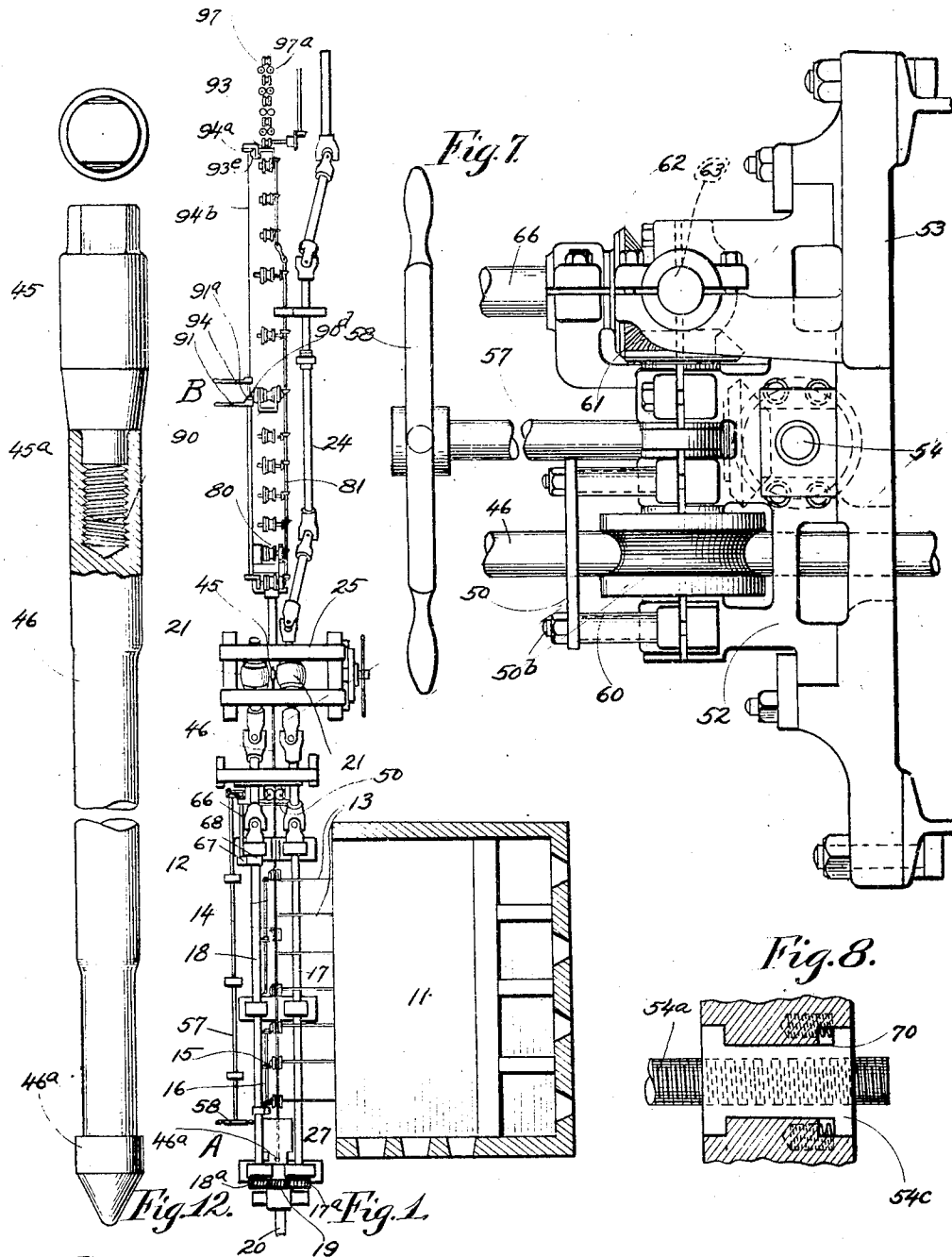


G. J. THUST.
TUBE ROLLING APPARATUS.
APPLICATION FILED MAR. 7, 1916.

Patented Sept. 18, 1917.
5 SHEETS—SHEET 1.

1,240,513.



Witness:

C. Burnap

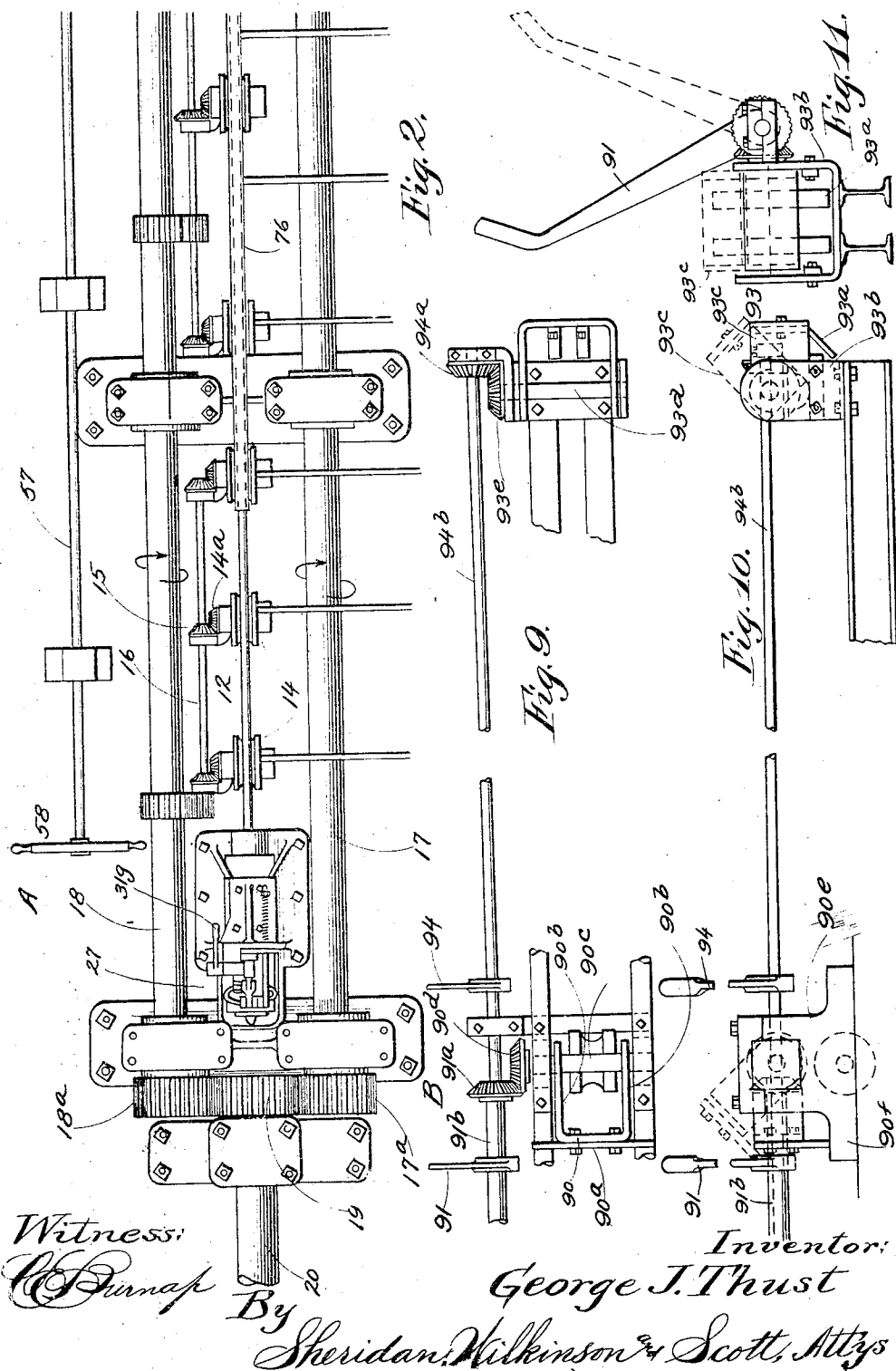
By

George J. Thust

Sheridan, Wilkinson & Scott, Attys

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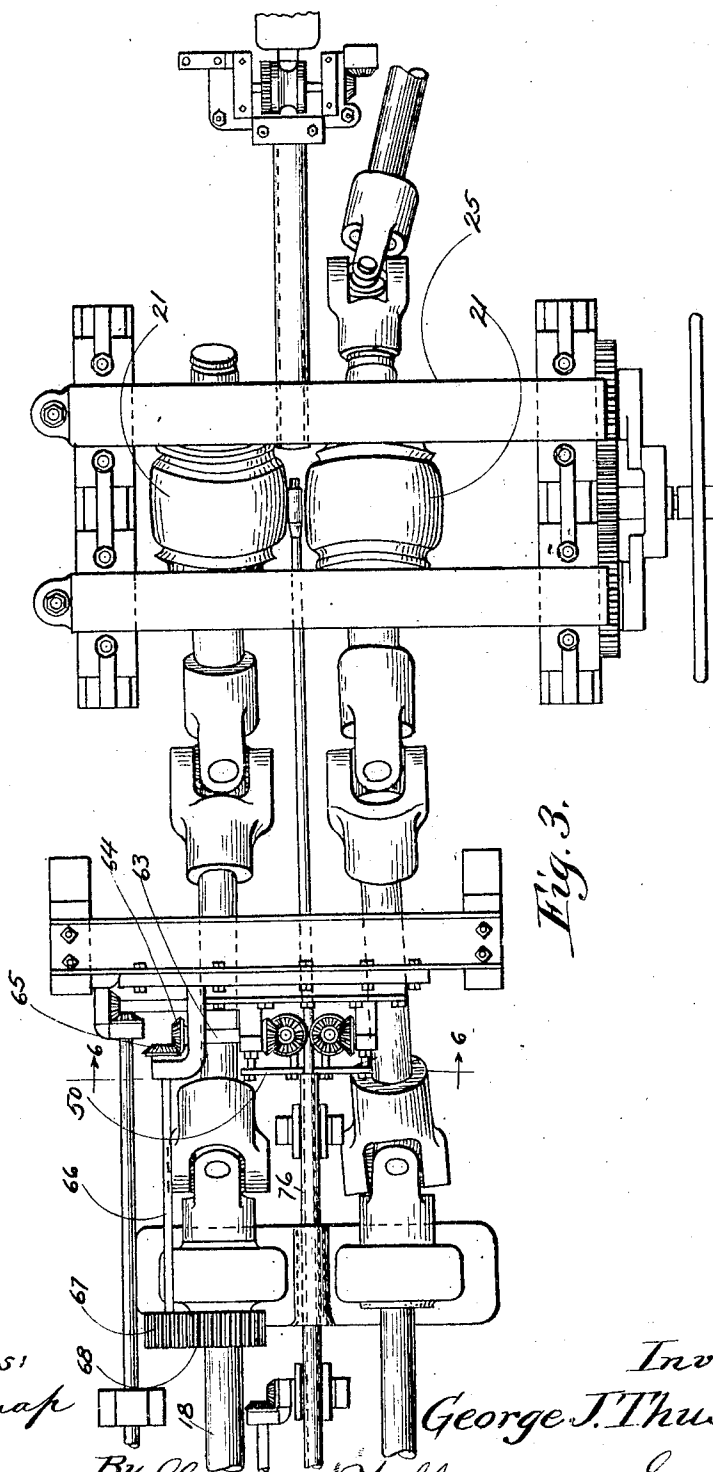
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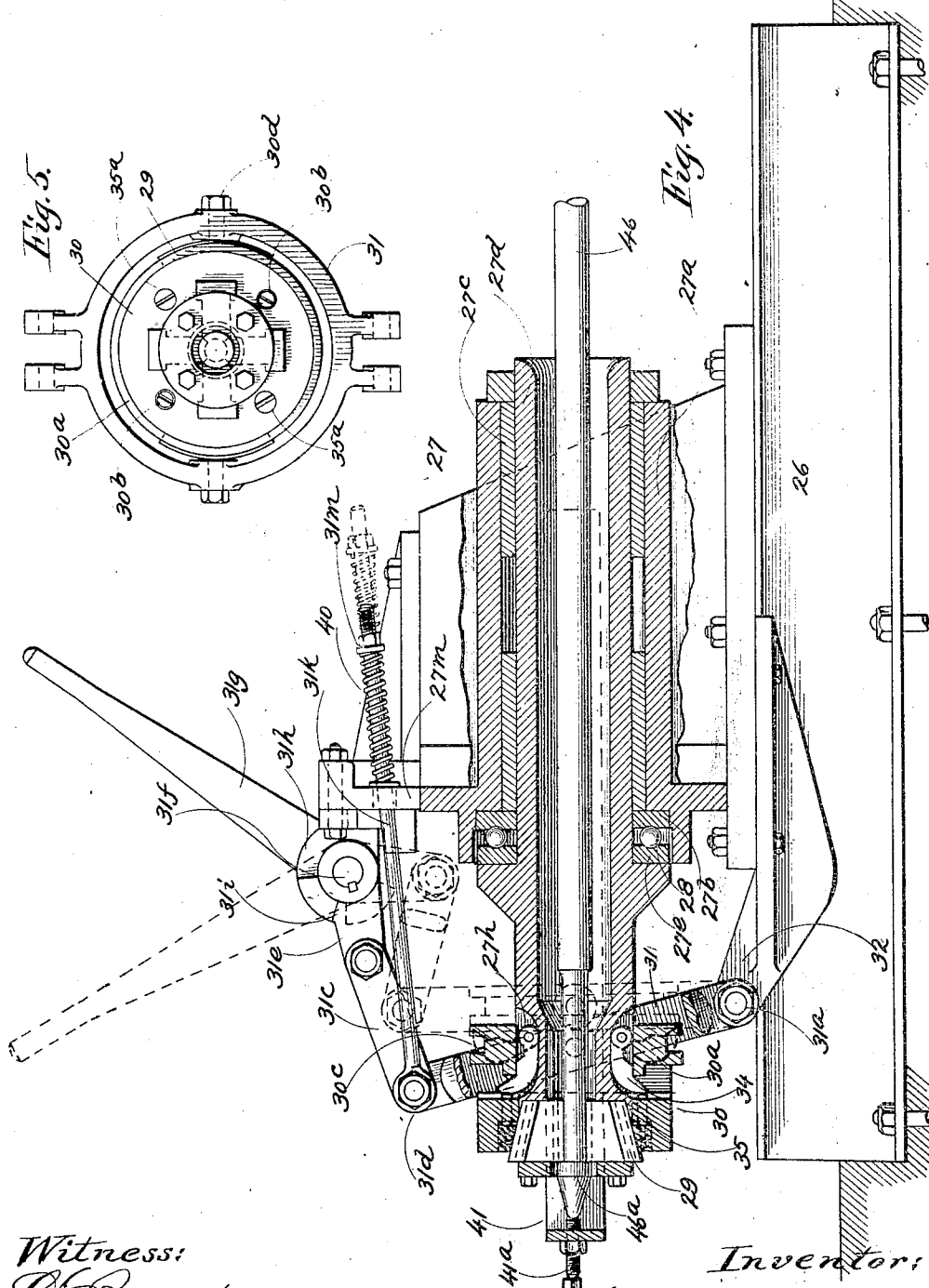
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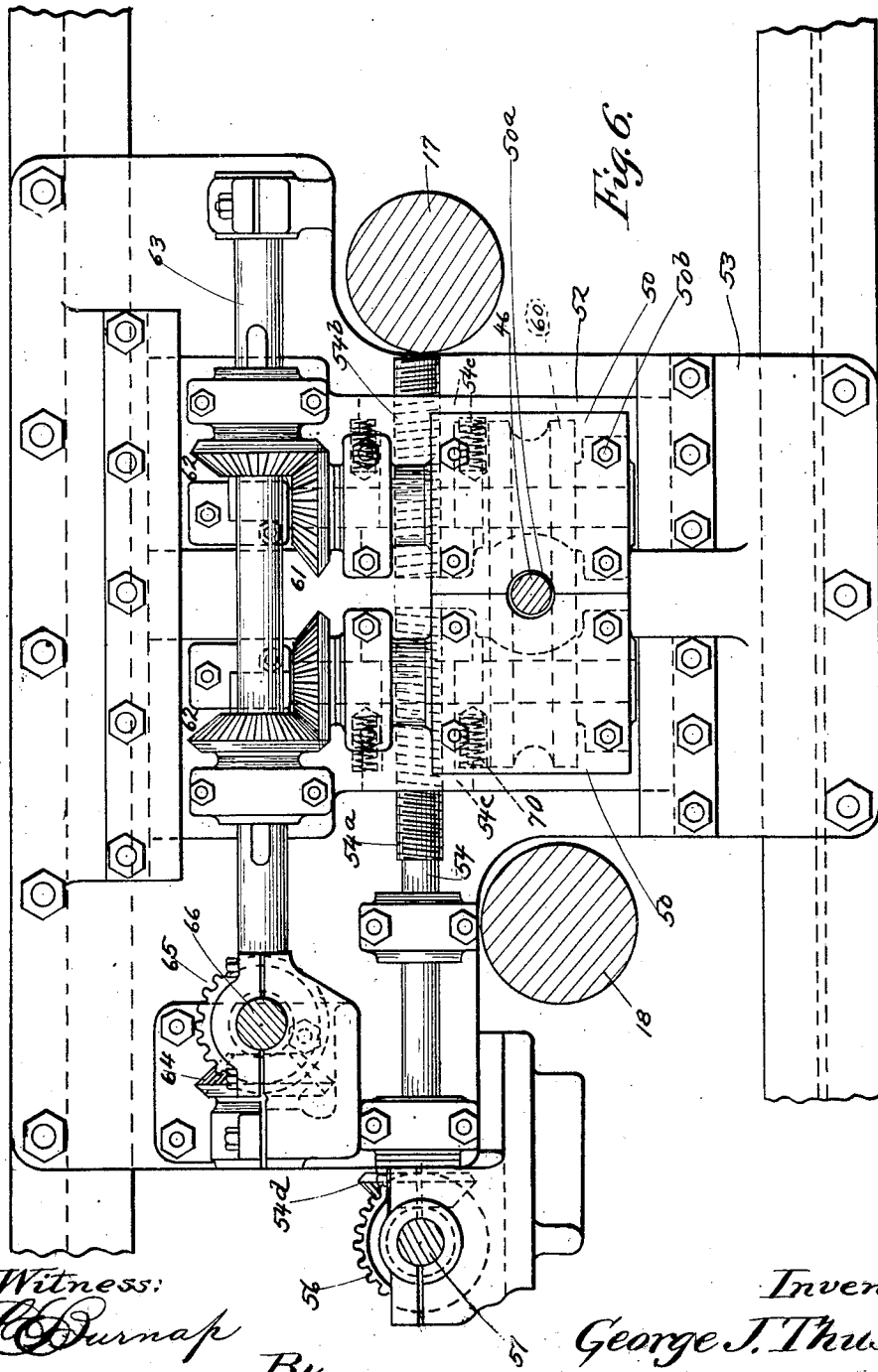
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5 SHEETS—SHEET 5.



Witness:

C. Durnap

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Inventor:

George J. Thust

UNITED STATES PATENT OFFICE.

GEORGE J. THUST, OF MILWAUKEE, WISCONSIN.

TUBE-ROLLING APPARATUS.

1,240,513.

Specification of Letters Patent. Patented Sept. 18, 1917.

Application filed March 7, 1916. Serial No. 52,546.

To all whom it may concern:

Be it known that I, GEORGE J. THUST, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Tube-Rolling Apparatus, of which the following is a specification.

This invention relates to improvements in tube rolling apparatus, and has for an object to provide new and improved apparatus of the class described, by the use of which I am enabled to produce a finished tube in a minimum of time and with a minimum of labor and consequent expense of rolling.

Hitherto it has been necessary to subject the billet after piercing to a number of operations causing a lack of continuity in rolling, and in many instances requiring one or more reheats of the tube. My apparatus overcomes these objections and, as stated, reduces the number of operators required to produce the tube.

Another object of my invention is to provide an apparatus of this nature in which a mandrel is used in conjunction with planishing or forming rolls, the mandrel being mounted upon a bar, this bar being held at one end while the tube is being rolled over the mandrel, the rolls and mandrel being so arranged that the tube is drawn off the mandrel rather than pushed over. By this improved feature the mandrel carrying bar is subjected to tensile stresses only, and as a consequence may be made much lighter and smaller in size, reducing the amount of power required and the cost of the bar. Furthermore, as will be more fully set forth below, by so handling the tubes and bar it is necessary to have the bar only slightly longer than the tube to be rolled, in contradistinction to the bars used in present day practice where they are more than twice as long as the tube length.

Another object resides in the provision of specific mechanism and apparatus to carry out the above objects, as will be more fully set forth below, and as shown in the accompanying drawings, in which—

Figure 1 is a general plan or diagrammatic outlay of my apparatus;

Fig. 2 is a plan view on an enlarged scale of a portion of the apparatus;

Fig. 3 is a similar view of another portion thereof;

Fig. 4 is an enlarged vertical section of the bar gripping and holding mechanism;

Fig. 5 is an end elevation of a portion of the same;

Fig. 6 is a transverse vertical section along the line 6—6 of Fig. 3;

Fig. 7 is a side elevation of a portion of the apparatus shown in Fig. 6;

Fig. 8 is a detail of the bar return mechanism;

Fig. 9 is a plan view of a pair of controlling gates;

Fig. 10 is a side elevation of the same;

Fig. 11 is an end elevation of the same; and

Fig. 12 is a side elevation of the mandrel and bar, a portion thereof being shown in section.

Like numerals refer to like elements throughout the drawings, in which 11 designates a heating furnace into which pierced billets or rough tubes are introduced after piercing thereof for proper heating before the planishing or rolling of the tube. 12 designates generally a pit or large trough to which run guide-ways 13 from the heating furnace 11, see Fig. 1. A plurality of rotating conveyer rolls 14 are mounted in the pit 12, each of said rolls being mounted with a bevel gear 14^a driven by a bevel pinion 15 mounted upon the shaft 16, as shown in Fig. 2. Main driving shafts 17 and 18 are located in the pit 12, being provided with gears 17^a, 18^a at their ends which mesh with the main driving gear 19 carried on the power shaft 20. These shafts 17 and 18 operate to drive the planishing rolls 21, through the medium of shafting and universal joints, as shown in Fig. 1. These planishing rolls 21 are skew mounted, as clearly shown in Fig. 3, and carried in suitable bearing framework, generally indicated by numeral 25. A shaft 24, operatively attached through one of the rolls 21 to the shaft 17 by means of universal joints and shafting, is provided for a purpose to be hereinafter described. Mounted upon suitable supports 26 at the operator's end of the pit, is provided the bar retaining mechanism generally indicated by numeral 27, and shown clearly in Figs. 4 and 5. This mechanism comprises the apertured internally bored casing 27^a carrying the bearing plate 27^b at one end thereof and provided with bushings or bearings 27^c in its interior, the rotatable sleeve 27^d being journaled

therein. The sleeve 27^a is provided with the bearing plate 27^e spaced from plate 27^b and balls 28 or the like are provided, this construction constituting a thrust bearing. At one end of the sleeve 27^a are provided the T-shaped jaw members 29 abutting against the end of sleeve 27^a and arranged in such wise as to be capable of inward and outward movement. A head 30 is slidably mounted on the end of the sleeve 27^a, the same being provided with suitable slots to engage the heads of jaw members 29. Spaced slightly therefrom is a collar 30^a secured thereto by the extended screws 30^b, shown in Fig. 5. This collar 30^a is grooved at 30^c for engagement by pins 30^d mounted in the clutch ring 31 which is pivoted at 31^a to a flange member 32 secured to the supporting members 26. The sleeve 27^a is provided with the seats or slots 27^b in which are pivotally mounted the dogs or cams 34 abutting against wear-pins 35 carried by the screws 35^a.

The construction above described is so arranged that, for example, when the clutch ring 31 is moved to the position shown in dotted lines in Fig. 4, the head 30 will be carried rearwardly by means of the collar 30^a, dogs or cams 34 being moved outwardly to the position indicated in dotted lines. At the same time the jaw members 29 are moved outwardly by reason of their coaction with the inclined slots in head 30. To operate the clutch ring 31, I provide a toggle 31^c pivoted at one end at 31^d to the upper part of clutch ring 31. At its other end this toggle 31^c is pivotally attached to the short crank arm 31^e which is carried by shaft 31^f. Rotatably mounted on the shaft 31^f is the operating handle 31^g provided with the striker lug 31^h arranged to contact with the lug or shoulder 31ⁱ of the crank arm 31^e after the desired amount of rotation thereof. A tension rod 31^k extends through an aperture in the fixed upstanding flange 27^m and is pivoted at one end at the connection of toggle 31^c and clutch ring 31, see Fig. 4. The spring 40 is coiled around tension rod 31^k and abuts against the flange 27^m, being held on said rod 31^k by means of the collar and nut 31^m. Levers, crank and toggle are so arranged that when operating handle 31^g is at one limit of its travel, as shown in full lines in Fig. 4, the crank 31^e and toggle 31^c will have slightly passed dead center, and will be held locked in such position by means of the tension rod 31^k and spring 40. Similarly the device will be held in the position indicated in dotted lines, as will be apparent. A yoke 41 extends outwardly from the end of the member 27 and is provided with a striker stop or bolt 41^a, for a purpose to be hereinafter described.

For use with my apparatus I provide a mandrel 45 having the reduced end 45^a threadedly engaging the threaded socket of

the mandrel carrying bar 46, which is of less diameter than the mandrel 45 and is provided with the enlarged head 46^a. During the rolling of a tube this head 46^a is held by the jaws 29, the mechanism being in the position shown in Fig. 4, proper movement of the operating handle 31^g causing collar 30^a to force the jaws 29 to closing position through the medium of dogs 34 and head 30, as will be obvious. In this position the head 27 and attached mechanism freely rotates with the bar 46, thrust bearings 28 serving to take care of the thrust resulting from rolling of the tube.

Located adjacent the planishing rolls 21 is a pair of slidable gate members 50 having, when in closed position as shown in Fig. 6, the central aperture 50^a slightly larger than the diameter of the bar 46. These gate members 50 are carried by suitable bolts or studs 50^b projecting outwardly from the carrier blocks 52, see Fig. 7. These carrier blocks are slidably mounted in guides in the frame 53 and are mounted to move simultaneously toward or away from each other through the medium of cross shaft 54, having the reversely threaded portions 54^a, 54^b engaging suitably threaded slits or bushings 54^c in the blocks. The shaft 54 is provided with the bevel gear 54^d at one end, meshing with a driving gear 56 carried on shaft 57 which terminates in an operating or hand wheel 58 located at station A, see Fig. 2. It will be apparent that rotation of wheel 58 in one direction will operate to bring the gate members 50 to the position shown in Fig. 6, while opposite rotation will move them apart.

Located adjacent the gates 50 and journaled in the carrier blocks 52 are the bar returning rolls 60 carried upon suitable shafts upon which are also mounted the bevel gears 61, driven from bevel gears 62 feathered upon cross shaft 63 which carries the bevel gear 64 driven by bevel gear 65, in turn carried upon shaft 66 carrying gear 67, which is driven by gear 68 on the main driving shaft 18. The bevel gears 62 are oppositely disposed so that the return rolls 60 rotate in opposite directions. At the same time it will be apparent, from an examination of the arrangement of the gearing, that these rolls 60, when in contact with the bar 46, will serve to return the same toward the member 27 against the rotatory movement of the guide rolls 14. Coil springs 70 act against the shoulders of the bushing blocks 54^c which are mounted in the carrier blocks 52 to permit a small amount of relative movement therebetween, so that in returning a bar, inequalities in the diameter thereof, or other causes, will be compensated for by the springs 70 without injury to the apparatus.

In rolling a tube the heated billet or blank

is dropped from oven 11, on to the conveyer rolls 14, the bar 46 having previously moved therefrom, as will be explained below, and the operator at station A closes gates 50, through the medium of hand wheel 58, which at the same time moves the returning rolls 60 into contact with the mandrel carrying bar. The gates 50 prevent the passage of the tube indicated by numeral 76, in Fig. 3 beyond such gates. At the same time the mandrel carrying bar 46 is moved back by rollers 60 through the tube blank until operator at A is enabled to move operating handle 31^a to the position shown in full lines in Fig. 4, by which operation members or jaws 29 move to position shown in Fig. 4, preventing longitudinal movement of mandrel bar 46, whereupon the gates 50 may be moved and the tube 76 conveyed to the planishing rolls 21. The mandrel 45 and bar 46 are so arranged that the former is held between the rolls 21 in the position shown in Fig. 3, and as the tube 76 is conveyed thereto it is seized or gripped by the rolls 21, and, owing to their being skew mounted, it is not only rotated but drawn over the mandrel 45, this operation resulting in planishing or sizing the tube, at the same time drawing it down to the proper dimensions. During this operation, as explained above, the bar 46 is held under tension and movement thereof is prevented save for its rotation.

Beyond the planishing rolls 21 are provided a second series of conveyer rollers 80 driven by bevel gearing from a shaft 81, in turn driven from a suitable source of power.

At B, see Figs. 1 and 9, is provided a second station for the operation of the following mechanism: A gate 90 is provided, the same consisting of the flat plate 90^a carried by the yoke 90^b which has its arms attached to the rotatable shaft 90^c, carrying the bevel gear 90^d. This gear meshes with a second gear 91^a carried upon the tube or sleeve 91^b to which is attached the operating lever 91, see Figs. 9, 10 and 11. The shaft 90^c is journaled in the up-right pedestals 90^e which are also provided with the portions 90^f constituting a stop for the plate 90^a, see Fig. 10. Another gate, generally indicated by numeral 93, similar in construction, is provided, the same having in place of a plate similar to 90^a, depending bent arms 93^a striking against the upright brackets 93^b when in the position shown in Fig. 10. This gate 93 comprises the yoke 93^c attached to shaft 93^d which carries the bevel gear 93^e meshing with bevel gear 94^a mounted on shaft 94^b to which is attached the operating handle 94. Suitable bearings are provided for shaft 94^b and tube 91^b. Beyond the gate 93 are located the finishing rolls 97, the same comprising angularly disposed pairs of rollers 97^a, the same being provided with

aligned grooves and used in combination with a pair carrying a plurality of sizing mandrels. This specific construction being old, I do not find it necessary to describe the same herein, as it is familiar to those skilled in the art and does not form an integral part of this invention. In the operation of the gates 90 and 93, after the tube 76 has been drawn over the mandrel 45, it is conveyed by the rollers 80 past the gate 90, which is in the position shown in dotted lines in Fig. 10, for example, and against gate 93 which is in closed position, shown in full lines in Fig. 10. After the tube has passed the gate 90 the operator at B signals to the operator at A to release his mandrel bar 46 from the jaws 29, whereupon the conveyer rolls 14 convey it past the planishing rolls 21 until it abuts against gate 90 which has been closed by the operator at B. If, upon its arrival there, the mandrel is intact, and has not been broken, he raises gate 93 and the tube 76 is allowed to pass to the finishing rolls 97. This permits inspection by operator at B to prevent possibility of passage to rolls 97 of a tube with a mandrel inside which would destroy or damage the rolls. At the same time a new tube blank or billet is dropped on the rolls 14 and the operator at A closes the gates 50 thereby moving guide rollers 60 to position engaging mandrel bar 46, which results in the mandrel bar 46 being carried back to position for rolling of the second tube.

It will be obvious that my invention is susceptible of a number of modifications and improvements, and I do not wish to be restricted to the form shown and described except as defined in the appended claims.

What I claim is:

1. In apparatus of the class described, rolling members, a mandrel located adjacent and between said rolls, and means to drive said rolls, the latter being constructed and arranged to draw a tube over said mandrel.
2. In apparatus of the class described, rolling members, a mandrel located adjacent and between said rolls, and means to drive said rolls, the latter being constructed and arranged to rotate and draw a tube over said mandrel.
3. In apparatus of the class described, rolls, means to drive said rolls, a bar, a mandrel carried thereby and located adjacent and between said rolls, said rolls being constructed and arranged to rotate and draw a tube over said mandrel.
4. In apparatus of the class described, rolls, means to drive said rolls, a bar, a mandrel carried thereby and located adjacent and between said rolls, said rolls being constructed and arranged to rotate and draw a tube over said mandrel, and means to hold said bar against the tension of said drawing.
5. In apparatus of the class described,

- rolls, means to drive said rolls, a bar, a mandrel carried thereby and located adjacent and between said rolls, said rolls being constructed and arranged to rotate and draw a tube over said mandrel, and means to hold said bar against the tension of said drawing, said means being arranged to permit rotation of and to rotate with said bar.
6. In apparatus of the class described, rolls, means to drive said rolls, a bar, a mandrel carried thereby and located adjacent and between said rolls, said rolls being constructed and arranged to rotate and draw a tube over said mandrel, and means to hold said bar against the tension of said drawing, said means being constructed and arranged to permit rotation of and to rotate with said bar, said means being further arranged to release or grip said bar, as desired.
7. In apparatus of the class described, planishing rolls, conveying rollers located on each side of said planishing rolls, a bar, a mandrel carried thereby, and means to engage and hold said bar whereby said mandrel will be maintained between said rolls, said last named means being operable to release or grip said bar to permit or prevent longitudinal movement thereof, as desired, said rolls being constructed and arranged to draw a tube, blank, or pierced billet over said mandrel to size and planish the same.
8. In apparatus of the class described, planishing rolls, a bar, a mandrel carried thereby, means to maintain said bar in position with said mandrel located between said rolls, means to convey said bar and mandrel from said position past said rolls, means to convey a tube to said rolls, and means operable at will to prevent passage of said tube to said rolls, said means being arranged to permit passage therethrough of said bar.
9. In apparatus of the class described, planishing rolls, a bar, a mandrel carried thereby, means to maintain said bar in position with said mandrel located between said rolls, means to convey said bar and mandrel from said position past said rolls, means to convey a tube to said rolls, means operable at will to prevent passage of said tube to said rolls, said means being arranged to permit passage therethrough of said bar, and means to return said bar through said means to said first named position.
10. In apparatus of the class described, rolls, conveyer rollers located on each side of said rolls, a gate located on one side thereof, and spaced apart second and third gates located on the opposite side thereof.
11. In apparatus of the class described, rolls, conveyer rollers located on each side of said rolls, a gate located on one side thereof, spaced apart second and third gates located on the opposite side thereof, and bar holding means operable to prevent movement of a mandrel bar by said rollers.
12. In apparatus of the class described, rolls, conveyer rollers located on each side of said rolls, a gate located on one side thereof, and spaced apart second and third gates located on the opposite side thereof, said first named gate being provided with an aperture therethrough to permit passage therethrough of a mandrel carrying bar.
13. In apparatus of the class described, rolls, conveyer rollers located on each side of said rolls, a gate located on one side thereof, and spaced apart second and third gates located on the opposite side thereof, said first named gate being provided with an aperture therethrough to permit passage therethrough of a mandrel carrying bar, all of said gates being operable to permit or prevent passage of a tube thereby.
14. In apparatus of the class described, rolls conveying rollers located on each side of said rolls, and a gate located on one side thereof and comprising separable component parts, said parts being simultaneously movable toward or away from each other, said parts being provided with apertures to permit passage of a mandrel bar when in closed position.
15. In apparatus of the class described, rolls, conveying rollers located on each side of said rolls, a gate located on one side thereof and comprising separable component parts, and means to move said parts from or toward each other simultaneously, said parts being constructed and arranged to permit passage of a mandrel and bar when in closed position.
16. In apparatus of the class described, rolls, conveying rollers located on each side of said rolls, a gate located on one side thereof and comprising separable component parts, means to move said parts from or toward each other simultaneously, gripping rollers mounted to move with said gate members, and means to rotate said gripping rollers.
17. In apparatus of the class described, rolls, conveying rollers located on each side of said rolls, a gate located on one side thereof and comprising separable component parts, means to move said parts from or toward each other simultaneously, gripping rollers mounted to move with said gate members, and means to rotate said gripping rollers, said gate members being provided with an aperture therethrough.
18. In apparatus of the class described, rolls, means to convey a tube thereto, means to convey a tube therefrom, a gate operable to permit or prevent said first named movement, a second gate spaced from said rolls and arranged to limit said second named movement of said tube, and a third gate located between said rolls and said second gate

and constructed and arranged as a stop for a mandrel carrying bar or the like after passage thereby of said tube.

19. In apparatus of the class described, rolls, means to convey a tube thereto, means to convey a tube therefrom, a gate operable to permit or prevent said first named movement, a second gate spaced from said rolls and arranged to limit said second named movement of said tube, a third gate located between said rolls and said second gate and constructed and arranged as a stop for a mandrel carrying bar or the like after passage thereby of said tube, and means to operate said second and third gates.

20. In apparatus of the class described, rolls, means to convey a tube thereto, means to convey a tube therefrom, a gate operable to permit or prevent said first named movement, a second gate spaced from said rolls and arranged to limit said second named movement of said tube, a third gate located between said rolls and said second gate and constructed and arranged as a stop for a mandrel carrying bar or the like after passage thereby of said tube, and means to operate said second and third gates, said means comprising operating handles located adjacent each other.

21. In apparatus of the class described, planishing rolls and conveyer rolls, gate members interposed between said planishing and conveyer rolls, means to simultaneously move said gate members toward or from

each other, said means comprising a rotatable shaft having oppositely threaded portions, and means to rotate said shaft in either direction, said last named means comprising a rotatable shaft and a manually operable member carried thereby.

22. In apparatus of the class described, a gate comprising members movable toward or from each other, said members being carried by carrier blocks, a rotatable shaft having oppositely threaded portions, one of said portions engaging each of said blocks, means to rotate said shaft, gripping rollers carried by said blocks, and means to rotate said rollers in opposite directions.

23. In apparatus of the class described, a gate comprising members movable toward or from each other, said members being carried by carrier blocks, a rotatable shaft having oppositely threaded portions, one of said portions engaging each of said blocks, means to rotate said shaft, gripping rollers carried by said blocks, means to rotate said rollers in opposite directions, and spring yielding means contacting with said blocks, said gripping rolls being mounted for limited movement relative to said blocks against the action of said spring members.

In testimony whereof, I have subscribed my name.

GEO. J. THUST.

Witnesses:

Jos. H. PHILLIPS,
D. G. MUSENHEIMER.