

Sept. 27, 1932.

B. F. ANTHONY

1,879,009

APPARATUS FOR FINISHING AND TESTING TUBULAR PRODUCTS

Filed May 7, 1930

2 Sheets-Sheet 1

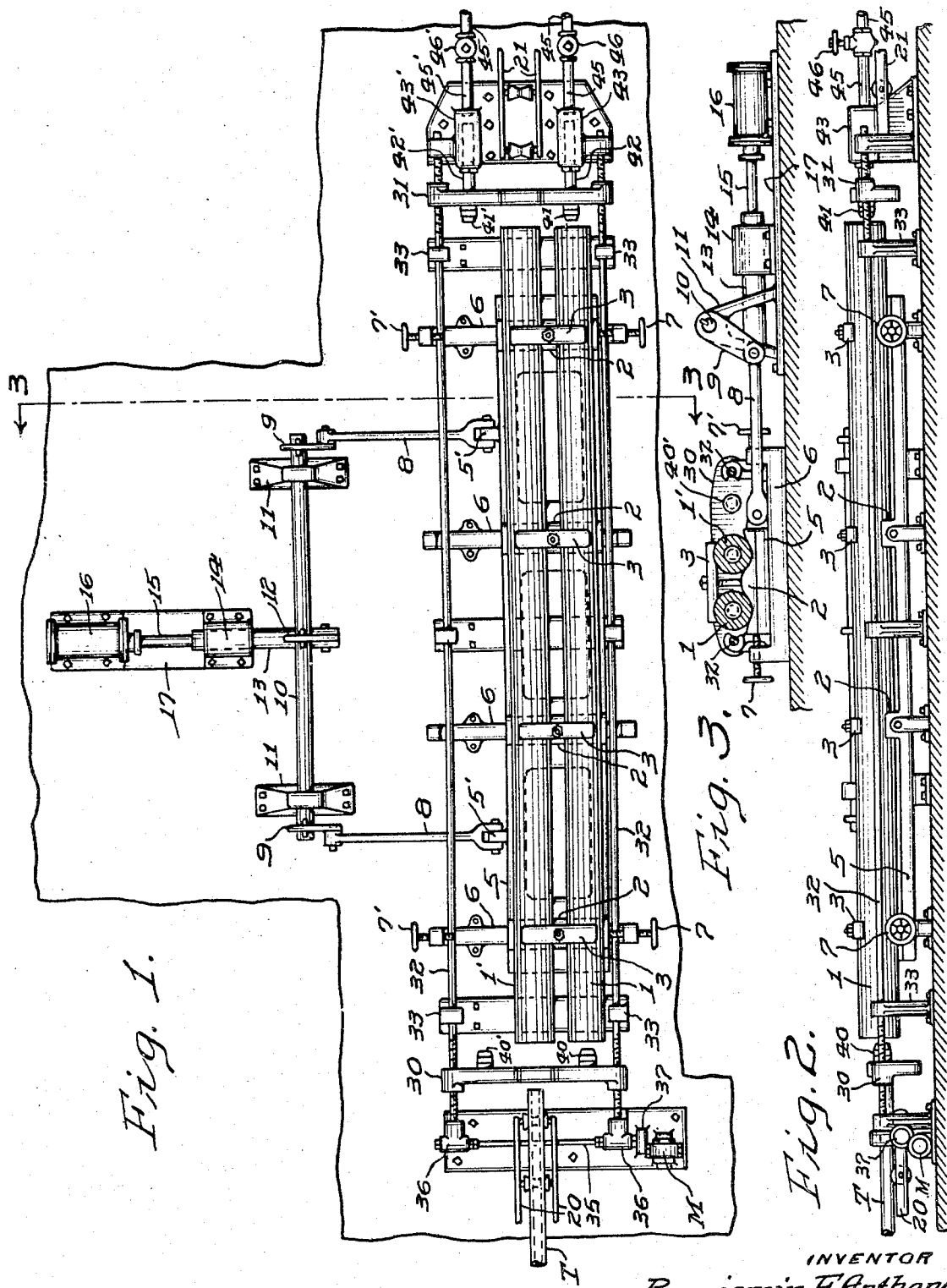


Fig. 1.

Fig. 3.

Fig. 2.

WITNESS

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APPARATUS FOR FINISHING AND TESTING TUBULAR PRODUCTS

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2 Sheets-Sheet 2

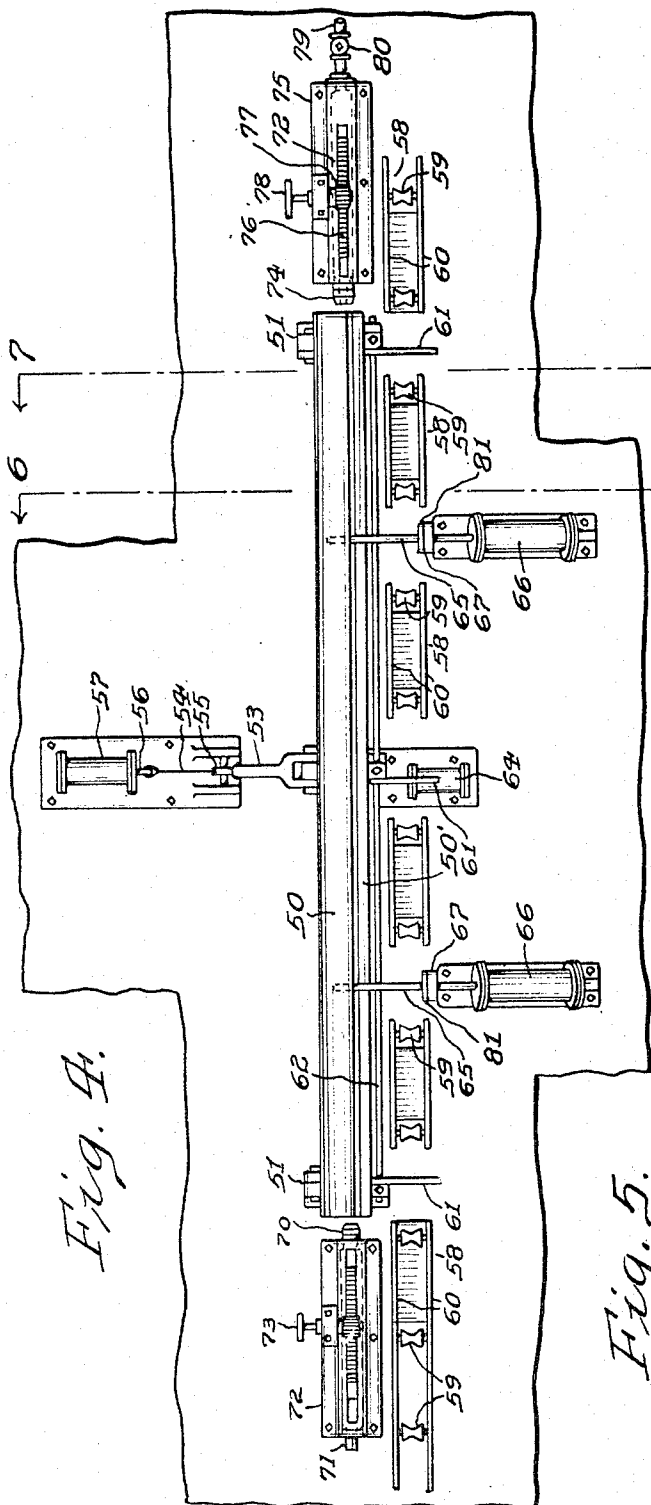


Fig. 4.

Fig. 5.

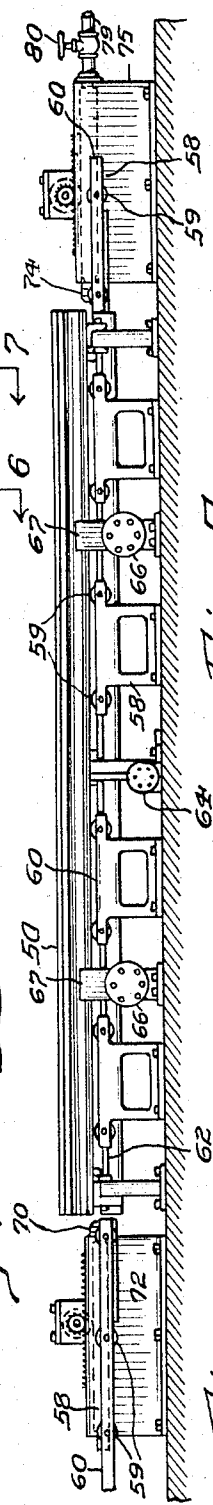


Fig. 7.

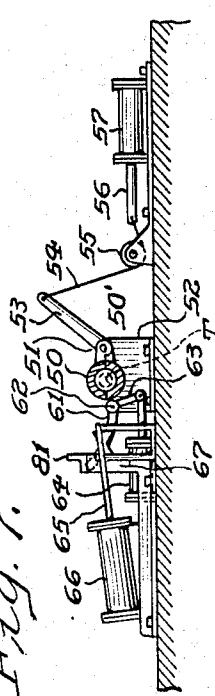
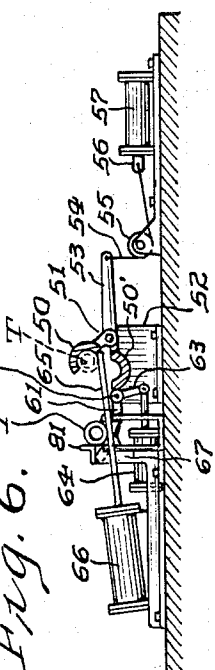


Fig. 6.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR FINISHING AND TESTING TUBULAR PRODUCTS

Application filed May 7, 1930. Serial No. 450,581.

My invention relates to the manufacture of tubular products such as pipes, seamless tubes and the like, and more particularly to straightening and finishing such products after they have been formed to substantially the required size and shape.

The methods of straightening and finishing tubular products heretofore employed are open to certain objections, particularly when maximum speed of production and fine surface finish are required. Thus, for example, in the production of seamless tubing, it has heretofore been the custom to deliver the sized and cross rolled hot piece to a cooling rack before running it through the cold straightening rolls. Just prior to its passage through the latter, the tube has a fine and highly desirable finish on its outside surface, but in its subsequent passage through the cold straightening rolls, which are usually of the typical cross roll type, the surface of the tube is scratched and marred to a varied extent and sometimes sufficiently to cause its rejection. While this abrading and scratching of the smooth surface occurs to a greater or less degree under the normal action of the cross rolls, it is frequently aggravated by the practice of tossing sand between the tube and the rolls if the former happens to stick in its passage therethrough. Additionally, this cross roll method of straightening is disadvantageous in that difficulties frequently arise in its performance when the tubes are improperly sized, while satisfactory straightening of "hooked" ends is practically impossible. Nor, with a view to eliminating the well known disadvantages of the cross roll straightening method, to some of which I have briefly referred, can resort under conditions dictating high speed production, be had to the "gag" press for performing the straightening operation since the slowness of that method and the personal equation or element necessarily incident to its use render it unsuitable for production of that character.

A principal object of my invention, therefore, is to provide novel apparatus for straightening and finishing tubular products such as pipes, seamless tubes and the like which is not open to the objections inherent in the use of cross roll straighteners and/or gag presses; and to provide apparatus adapted for that purpose which can be employed without damage to the surface finish of the articles being treated, which is effective during the treatment to size the tubular articles, to disclose defects therein, to bring all of the said articles to the same exterior diameter and also to loosen any scale which may adhere to the articles at the initiation of various operations incident to their treatment.

Further objects of the invention are to provide apparatus of the character aforesaid which is suitable for use in the high speed production of pipes, tubes and like articles on a large scale and which, as an incidental effect, tends to increase the yield point and ultimate tensile properties of the articles which may be subjected to its action.

A still further object of my invention is to provide apparatus for the utilization of fluid pressure in the straightening of tubular articles with a maximum of speed and convenience.

Additional objects, advantages and novel features of design, construction and arrangement of the apparatus of the present invention are hereafter more particularly pointed out or will be apparent to those familiar with the art from the following description of certain forms of said apparatus as illustrated in the accompanying drawings.

Speaking generally, my invention contemplates confining the tubular article which is to be straightened within a relatively heavy cylindrical casing whose inside diameter corresponds to the desired external diameter of the finished article and then exerting fluid pressure interiorly of the article sufficient to strain the latter beyond its elastic limit and

thereby expand it against and bring it into coincidence with the interior of the casing whereby, when the pressure is relieved and the article removed from the casing, the desired straightening will have been brought about without detriment to the surface finish of the article and other beneficial or desirable effects attained as hereinafter more particularly pointed out.

10 My invention is therefore embodied in certain forms of apparatus now to be described, one of said forms being illustrated in Figs. 1 to 3 of the accompanying drawings and the other of said forms in Figs. 4 to 7 thereof.

15 In the said drawings Fig. 1 is a top plan view of the first form of apparatus; Fig. 2 is a side elevation thereof, and Fig. 3 is a transverse section on line 3—3 in Fig. 1 looking in the direction of the arrows; Fig. 4 is a top plan view, generally corresponding to Fig. 1, of the second form of the apparatus; Fig. 5 a side view thereof, and Figs. 6 and 7 transverse sectional views substantially on lines 6—6 and 7—7 respectively in Fig. 4 and showing certain of the parts as in different positions as hereinafter more fully explained. Like symbols of references are used to designate the same parts in the several figures.

20 Referring now more particularly to that form of the apparatus shown in Figs. 1 to 3, the same comprises a pair of relatively heavy hollow cylindrical casings 1, 1' disposed parallel to each other and supported at suitable intervals on V-blocks 2, transversely extending longitudinally spaced clamps 3 being provided for holding them in place on the blocks. These V-blocks are either secured to or formed integral with a sliding bed 5 which is supported on longitudinally spaced guides 6 for movement transversely of the apparatus, adjustable stop screws 7, 7' extended through turned-up lugs at the ends of the guides serving to adjustably limit the extent of movement in either direction.

25 For effecting the requisite movement of the bed on the guides 6, which latter are supported on the floor of the building or other suitable surface, any convenient means may be provided, those shown comprising a pair of longitudinally spaced links 8 connected at their forward ends to lugs 5' carried by the bed and at their opposite ends to cranks 9 disposed on the ends of a rock shaft 10 rotatably journaled in suitable pedestals 11. This rock shaft also carries a crank 12, preferably disposed substantially midway of its ends, to the free end of which is connected a horizontally disposed bar 13 extending through and adapted for reciprocation in a guide 14 and at its opposite end connected with a piston rod 15 extending into a cylinder 16 and there connected to a piston, the cylinder and guide being preferably supported on a bed plate 17. Thus, by the ad-

mission of a suitable fluid, as and when required, to one end or the other of the cylinder, the rock shaft 10 may be oscillated so as to slide the bed 5 transversely on the guides 6 through the medium of the links 8 and cranks 9.

For bringing to the machine from any convenient source of supply the tubular articles which are to be straightened and which for convenience I shall refer to as "tubes", a conveyor, generally designated as 20, may be arranged adjacent one end of the machine, while a generally similar conveyor 21 may be arranged adjacent its opposite end for conveying the tubes away from the machine after they have been acted upon; these conveyors may be of any preferred construction and thus will ordinarily, and as shown, comprise a plurality of spaced rollers disposed between rails in such manner that a tube T can be readily slid longitudinally upon them. Desirably the conveyors are disposed in alignment with the center line of the machine, that is, a line substantially equidistant from the ends of the guides 6 so that either of the containers 1 or 1' may be brought, by suitable manipulation of the bed, into alignment with the conveyors to receive a tube therefrom or discharge one thereonto, the conveyors of course being disposed at such height that the axes of the tube when lying thereon will coincide with that of the container when aligned therewith.

Any convenient means (not shown) are provided for moving a tube from the conveyor 20 into whichever of the containers may be aligned therewith; for example and as shown, the container 1'; for effecting this movement, pinch rolls, magnetic rolls, a push-bar or any other suitable apparatus may be employed, the same forming no part of the present invention.

It will thus be apparent that by suitable operation of the mechanism heretofore described, either of the containers 1 or 1' may be aligned with the conveyors 20 and 21, and that when so aligned a tube T may be pushed from the former thereinto, the advancing tube being operative to push before it and thus eject from that container onto the conveyor 21 the preceding tube, if any, which may be disposed therein. It will further be noted that when either of the containers is aligned with the conveyors, the other container will lie on one side or the other of the latter, and means now to be described are provided for sealing the ends of the tube disposed in which ever container may be thus laterally out of alignment with the conveyors and thereafter subjecting it to hydraulic pressure so as to expand the tube against its encircling container.

To this end a cross head 30 is provided adjacent that end of the machine at which the tubes are introduced, and a substantially sim-

ilar cross head 31 at the opposite end of the machine. These cross heads are respectively disposed adjacent but spaced from the ends of the containers and may desirably be downwardly dished or formed U-shaped at their centers so as to be out of alignment with the bore of the centrally positioned container and thus not interfere with the introduction to or discharge of the tube therefrom. The cross heads are bored and internally threaded at their respective ends for the passage of correspondingly threaded horizontal supporting rods 32 which extend parallel with the containers on opposite sides of the machine and serve to support the cross heads, the rods in turn being rotatably supported in upright pedestals 33 spaced at suitable intervals longitudinally of the machine. Desirably only those portions of the rods lying adjacent the cross heads are threaded, and in order to effect simultaneous movement of the cross heads to or from the containers the threads on the ends of each rod are of opposite pitch whereby when both rods are rotated in the same direction the cross heads will be moved outwardly or inwardly in opposite directions. Any suitable means may be employed for rotating the rods as, for example, a bevel gear on an end of each rod cooperating with another bevel gear on a cross shaft 35 disposed adjacent that end of the machine at which the tube is introduced, the gears being desirably housed in boxes 36, and the cross shaft being driven by a motor M or other convenient source of power through suitable gearing housed in a gear box 37. Thus, by operating the motor in one direction or the other, the rods 32 can be simultaneously rotated in the same direction.

The cross head 30 is provided with a pair of laterally spaced plugs 40, 40' each of a form and size to enter and seal the end of a tube T when disposed in one of the containers, the distance between the plugs being such that the plug 40 will align with the container 1 when the container 1' is aligned with the tube conveyor and the plug 40' will correspondingly align with the container 1' when the container 1 is aligned with the conveyor. Thus, when either container is in position to receive or discharge a tube, one of the plugs is also in position to close the end of the tube in the other container when the cross head 30 is moved inwardly sufficiently to engage the plug therewith. In like manner, the cross head 31 is provided with plugs 41, 41', and suitable means are provided for admitting fluid through these plugs to the tubes in the containers. While said means may be of any convenient character, those shown comprise pipes 42, 42' respectively extending from the plugs into boxes 43, 43' through suitable packing glands whereby the pipes may slide in and out in their respective boxes when the cross head 31 is moved. To the other end of the

boxes pipes 45, 45' controlled by valves 46, 46' or other suitable means extend to any convenient source of fluid supply, so that by opening either valve fluid may be admitted to the adjacent box and plug and thus into the tube in which that plug is entered. All of the plugs are preferably provided with suitable packing or otherwise arranged so as to form fluid and pressure tight joints with the ends of the tube in which they may be inserted.

The manner of using an apparatus of the general character of that just described for finishing and testing tubular products in accordance with the invention will now be briefly described: Assuming that the parts of the apparatus are in substantially the positions shown in the drawing with the container 1' thus aligned with the conveyor 20 and the cross heads 30, 31 retracted so that their respective plugs are clear of the ends of the containers, a tube is moved along the conveyor and pushed into the container 1' until it is completely enclosed therein. Fluid may then be admitted to the cylinder 16 so as to move the containers toward the opposite side of the machine, thus bringing the container 1 into alignment with the conveyors and the container 1' into alignment with the plugs 40', 41'. The motor M is then started in a proper direction to move the cross heads inwardly toward the containers so as to enter the said plugs in the ends of the tube in the container 1' and firmly seat them therein, thus closing both ends of that tube substantially simultaneously. Valve 46' or other fluid controlling means is then operated to admit fluid to the said tube through the plug 41' and expand the tube against and bring it into coincidence with the interior of the container, the pressure exerted within the tube being sufficient to strain the walls of the latter beyond their elastic limit and thus cause the tube to permanently conform to the configuration of the chamber in the container, whereby when the tube is subsequently removed from the container it will retain that shape both as to cross-sectional form and longitudinal or axial alignment. While these operations are being carried on, a succeeding tube is pushed into the other container 1 which is now aligned with the conveyor, and as soon as the expansion of the tube in container 1' is completed, the cross heads are backed off so as to clear the plugs from the ends of that tube and container and the sliding bed actuated from cylinder 16 to return the containers to the position shown in Fig. 1, thus bringing the container 1' into alignment with the conveyor and the container 1 into alignment with the plugs 40, 41. The cross heads are now moved inwardly so as to enter the said plugs in the tube and its container 1 and fluid then admitted thereto through operation of the valve 46. At or about the same time, the ex-

panded tube is pushed out of container 1' onto the conveyor 21 by means of another tube from the conveyor 20 as this latter tube is moved forward into that container, thus placing it in condition to be expanded after the expansion of the tube in container 1 is finished. It will thus be apparent that during the normal operation of the machine a tube is always in course of expansion in one container while the other is having a tube removed therefrom and another inserted, whereby a much higher rate of production can be maintained than if but a single container was employed and the tubes inserted therein consecutively instead of alternately as when two containers are utilized, although the use of but a single container is entirely permissible and may in some cases be found desirable.

20 In fact, in the form of the apparatus now to be described and which is illustrated in Figs. 4 to 7 inclusive, but a single container is employed, but due to the particular construction of the apparatus a relatively higher rate of production may be maintained therewith than when but a single container of the construction of those shown in Figs. 1 to 3 is utilized.

Thus, referring now more particularly to the said figures, the apparatus therein shown comprises a single container which, however, is split substantially on its horizontal diameter to provide an upper half 50 and a lower half 50' suitably hinged together as at 51.

35 The lower half of the container is supported on a suitable base or pedestal 52 while to the upper half is attached a rearwardly extending lever arm 53 connected by a cable 54 traveling over a suitably positioned sheave 55 with the piston rod 56 of a cylinder 57 which may thus be operated, through the admission of suitable fluid, to raise the upper half of the container as shown in Fig. 6, or to lower it on the lower half, thus closing the container, as shown in Fig. 7.

It will be understood that in this form of the apparatus the tube which is to be treated is preferably positioned in and removed from the container when the upper half of the latter is raised, as shown in Fig. 6, by moving the tube transversely, and suitable means are therefore provided for introducing and ejecting the tube. For the former purpose, a conveyor, generally designated as 58 and conveniently comprising spaced rollers 59 carried on rails 60 is disposed adjacent the container on the opposite side thereof from the lever 53 so that the tubes may be consecutively moved along the conveyor until they are transversely aligned with the container into which they are then adapted to be moved by a series of longitudinally spaced kick-off arms 61 which are carried on a shaft 62 extending alongside the container and adapted for oscillation through the medium of a crank 63 con-

nected with the piston of a horizontally disposed cylinder 64, the arrangement being such that as fluid is admitted to the end of the cylinder adjacent the container its piston will be retracted so as to swing the kick-off arms upwardly and roll the tube into the lower half of the container. For assisting in the discharge of the tube from the container after it has been treated therein, two or more angularly disposed skids 65 are provided and arranged for reciprocation across the lower half of the container through the medium of fluid actuated cylinders 66, the skids being slidable in supporting guides 67 located between the cylinders and the container. The skids are arranged to slope away from the container and when in projected position to extend substantially across the lower half thereof as shown in Fig. 6; when in retracted position as shown in Fig. 7, they are entirely clear of the container and terminate adjacent the conveyor. The purpose of the skids will hereinafter more fully appear.

Means are also provided for closing the ends of the tubes when disposed in the container, said means at one end desirably comprising a plug 70, substantially similar to the plugs 40, 40', which is mounted on a plunger 71 slidable in a guide 72, any convenient mechanism such as a rack on the plunger and pinion mounted on the guide and controlled by a hand wheel 73 being preferably provided for forcing the plug into the end of the tube when positioned in the container. In a generally similar manner another plug 74 is arranged adjacent the opposite end of the container and means provided for admitting fluid through this plug to the tube. Thus, the plug may be mounted on a plunger slidable in a pedestal 75 through the medium of a rack 76 and pinion 77 controlled by a hand wheel 78, the rear end of the plunger which is hollow entering a chamber within the pedestal to which fluid may be admitted through a pipe 79 leading to any suitable source of supply and controlled by a valve 80 or in any other convenient way, the arrangement being such that after the tube is positioned in the container the plugs may be moved forwardly by means of the hand wheels so as to enter and close the ends of the tube, after which fluid may be admitted to the container through the plug 74 and its plunger by manipulation of the valve 80.

In the operation of this form of apparatus the tubes are consecutively run down the conveyor until the leading tube is positioned in alignment with the container, the upper half of which is now raised. Through the operation of the kick-off arms the tube is then thrown over into the container, the skids 65 being retracted, and the upper half of the container lowered over the tube. The plugs 70 and 74 are then brought up and snugly seated in the ends of the tube by means of

their operating mechanisms and fluid under the requisite pressure admitted to the tube to expand it against the walls of the container in the manner heretofore described. In order to determine the proper extent of expansion the upper half of the container may be either locked to the lower half preparatory to the admission of the fluid by any suitable locking means (not shown), or the halves of the container left unlocked and a suitable indicating instrument arranged between them so as to show the extent to which the upper half of the container is lifted relative to the lower half as the tube expands, whereby when the required degree of expansion has been reached the fluid pressure can be immediately shut off. The plugs 70 and 74 are now retracted and a U-clamp (not shown) slipped over each end of the tube and adjacent end of the container so as to suspend the tube from the latter, after which the upper half of the container carrying with it the expanded tube is raised by admitting fluid to cylinder 57, thus lifting the tube out of the lower half of the container to permit the skids 65 to be projected over the latter and beneath the tube as shown in Fig. 6. The U-clamps are then knocked off and the tube allowed to roll down the skids until it comes into contact with suitably positioned stops 81 which bring it to rest upon the conveyor, along which it is then pushed by the succeeding tube as the latter is brought into position for transfer to the container. The skids are now retracted to permit the succeeding tube to be transferred to the container by means of the kick-off arms, while the expanded tube passes to a storage rack, annealing furnace or some other point in the plant.

It will of course be appreciated that to effect the requisite expansion of the tube extremely high fluid pressures are required, and the various parts of the apparatus required to stand these pressures must therefore be of such design and construction as are necessarily incident to the duties imposed on them. No attempt has therefore been made in the drawings to illustrate the specific details of construction of either form of apparatus, but merely to show the apparatus in a substantially diagrammatic manner yet with sufficient detail to readily enable those skilled in the art to construct the same in a manner suitably adapted to satisfactorily meet the requirements inherent in any particular installation or set of operating conditions to be encountered.

While of course any suitable fluid may be utilized for effecting the expanding operation, water will ordinarily be preferred, and in that form of the apparatus first described as well as in the second form of the apparatus when the two parts of the container are locked together, the hydrostatic pressure or head may exceed the amount necessary to

cause the tube to conform to the container provided it is not so excessive as to rupture the container or other parts; however, when a two part container is employed and the parts thereof not locked together either the maximum hydrostatic head must be adjusted to effect the exact extent of tube expansion desired or else the pressure must be promptly shut off as soon as the requisite expansion is obtained as ascertained from the indicating instrument employed for that purpose.

I am thus enabled with the aid of apparatus of my invention to straighten tubes, pipes and like articles without detriment to the surface finish thereof such as occurs when the ordinary methods utilized for straightening are employed; additionally, the tubular articles after being straightened as described are all of the same diameter and, as they have been subjected to an internal pressure greatly in excess of the ordinary service pressures with which they are designed for ultimate use, no further hydraulic test is ordinarily necessary to determine their suitability therefor. Moreover, the stretching of the articles during the straightening operation serves to magnify any surface defects which may exist, thus facilitating the usual surface inspection after straightening, as well as permitting such defects as it may reveal to be thereafter chipped or ground out with the knowledge that they are not sufficiently serious to cause a rupture under service conditions. The cold working of the metal during the straightening process also tends to increase the yield point and ultimate tensile properties of the article, while adhering scale is loosened, particularly from the interior of the article from which it may thereafter be readily removed. These advantages, among others, resulting from the operation of my improved apparatus, are material, tending as they do to the production of articles of better quality and finish, and frequently at lower production costs, than has hitherto been commercially possible.

While, as hitherto stated, the apparatus herein disclosed may desirably be employed for carrying out the purposes and objects of the invention and obtaining its several advantages, the details of design, construction and arrangement of the various parts of the said apparatus may be modified and varied in numerous particulars from the precise embodiments to which I have chosen to refer, without departing from the spirit and scope of the invention as defined in the claims as hereto appended.

Having thus described my invention, I claim and desire to protect by Letters Patent of the United States:

1. Apparatus of the class described comprising a container having a hollow, substantially cylindrical chamber in its interior, means for supporting the container substan-

tially horizontally, means operable to introduce a tubular article into the container, means for closing the ends of the article when in the container, and means for there-
 5 after introducing fluid under pressure to the interior of the article through one of said closing means.

2. Apparatus of the class described comprising a pair of containers each having a
 10 substantially cylindrical chamber in its interior adapted to receive a tubular article, a pair of cross heads respectively disposed adjacent the ends of the containers, means carried by the cross heads operative to seal the
 15 adjacent ends of a tubular article when disposed in either of the containers, means for moving the cross heads simultaneously toward or away from the containers to bring said sealing means into engagement with the
 20 article, and means for introducing fluid under pressure to an article in either container after its ends are sealed by the operation of said sealing means.

3. In apparatus of the class described, the
 25 combination of a pair of containers extending parallel to each other and each having a substantially cylindrical chamber in its interior, means for supporting the containers, a conveyor adapted to transport tubular articles
 30 toward one end of said containers, means for moving the containers unitarily so as to bring either container into alignment with said conveying means and into position to receive a tubular article therefrom, a pair of cross
 35 heads respectively disposed adjacent the ends of the containers, means for moving the cross heads simultaneously toward or away from the containers, means carried by the cross heads for sealing the ends of a tubular
 40 article disposed in either container when such container is out of alignment with said conveying means, and means for introducing fluid under pressure to the interior of such article after its ends are sealed.

4. In apparatus of the class described, the
 45 combination of a pair of containers extending parallel to each other and each having a substantially cylindrical chamber in its interior, means for supporting the containers, a conveyor adapted to transport tubular articles
 50 toward one end of said containers, means for moving the containers unitarily through a limited path normal to their axes so as to bring either container into alignment with
 55 said conveying means and into position to receive a tubular article therefrom, a pair of cross heads respectively disposed adjacent the ends of the containers, means for moving the cross heads simultaneously toward or
 60 away from the containers, means carried by the cross heads for sealing the ends of a tubular article disposed in either container when such container is out of alignment with
 65 said conveying means, and means for intro-

ducing fluid under pressure to the interior of such article through said sealing means after its ends are sealed.

5. In apparatus of the class described, the
 70 combination of a pair of containers disposed in parallelism and each having a hollow cylindrical chamber in its interior, means for supporting the containers, a conveyor adapted to transport a tubular article toward one end
 75 of the containers, means for moving the containers transversely of their axes to thereby effect alignment of either container with said conveying means to thereby position such container to receive a tubular article there-
 80 from, a pair of cross heads respectively disposed adjacent the ends of the containers, a pair of laterally spaced plugs carried by each cross head and respectively arranged to align with whichever container is out of alignment
 85 with the conveying means when the other container is aligned therewith and adapted to close the adjacent ends of a tubular article disposed in the first mentioned container, means for moving the cross heads simultane-
 90 ously to or away from the containers so as to enter or withdraw the plugs from said first mentioned container, and means for introducing fluid under pressure to the article after its ends have been closed by said plugs.

6. In apparatus of the class described, the
 95 combination of a container having a lower section and a relatively movable upper section and providing when said sections are closed on each other a hollow substantially cylindrical chamber in its interior, means for
 100 supporting said lower section, means for raising and lowering said upper section, means adjacent the container for introducing a tubular hollow article thereinto when the upper section is raised, means for closing the ends
 105 of said article after it is introduced into the container and the upper section thereof lowered, and means for introducing fluid under pressure into the interior of the article.

7. In apparatus of the class described, the
 110 combination of a container having a lower section and a relatively movable upper section hinged thereto and providing when said sections are closed on each other a hollow substantially cylindrical chamber in its interior,
 115 means for supporting said lower section, means for raising and lowering said upper section, means adjacent the container for introducing a tubular hollow article thereinto when the upper section is raised, means
 120 movable axially of the container for closing the ends of said article after it is introduced into the container and the upper section thereof lowered, and means for introducing through one of the closing means fluid under
 125 pressure into the interior of the article.

8. In apparatus of the class described, the
 130 combination of a container having a lower section and a relatively movable upper section and providing when said sections are

closed on each other a hollow substantially cylindrical chamber in its interior, means for supporting said lower section, means for raising and lowering said upper section, means adjacent the container for introducing a tubular hollow article thereinto when the upper section is raised, means for closing the ends of said article after it is introduced into the container and the upper section thereof lowered, means for introducing fluid under pressure into the interior of the article, and means for assisting in the removal of the article from the container after it has been subjected to said fluid pressure.

9. In apparatus of the class described, a container provided with a hollow substantially cylindrical chamber in its interior, said container comprising upper and lower sections hinged together, means for supporting the lower section, means for raising and lowering the upper section relatively to the lower section, means for discharging a tubular article into the lower section of the container when the upper section thereof is raised, means for sealing the ends of the article after it has been positioned in the container and the upper section lowered, means for introducing fluid under pressure to the interior of the article after its ends are sealed, and means for assisting in the discharge of the article from the container after it has been subjected to said fluid pressure comprising a pair of inclined skids adapted to be projected across the lower part of the container when the upper section thereof is lifted relatively thereto.

10. In apparatus of the class described, a container providing a hollow substantially cylindrical chamber in its interior, said container comprising upper and lower sections hinged together, means for supporting the lower section of the container, means for lifting the upper section of the container relative to the lower section, conveying means extending adjacent and parallel to the lower section of the container, means for transferring a tubular article from the conveyor to the lower section of the container when the upper section thereof is raised, means for sealing the ends of the article after said transfer and after the upper section has been lowered onto the lower section, means for admitting fluid under pressure to the interior of the article, and means for assisting the return of the article to the conveyor after subjection to said fluid pressure and when the upper part of the container is raised.

11. In apparatus of the class described, a container providing a hollow substantially cylindrical chamber in its interior, said container comprising upper and lower sections hinged together, means for supporting the lower section of the container, means for lifting the upper section of the container relative to the lower section, conveying means

extending adjacent and parallel to the lower section of the container, means comprising longitudinally spaced kick-off arms for transferring a tubular article from the conveyor to the lower section of the container when the upper section thereof is raised, means for sealing the ends of the article after said transfer and after the upper section has been lowered onto the lower section, means for admitting fluid under pressure to the interior of the article, and means for assisting the return of the article to the conveyor after subjection to said fluid pressure and when the upper part of the container is raised comprising a pair of angularly disposed skids and means for projecting said skids across the lower part of the container.

In witness whereof I have hereunto set my hand this 5 day of May, 1930.

BENJAMIN F. ANTHONY.