubes or other articles, the combination with a fluxing and cleaning tank, and a furnace arranged in suitable relation to said fluxing-tank, of two series of pivoted brackets connected to said cleaning-tank and furnace, a railway interposed between said brackets, a traveling carriage operating upon said railway, a frame suspended therefrom, a vertically-adjustable frame arranged therein, means for adjusting said frame, a crane swiveled at one end to said adjustable frame, and a revolving furnace arranged in suitable relation to said frame, substantially as described.

20. In an apparatus for coating boiler-tubes or other articles, the combination with a fluxing and cleaning tank, and a furnace arranged in suitable relation to said fluxing-tank, of two series of pivoted brackets connected to said cleaning-tank and furnace, a railway interposed between said brackets, a traveling carriage operating upon said railway, a frame suspended therefrom, a vertically-adjustable frame arranged therein, means for adjusting said frame, a crane swiveled at one end to said adjustable frame, a series of hooks carried by said crane, and a revolving furnace arranged in suitable relation to said crane, substantially as described.

21. In an apparatus for coating boiler-tubes or other articles, the combination with a fluxing and cleaning tank, and a furnace arranged in suitable relation to said fluxing-tank, of two series of pivoted brackets suitably connected to said cleaning-tank and furnace, a railway interposed between said brackets, a traveling carriage operating upon said railway, a frame suspended therefrom, a vertically-adjustable frame arranged therein,

means for adjusting said frame, a crane swiveled at one end to said adjustable frame, a series of hooks carried by said crane, means connected to said crane to permit of a circulation therethrough of a cooling medium, and a revolving furnace arranged in suitable relation to said crane, substantially as described.

22. In an apparatus for coating boiler-tubes or other articles, the combination with a fluxing and cleaning tank, and a furnace arranged in suitable relation to said fluxing-tank, of two series of pivoted brackets suitably connected to said cleaning-tank and furnace, a railway interposed between said bars, a traveling carriage operating upon said railway, a frame suspended therefrom, a vertically-adjustable frame arranged therein, means for adjusting said frame, a crane swiveled at one end to said adjustable frame, a series of hooks carried by said crane, means connected to said crane to permit of a circulation therethrough of a cooling medium, a cylindrical furnace arranged in suitable relation to said crane, and means for revolving the same, substantially as described.

23. In an apparatus for coating boiler-tubes or other articles, the combination with a fluxing and cleaning tank, and a furnace arranged in suitable relation to said fluxing-tank, of two series of pivoted brackets suitably connected to said cleaning-tank and furnace, a railway interposed between said bars, a traveling carriage operating upon said railway, a frame suspended therefrom, a vertically-adjustable frame arranged therein, means for adjusting said frame, a crane swiveled at one end to said adjustable frame, a series of hooks carried by said crane, means connected to said crane to permit of a circulation therethrough of a cooling medium, a cylindrical furnace arranged in suitable relation to said crane, a vertically-adjustable gate therefor, and means for revolving said cylindrical furnace, substantially as described.

24. In an apparatus for coating boiler-tubes or other articles, the combination with a fluxing and cleaning tank, and a furnace arranged in suitable relation to said fluxing-tank, of two series of pivoted brackets suitably connected to said cleaning-tank and furnace, a railway interposed between said bars, a traveling carriage operating upon said railway, a frame suspended therefrom, a vertically-adjustable frame arranged therein, means for adjusting said frame, a crane swiveled at one end to said adjustable frame, a series of hooks carried by said crane, means connected to said crane to permit of a circulation therethrough of a cooling medium, a cylindrical furnace arranged in suitable relation to said crane, a vertically-adjustable gate therefor, operating means for said gate, a fuel-feed pipe extending therethrough into said cylindrical furnace, and means for revolving the said cylindrical furnace, substantially as described.

25. In an apparatus for coating boiler-tubes

or other articles, a traveling carriage, a vertically-adjustable horizontally-movable crane connected thereto, means for adjusting said crane, a series of hooks having anchor-shaped ends carried by said crane, and a revolving furnace arranged in suitable relation to said crane.

26. In an apparatus for coating boiler-tubes or other articles, a traveling carriage, a vertically-adjustable horizontally-movable crane connected thereto, means for adjusting said crane, a series of hooks having anchor-shaped ends carried by said crane, means connected to the said crane to permit of a circulation there-through of a cooling medium, and a revolving furnace arranged in suitable relation to said crane.

27. In an apparatus for coating boiler-tubes or other articles, a horizontally-movable vertically-adjustable frame provided with suitable hooks, a cylindrical crucible provided on its inner face with a series of annular grooves, adapted to receive said hooks, a pair

of bands surrounding the same and resting upon a pair of antifriction-rollers, a ratchet-band surrounding said cylinder and arranged between the pair of bands, means engaging said ratchet-band for revolving said crucible, a sliding gate, and means connected to said gate for adjusting the position thereof, substantially as described.

28. In an apparatus for coating boiler-tubes or other articles, a furnace, a perforated top wall for the combustion-chamber thereof, a series of ridges formed upon the upper face of said wall, a hood mounted upon said furnace and extending over said top, and a hinged plate secured to each side of said hood, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

LEE WEST.

Witnesses:

FRED M. LENNAR,
WM. A. NOBLE.