May 11, 1937. C. W. EGGENWEILER ET AL 2,080,170

APPARATUS FOR BABBITTING A CONTINUOUS STRIP IN THE FORMATION OF HALF BEARINGS AND THE LIKE

Original Filed Jan. 31, 1933 7 Sheets-Sheet 1

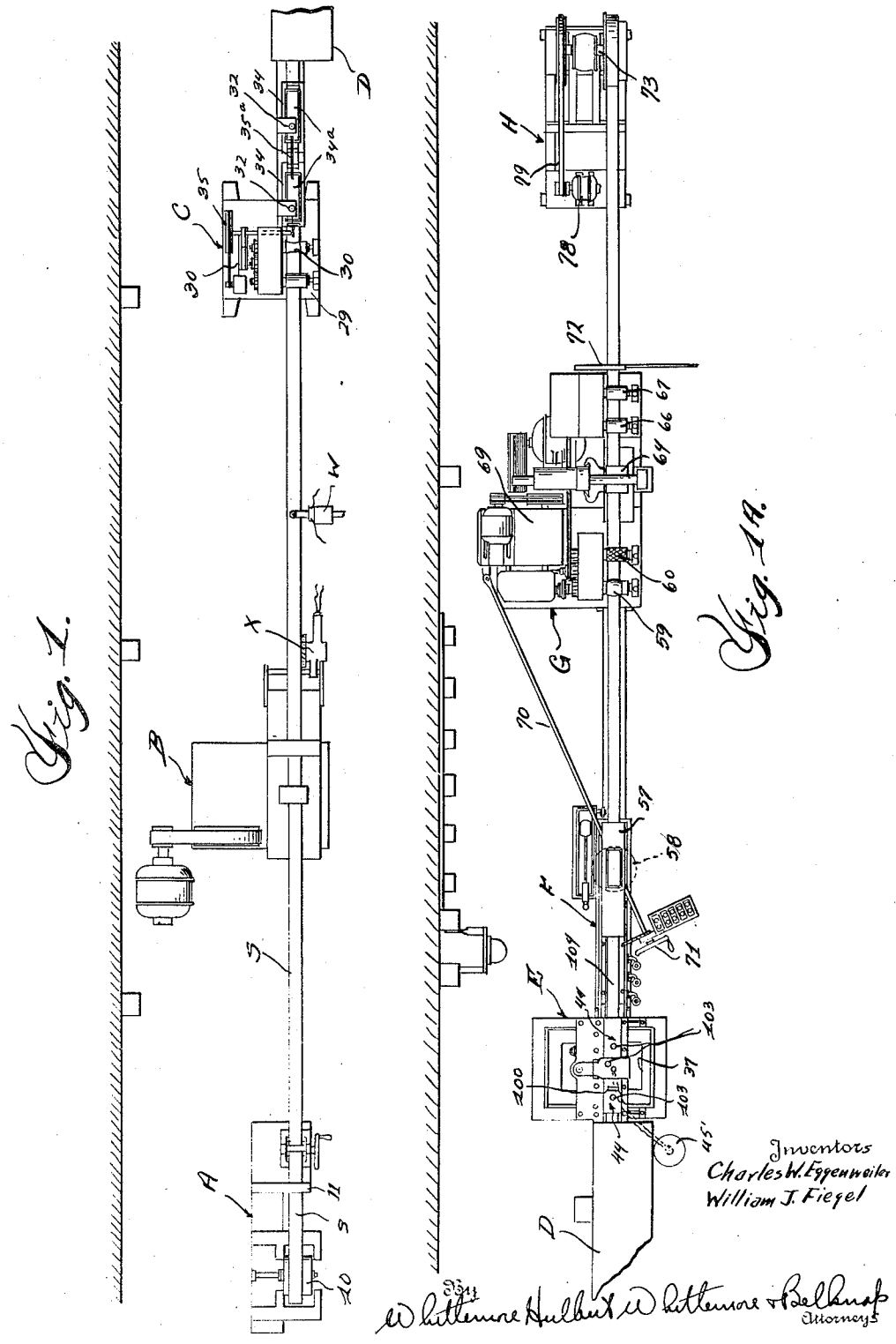

Fig. 1.

Fig. 1A.

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Original Filed Jan. 31, 1933 7 Sheets-Sheet 2

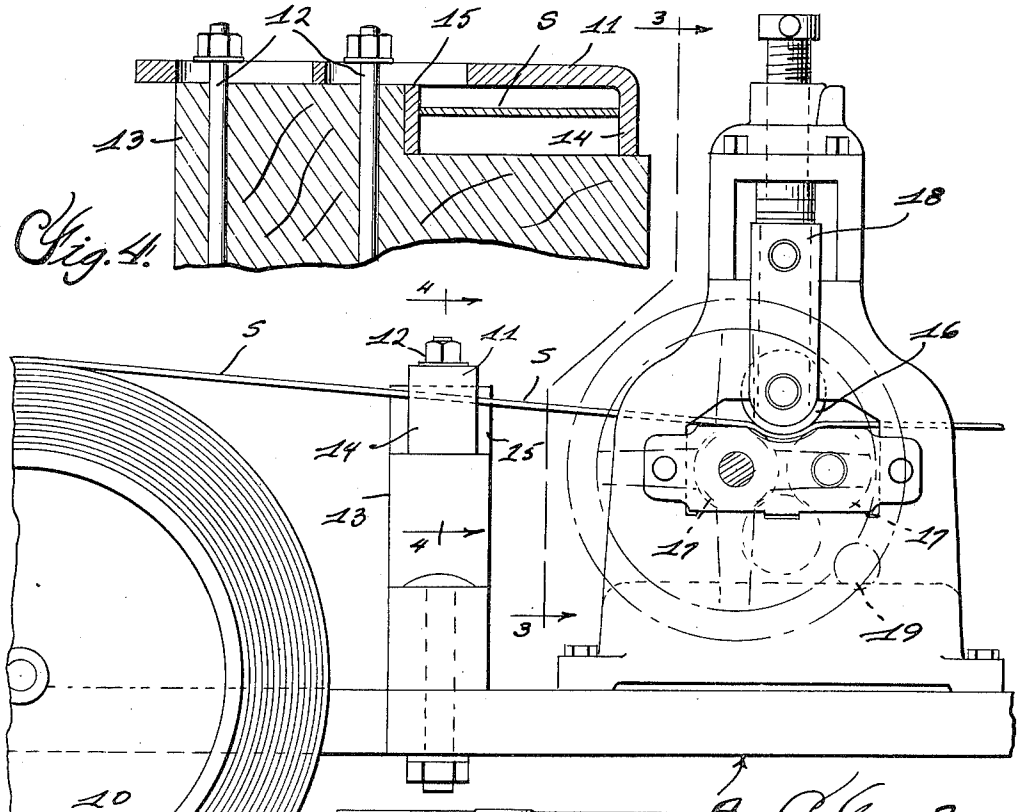

Fig. 4.

Fig. 2.

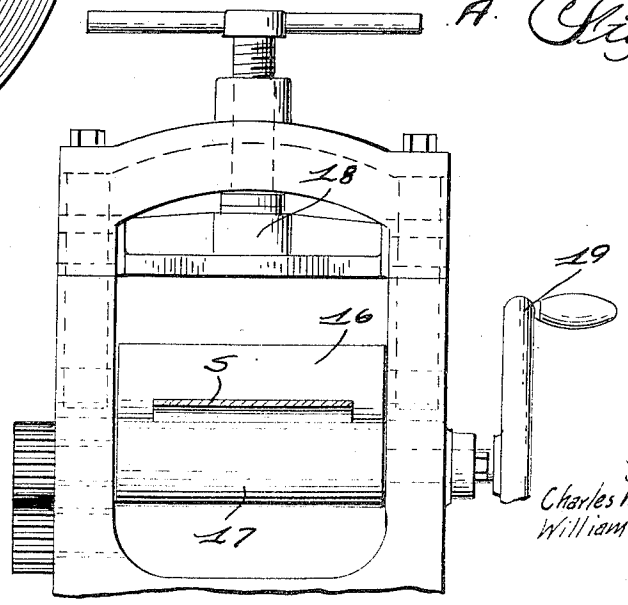

Fig. 3.

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APPARATUS FOR BABBITTING A CONTINUOUS STRIP IN THE FORMATION OF HALF BEARINGS AND THE LIKE

Original Filed Jan. 31, 1933 7 Sheets-Sheet 3

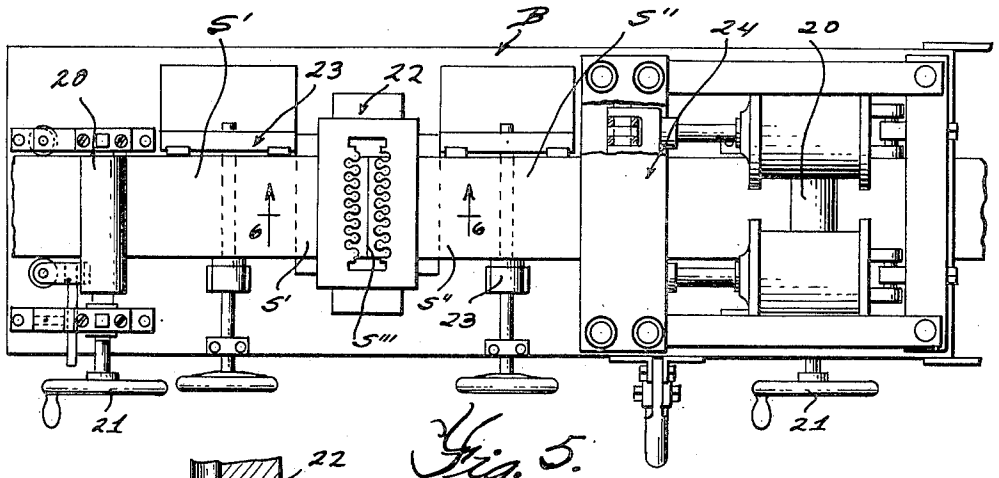


Fig. 5.

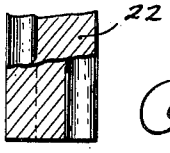


Fig. 6.

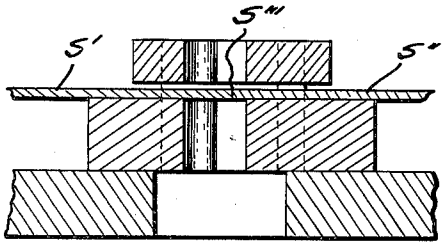
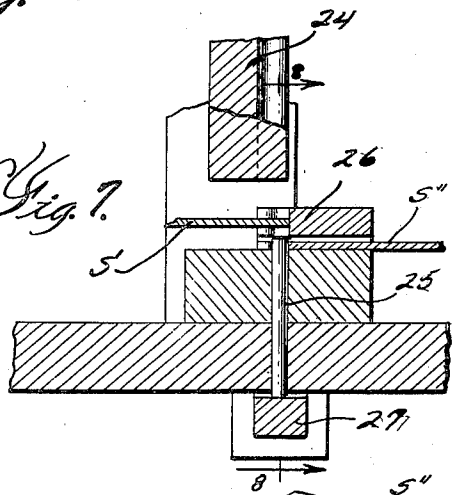


Fig. 7.



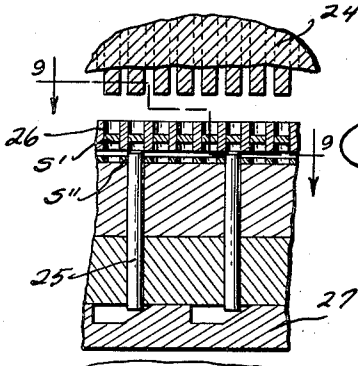


Fig. 8.

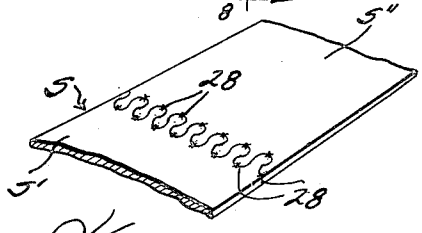


Fig. 10.

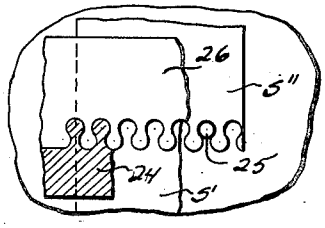


Fig. 9.

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Original Filed Jan. 31, 1933 7 Sheets-Sheet 4

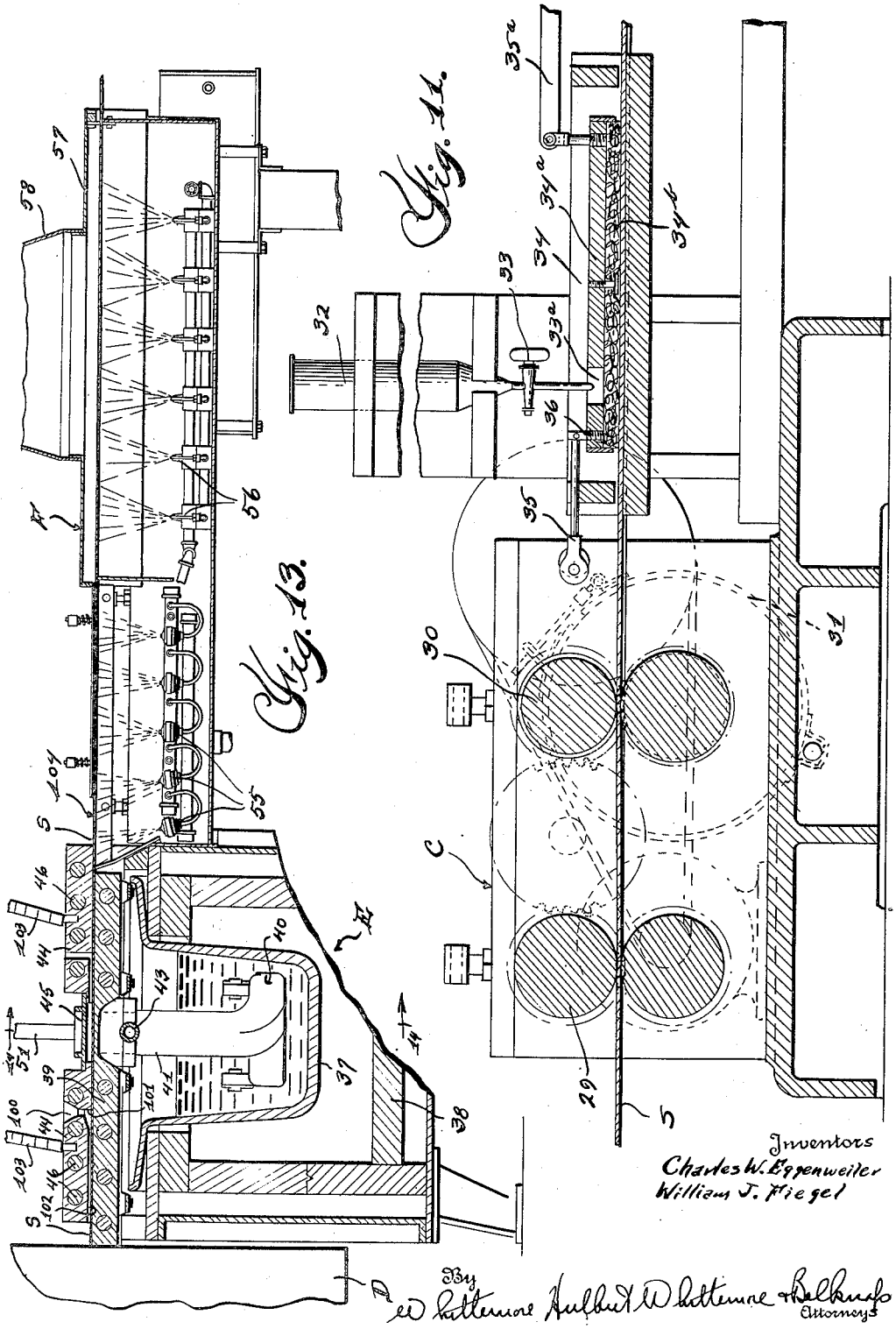

Fig. 12.

Fig. 13.

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APPARATUS FOR BABBITTING A CONTINUOUS STRIP IN THE FORMATION OF HALF BEARINGS AND THE LIKE

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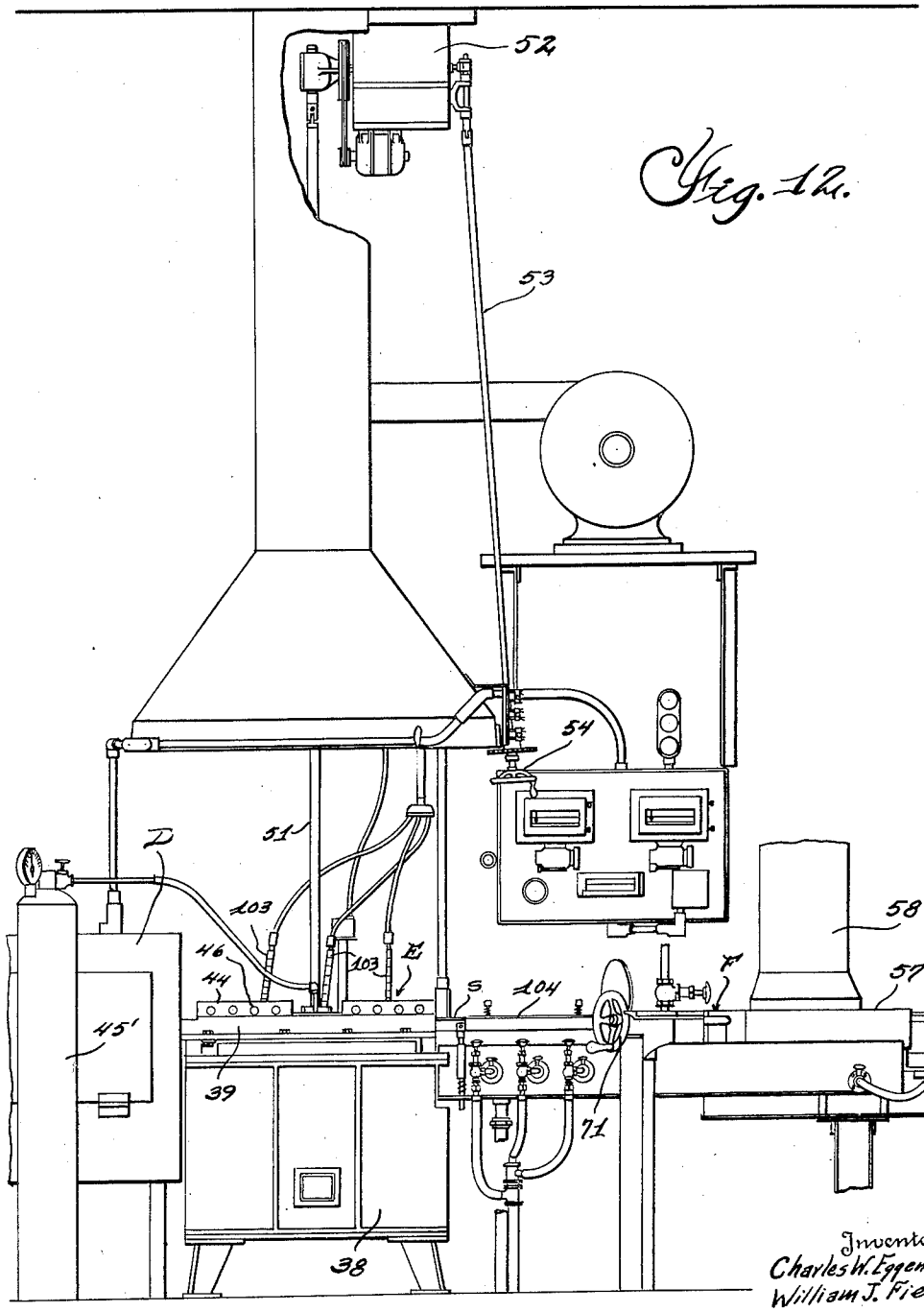

Fig. 12.

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APPARATUS FOR BABBITTING A CONTINUOUS STRIP IN THE FORMATION OF HALF BEARINGS AND THE LIKE

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Fig. 14.

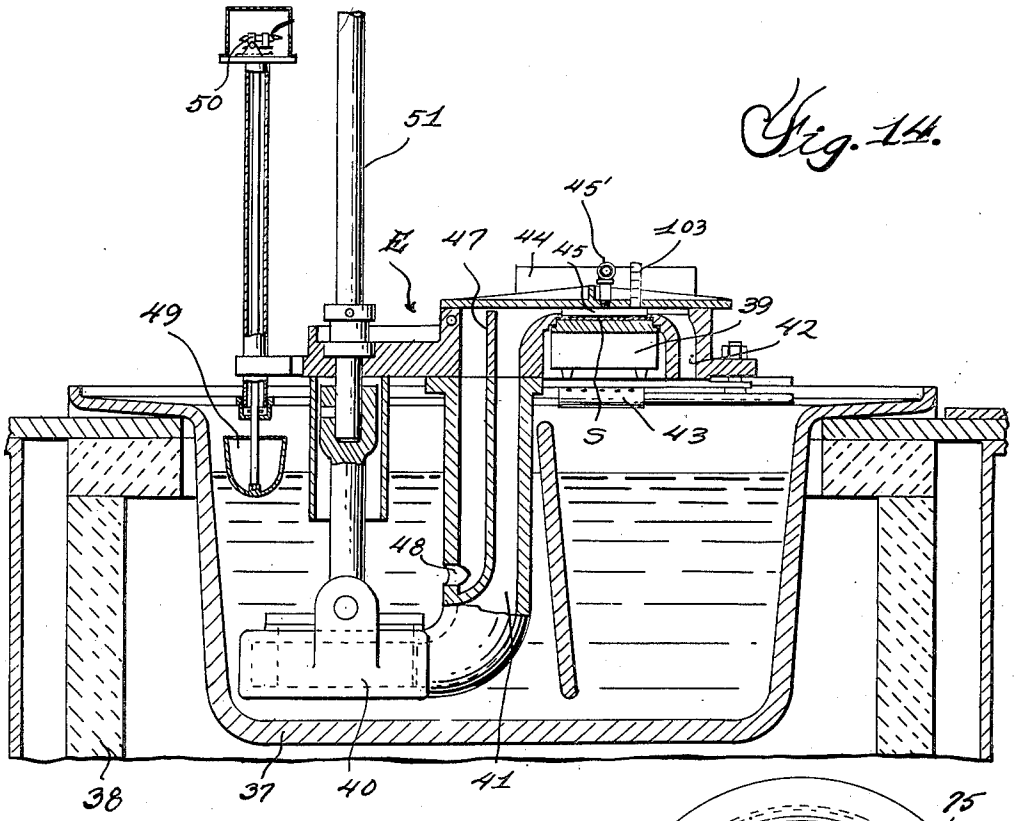
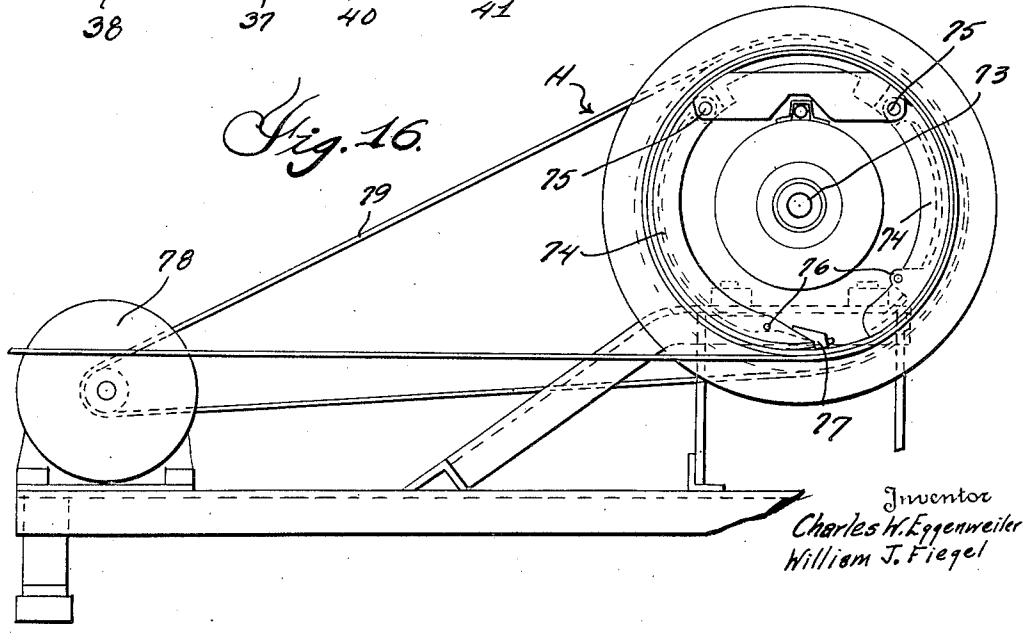


Fig. 16.



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APPARATUS FOR BABBITTING A CONTINUOUS STRIP IN THE FORMATION OF HALF BEARINGS AND THE LIKE

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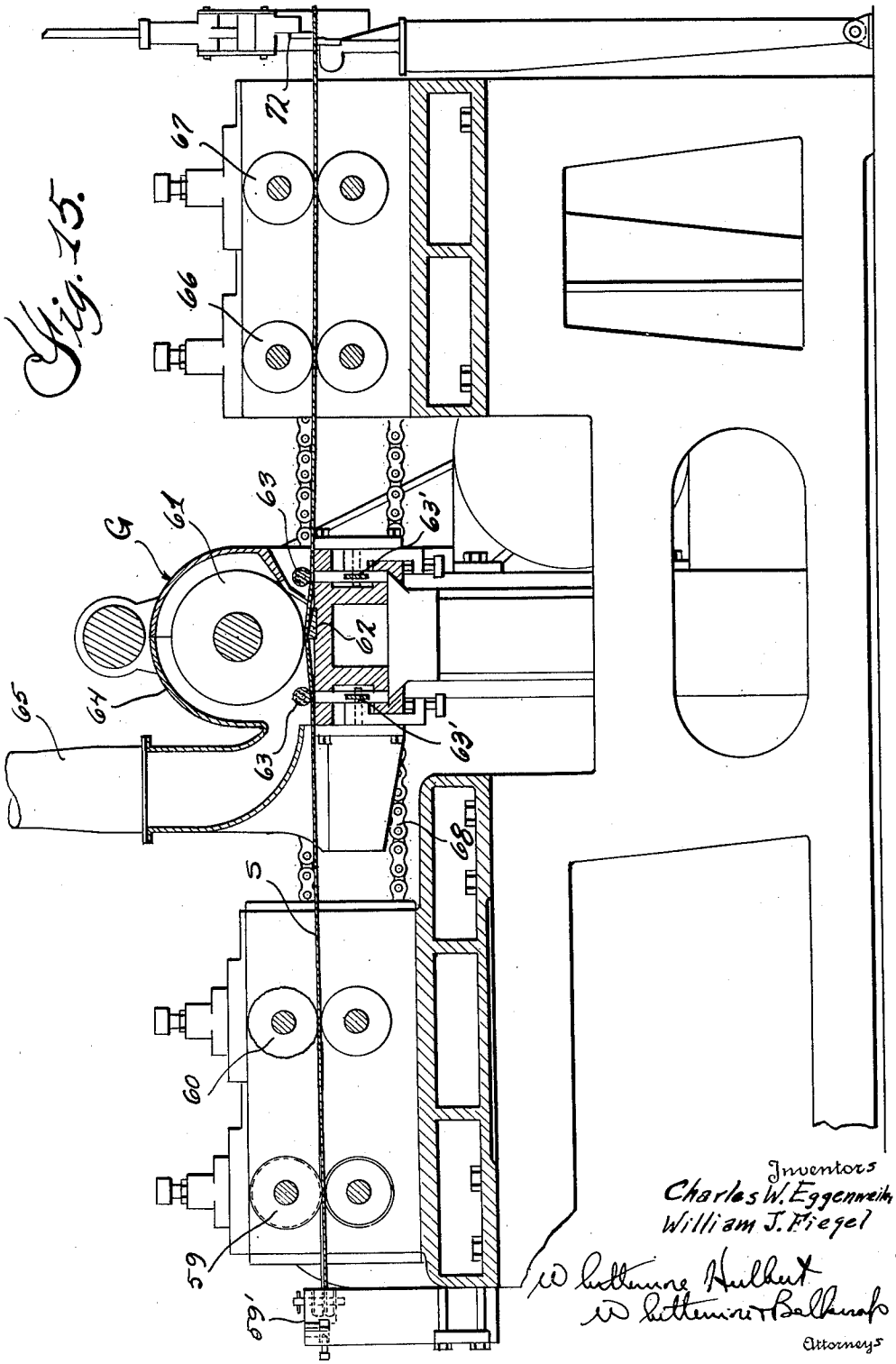
Fig. 15.



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Patented May 11, 1937 2,080,170

UNITED STATES PATENT OFFICE

2,080,170

APPARATUS FOR BABBITTING A CONTINUOUS STRIP IN THE FORMATION OF HALF BEARINGS AND THE LIKE

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Application January 31, 1933, Serial No. 654,442
Renewed October 9, 1936

6 Claims. (Cl. 29—33)

The invention relates to a method and apparatus for babbitting a continuous strip in the formation of half bearings and the like.

The present invention relates more particularly to the process and apparatus for forming steel back bearings and half bearings from a continuous strip of metal, and has as its particular objects to simplify, render more efficient, and improve generally that portion of the method and apparatus which involves the babbitting of the continuous strip.

In accordance with this invention, a continuous strip of metal, such as previously tinned steel, is caused to continuously pass through the several units of the apparatus, the principal ones of which are a babbitting machine, a cooling unit, and a milling unit; there being also provided a strip end joiner and suitable devices for heating the strip, fluxing the strip, and also flexing the strip to maintain the same in a flat condition.

This invention also contemplates the provision of additional tinning means operable upon the strip preferably just prior to the babbitting operation for retinning the strip to insure the presence of an adequately tinned surface to afford a proper bond for the babbitt.

The invention also contemplates the production of bearings from an untinned strip in which event one surface of the strip will be tinned by, for instance, the retinning means previously referred to which acts on the strip prior to the babbitting means.

The several steps of the method as well as the apparatus employed will be fully explained as this description proceeds, reference being made to the accompanying drawings in which

Figures 1 and 1A are semi-diagrammatic plan views of the apparatus by means of which the herein described method is performed;

Figure 2 is an enlarged side elevational view showing the beginning of the strip feeding and guiding mechanism;

Figure 3 is a fragmentary detail sectional elevational view taken substantially on the plane indicated by line 3—3 in Figure 2;

Figure 4 is a detail sectional view taken on the plane indicated by line 4—4 in Figure 2;

Figure 5 is a plan view partly in horizontal section of the strip end joining mechanism;

Figure 6 is a fragmentary detail sectional view taken substantially on the plane indicated by line 6—6 in Figure 5;

Figure 7 is a fragmentary detail vertical sectional view of a portion of the joining mechanism;

Figure 8 is a detail sectional view taken substantially on the plane indicated by line 8—8 in Figure 7;

Figure 9 is a detail sectional elevational view taken substantially on the plane indicated by line 9—9 in Figure 8;

Figure 10 is a fragmentary perspective view showing the completed joint between the ends of two strips;

Figure 11 is a sectional elevational view showing the strip straightening and acid applying means;

Figure 12 is a front elevational view of the babbitting machine and cooling unit, together with the controls therefor;

Figure 13 is a vertical longitudinal sectional view through the babbitting machine and the strip cooling unit;

Figure 14 is a vertical transverse sectional view through the babbitting machine taken substantially on the plane indicated by line 14—14 in Figure 13;

Figure 15 is a sectional elevational view showing the milling unit and its associated mechanism, and

Figure 16 is an elevational view showing the reeling mechanism for the completed strip.

Referring now more particularly to Figures 1 and 1A, it will be noted that there is illustrated at A a unit which consists of a mounting for the supply roll of strip metal together with a hand feed mechanism for starting the strip. From this, the strip passes through unit B which consists of joining mechanism whereby the ends of successive rolls of strip material may be joined so that the process is substantially continuous. Following this, the strip passes through a unit C which includes a series of drag and straightening rolls which act to flatten the strip and to tension the same. Following this, the strip passes through the oven unit D and from the oven the strip passes through the babbitting unit E. Upon leaving the babbitting unit, the strip passes through the cooling unit F and thence to the milling unit G. The reference character H indicates the reeling unit for receiving the babbitted strip.

Referring now more particularly to Figures 2, 3, and 4, it will be noted that there is illustrated a supply reel 10 upon which the stock in the form of a continuous previously tinned metal strip S is wound. This strip is conducted through a guide in the form of an adjustable member 11 adjustably mounted, as at 12, upon a suitable support 13, this adjustable member 11 being pro-

vided with a lateral down-turned edge 14 engaging one edge of the strip S, the other edge of the strip engaging a companion guide strip 15.

From this guiding mechanism, the strip S passes under a roll 16 and over a pair of rolls 17. The upper roll is adjustable by mechanism 18 so that the strip will be frictionally engaged between the rolls, and the rolls are geared together and operable by means of a handle 19 so that the strip may be fed by hand through this mechanism in starting the operation and at any time thereafter when it is desirable to effect a short or slow feed of the strip.

The unit B, which is the end joining mechanism, is illustrated in Figures 5 to 9 inclusive. This joining mechanism consists of pairs of spaced feed rolls 20 provided with suitable manual operating means 21. These manually operated feed rolls 20 will be employed to adjust the adjacent ends S' and S'' of two strips of stock so as to join the rear end of one roll to the front end of the new roll of stock. The meeting ends of these two strips are indicated by the reference character S''' and these end edges are adapted to be positioned under a punch press indicated generally by the reference character 22 (see also Figure 6). When thus positioned, the ends of the strips S' and S'' are secured in place by means of clamping devices 23. The punch press 22 is then operated to provide a tongue and groove configuration on the adjacent ends of the strips S' and S''. Having thus shaped the ends of the strips, these ends are moved under a joining press 24 and superposed one over the other in overlapping relation, as illustrated in Figure 7, with the tongues of one of the strips being disposed over the grooves of the other strip. The ends of the strips may be held in this position, the lower strip S'' by means of pins 25, and the end of the strip S' by means of a block 26. The joining press 24 is then caused to descend to press the tongues of the upper strip S' into the grooves of the lower strip S'', a pin control block 27 being simultaneously operated to permit the anchor pins 25 to move downwardly. Thus the two ends of the strips of stock are united in the manner suggested in Figure 10, and subsequently the contacting portions of the strips are permanently secured together with welds, for instance at the points 28, by means of a welder W (see Figure 1). A grinder X is provided by means of which the edges of the strips at the joint may be smoothed so as to facilitate the passage of the joint through the machine in the subsequent operations.

The strip S then passes between pairs of rolls 29 and 30 which rolls are all geared together so as to operate in unison. The upper roll of the pair of rolls 30 is provided longitudinally with a concave contour, whereas the lower or companion roll is provided with a convex contour. This upwardly flexes the strip transversely as illustrated to offset the tendency of the strip subsequently to curl upwardly at the longitudinal edges. The pairs of rolls 29 and 30 are adjusted to tightly engage the strip and, as heretofore mentioned, are rotated in unison and by reason of the frictional engagement of the strip therewith. The shaft of the lower of the pair of rolls 30 is provided with a drag brake 31 so that rotation of the rolls is retarded or resisted, thus placing a tension upon the strip S to hold the same taut.

Located preferably adjacent the unit C is a flux applying mechanism. This mechanism may consist of one or more substantially box-like enclosures 34 through which the strip S is caused to travel. Arranged in each enclosure 34 is a reciprocable member 34a provided with a padded surface 34b. The member 34a is reciprocated by means indicated generally by the reference character 35, and if a second similar device is employed the reciprocable member of the second device is connected to the member 34a by means of a link 35a. Flux is supplied from a container 32 and discharged through a valve controlled spout 33 and through an opening 33a in the reciprocable member 34a.

The strip S is then caused to travel through the furnace D where the temperature of the strip is raised preparatory to the babbitting operation which occurs at the unit E.

The babbitting apparatus comprises a pot 37 arranged within a furnace 38. The strip S is caused to travel along a support 39 arranged over the pot 37. The reference character 40 indicates a pump which forces the molten babbitt metal up through conduit 41 and over the top surface of the strip S transversely to the path movement of the strip, the excess babbitt metal flowing downwardly through conduit 42 and out again into the pot 37. The strip S is held in engagement with the support 39 by a pair of upper guide members 44 which are spaced apart to provide the chamber 45 through which the babbitt metal flows in contact with the exposed upper surface of the strip S. Both the support 39 and the upper guide members 44 are provided with means 46 for heating the same.

The pump 40 raises an amount of molten babbitt metal in the conduit 41 in excess of that which can flow across through chamber 45, and this excess babbitt metal flows over the wall 47 in the conduit 41 and back downwardly and out through opening 48 into the pot. This insures a constant flow of hot babbitt metal across the exposed surface of the strip S. A heater 43 is preferably arranged below the chamber 45 so that the temperature of the babbitt metal as it contacts with the strip S can be more accurately controlled.

Retinning means is preferably provided in advance of the babbitting chamber 45, and this retinning means may be in the form of a well or recess 100 formed in the upper guide member 44, into which well slugs or pieces of tin may be placed, which in view of the heaters 46 will be reduced to a molten state and flow onto the upper exposed surface of strip S. The wall 101 of the well or recess is extended down to the surface of the strip so as to scrape any excess tin from the strip as the latter passes. However, in advance of the well a clearance 102 is provided to permit the coating of the surface of the strip with tin. Temperature indicating means in the form of thermo-couplers 103 are preferably provided for the babbitting chamber 45 and between the guide blocks 44.

Beyond the babbitting mechanism is a space 104 through which the condition of the strip may be observed so that the operator can ascertain from the condition of the babbitted surface whether or not the strip is traveling at too great a speed or too slowly, and thus can control the heat of the strip accordingly.

The reference character 49 indicates a float which floats in the molten babbitt metal and indicates when additional babbitt metal must be introduced into the bath by operating a switch 50. The reference character 51 indicates the

shaft for operating the rotor of the pump 40, this shaft being operatively connected to and driven by a transmission mechanism 52. The speed of rotation of the pump and thus the quantity of molten babbitt metal supplied may be regulated by properly adjusting the transmission mechanism through a shaft 53 operable by means of a hand wheel 54. (See Figure 12).

In order to provide against oxidization, some agent such as nitrogen or CO_2 is introduced in the chamber 45 by means such as 45' to produce a reducing atmosphere therein.

As the strip leaves the babbitting unit E it is carried through a cooling unit F in which it is first subjected to an atomized spray of water and air by means of spray nozzles 55, and subsequently is subjected to jets of water from nozzles 56. This latter may occur in a housing or the like 57 provided with a hood or conduit 58 for conveying the steam away.

Prior to passing through the milling unit G the strip passes through a guide 59' and then through pairs of driving rolls 59 and 60. The upper of the rolls 59 is convex in longitudinal contour, whereas the lower roll of this pair is concave. This dishes or bows the strip transversely in a direction opposite to the action of the rolls 30, heretofore referred to. The other pair of rolls 60 are cylindrical, and the upper roll is knurled. These rolls are positively driven through suitable gearing to assist in effecting the feed of the strip S through the machine.

The upper surface of the strip which is now coated with babbitt metal is subjected to the action of a milling cutter 61. The strip at the point of engagement with the milling cutter is raised out of the general plane of its path of travel by passing over an anvil 62. On either side of the anvil 62 is a roller 63 extending transversely of the strip and engaging the top surface thereof. These rollers are rockably mounted by mounting means 63' so as to be tiltable longitudinally to adjust themselves to any camber of the strip S. The milling cutter is enclosed in a housing 64 connected to a conduit 65 by means of which the chips from the milling cutter may be conveyed away and reclaimed. Beyond the milling cutter are other sets of strip driving rolls 66 and 67. All of the rolls 59, 60, 66, and 67 are driven at the same speed through suitable gearing of which the chain 68, shown in Figure 15, forms a part. The rolls 66 and 67 are of larger diameter than the rolls 59 and 60 so as to hold the strip S taut while passing the milling cutter. This driving mechanism (Figure 1A) includes a variable speed transmission 69 which is adjustable by means of a control rod 70 and a hand wheel 71 from the operator's position adjacent the babbitting machine unit E. Thus the speed of travel of the strip S may be regulated by regulating the speed of rotation of the driving rolls 59, 60, 66, and 67. The milling cutter is driven at a constant speed.

The reference character 72 indicates a sheering device or cutter so that after a length of material sufficient for convenient handling has passed through the machine this length may be severed from the remainder.

Beyond the milling cutter is a reeling device which consists of a collapsible core member mounted on an axle 73 and comprising a pair of pivoted segments 74 which are pivotally mounted as at 75. These segments 74 are held in their outer position by means of pins 76. The end of the strip S may be provided with an abutment 77 clamped thereto which can be hooked over one of these segments when the roll is commenced. When a sufficient quantity of material has been wound upon the roll, the pins 76 are withdrawn and the segments 74 are collapsed inwardly thus permitting the roll of babbitted strip material to be removed. The reeling device is driven from a motor 78 by means of a belt 79.

From the foregoing, it will be apparent that starting with a continuous strip of metal the same is subjected to a babbitting operation and subsequently to a milling operation with the result that a strip provided with a uniform coating of babbitt material is produced which may subsequently be sheared and shaped into half bearings.

In practice, the strip is subjected to the operation of sheering and shaping devices which sheer the same into pieces and shapes the pieces into substantially semi-cylindrical half bearings or cylindrical whole bearings.

If an untinned strip is to be employed, the retinning mechanism hereinbefore referred to, or some other generally similar means, may be employed for applying a coating of tin to the upper surface of the strip prior to the babbitting operation.

Having thus described our invention, what we claim is:

1. In an apparatus of the class described, means for advancing a continuous strip of metal, means for maintaining a column of molten babbitt metal at one side of the strip and flowing the same transversely of the path of movement of the strip in contract therewith for depositing a layer of babbitt metal on one surface of the strip during the travel thereof, and means acting during the continued movement of the strip for machining the babbitted surface thereof.

2. In an apparatus of the character described, means for continuously advancing a continuous strip of metal, means for maintaining a column of molten babbitt metal at one side of the strip and flowing the same transversely across the strip for depositing a layer of babbitt metal on one surface of the strip during the travel thereof, means for cooling the composite strip during its continued travel, a surfacing element, and means for moving said strip past said surfacing element to machine the babbitted surface thereof.

3. In an apparatus of the character described, means for continuously advancing a continuous strip of metal, a heating compartment through which said strip is passed, a babbitting apparatus acting on the previously heated strip during its travel to deposit thereon a layer of babbitt metal of substantially predetermined thickness, a cooling means through which said strip is conducted, and means acting on the babbitted surface of said strip during the continued movement thereof for machining the babbitted surface to reduce the composite strip to approximate thickness.

4. In an apparatus of the character described in which an endless strip of metal is continuously drawn from a supply reel, means for continuously advancing said strip of metal, means for fluxing and heating said strip during its advance movement, means for subsequently depositing a layer of babbitt metal on one surface of the heated strip, means for cooling the strip, means acting on the babbitted surface of the strip during its advance movement to machine the bab-

bitted surface thereof, and means for winding the strip on a reel.

5. In an apparatus of the character described in which an endless strip of metal is continuously drawn from a supply reel, means for continuously advancing said strip of metal, joining means for the adjacent ends of successive strips, means for applying flux to the strip during its advance movement, a heating chamber through which said strip passes, babbitting means for depositing a layer of babbitt metal upon one surface of said strip during the movement thereof and immediately after the same leaves the heating chamber, a cooling device acting on said strip subsequent to said babbitting operation and during movement of the strip, a machining device acting on the babbitted surface of said strip during the movement of the strip for machining said babbitted surface, and a reeling device upon which the completed composite strip is received.

6. In an apparatus of the character described in which an endless strip of metal is continuously drawn from a supply reel, means for continuously advancing said strip, joining means for the adjacent ends of successive strips, means acting on the advancing strip for straightening and flattening the same, a heating chamber through which the strip passes, means for maintaining a column of molten babbitt metal and flowing the same transversely of the path of movement of the strip in contact therewith for depositing a layer of babbitt metal on one surface of the heated strip during the travel thereof, cooling means acting on said strip subsequent to the babbitting operation and during the continued movement of the strip, and means acting on the babbitted surface of the strip as it leaves the cooling means to machine the babbitted surface thereof to reduce the composite strip to approximate thickness.

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