

April 25, 1939.

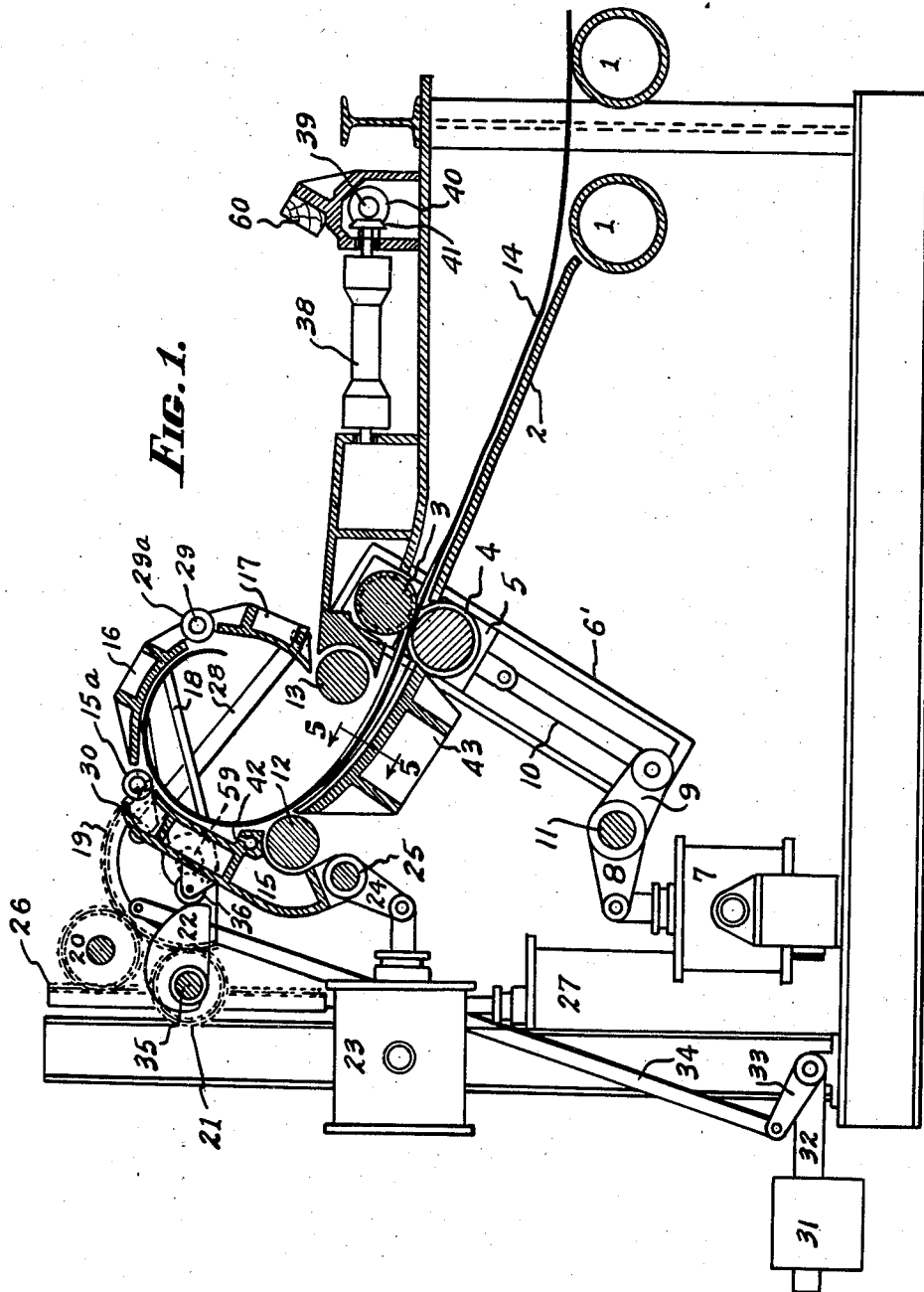
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2,155,879

SEMIARTICULATED FORMING HOOD FOR UP-TYPE COILERS

Filed Aug. 25, 1937

4 Sheets-Sheet 1



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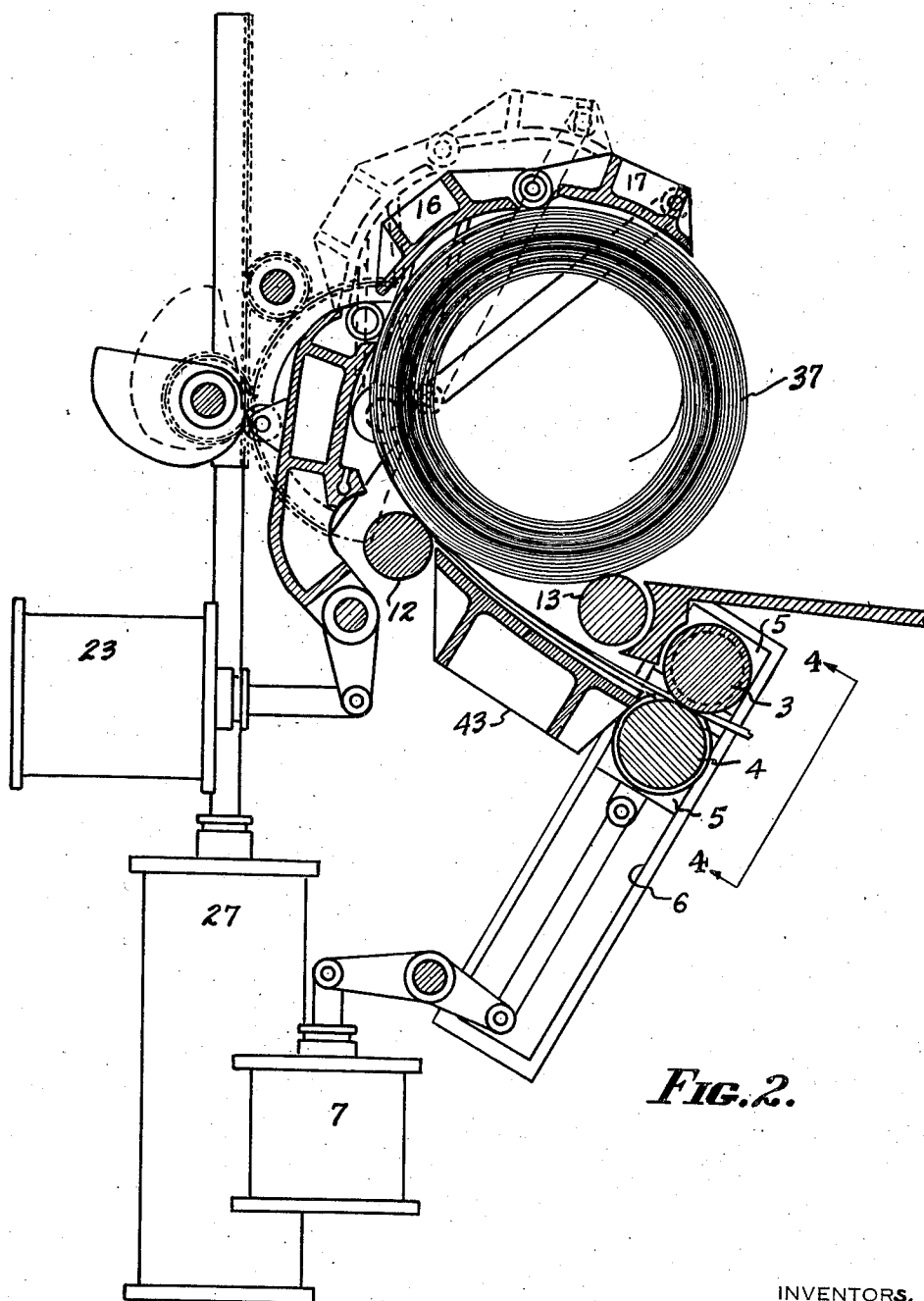
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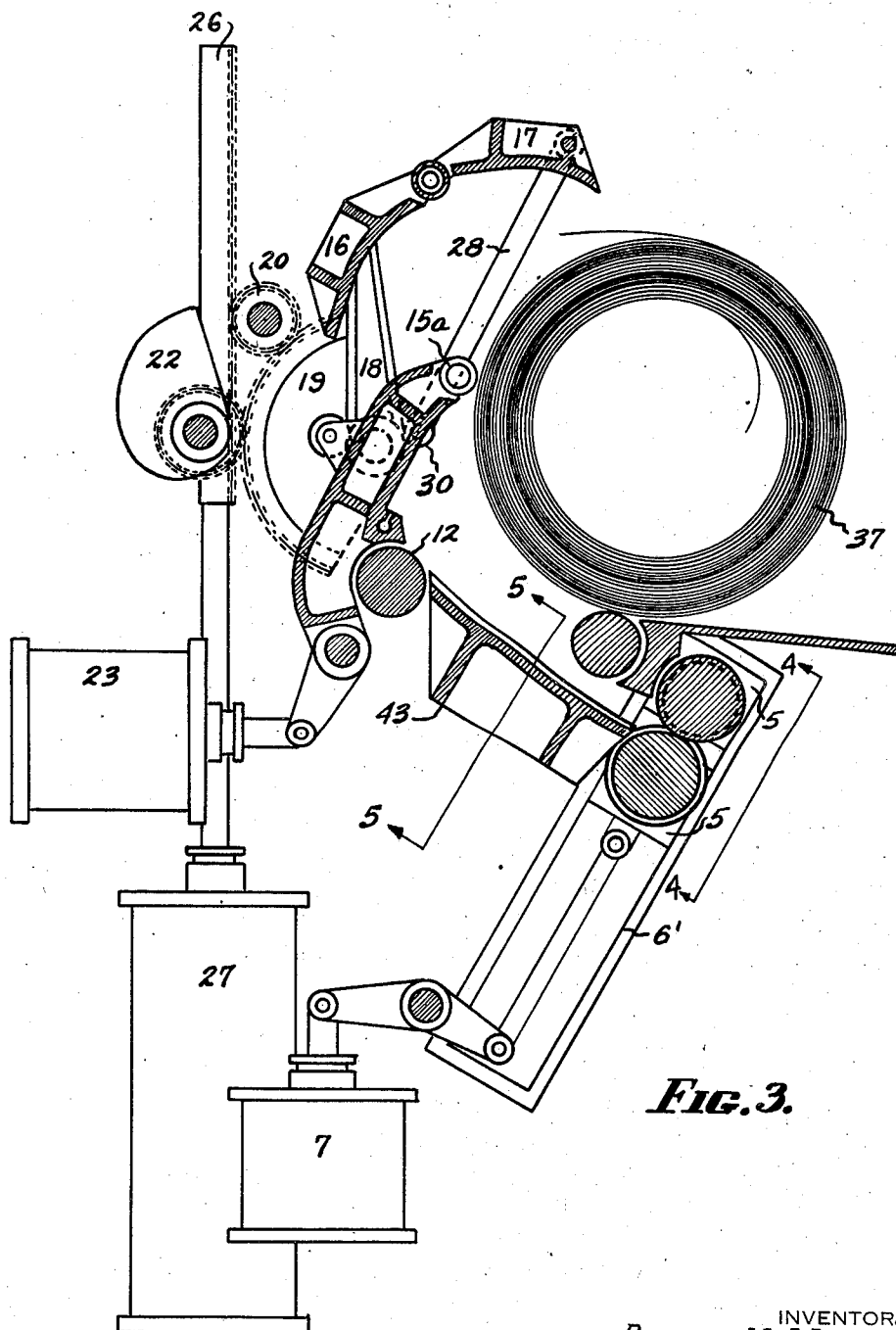
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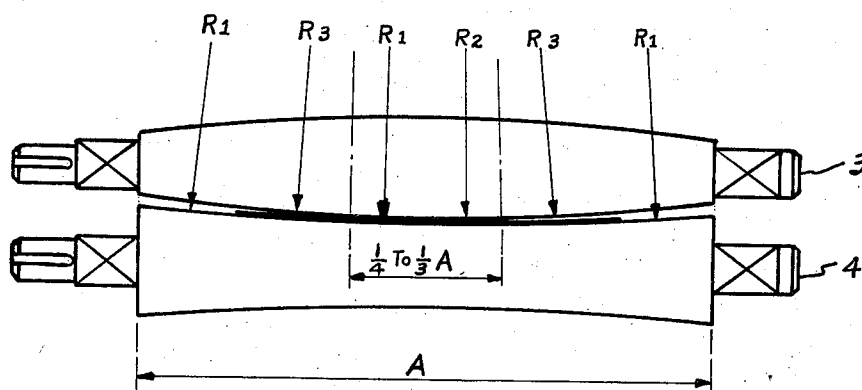


FIG. 4.

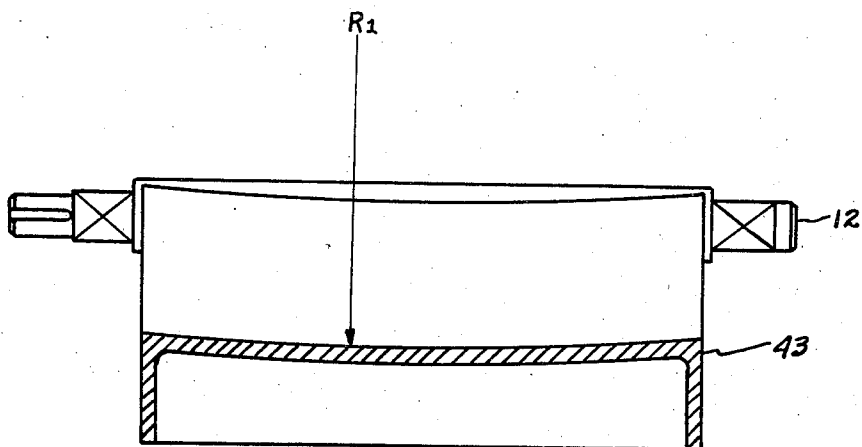


FIG. 5.

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UNITED STATES PATENT OFFICE

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SEMIARTICULATED FORMING HOOD FOR
UP-TYPE COILERS

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Application August 25, 1937, Serial No. 160,895

6 Claims. (Cl. 242—78)

This invention relates to hot strip coilers for coiling strip as it comes from the hot strip rolling mill. More particularly, our invention relates to a coiler having a semi-articulated forming hood for directing and guiding strip into coil form and for retaining the coil as it is formed, and for ejecting the formed coil onto a conveyor.

It is an object of our invention to provide a coiler of the type above mentioned which will be simple in its structure and inexpensive to build and maintain.

Since hot strip is delivered from the mills at high surface speed a coiler for this purpose must be automatic in operation so that the coil forming operation will start at the proper time. It is, therefore, a further object of our invention to provide an articulated coil forming device which is automatic in starting when the strip is first received into the machine to be coiled. It is a still further object of our invention to provide a system of counterweights whereby the coil itself starts the outward movement of the articulated forming members, whereby all other timing means are eliminated.

These and other objects of our invention which will be pointed out hereinafter or which will be apparent to one skilled in the art upon reading these specifications, we accomplish by that certain method and by that construction and arrangement of parts of which we shall now describe an exemplary embodiment. Reference is made to the drawings forming a part hereof, and in which:

Figure 1 is a vertical longitudinal section through the machine.

Fig. 2 is a partial section similar to Fig. 1 through a part of the machine showing the coil as it is being formed.

Fig. 3 is a view similar to Fig. 2 showing the manner in which the coil is ejected from the machine after it is wound.

Fig. 4 is an elevation of the pinch rolls showing the special formation which gives longitudinal stiffness to the strip.

Fig. 5 is a cross sectional view of the apron plate taken on the line 5—5 of Fig. 1.

Briefly, in the practice of our invention, we provide specially formed pinch rolls which feed the strip over an apron plate into the coil forming hood. These pinch rolls are shaped as will be described hereinafter, to impart longitudinal stiffness of the strip to prevent buckling. We provide a series of coil forming members, certain of which are actuated by the coil as it grows, and which through a linkage mechanism operate

another coil forming member, so that as the coil grows, the coil forming members spread in a circular manner.

Referring to the drawings, the rolls 1 are the last rolls at the hot mill table which delivers the strip from the hot mill to the coiler. The strip 14 is carried upwardly over a plate 2 to pinch rolls 3 and 4 which propel the strip into the coil from a region included within the segments 15, 16 and 17, and the carrier rolls 12 and 13, and the apron plate 43. The strip is fed upwardly into this space between the rolls 12 and 13 and the coil as it is being formed rests upon the rolls 12 and 13, as may be seen in Fig. 2. The pinch rolls 3 and 4 are mounted in bearing blocks 5 suitably positioned in the housing window 6 of the side frames of the machine. An air cylinder 7 is provided for urging the lower pinch roll 4 against the upper pinch roll 3 through the linkage 8, 9 and 10. Since the lever arms 8 and 9 are both keyed to the shaft 11 which extends across the machine to the side frames 6, it will be seen that as pressure is admitted to the upper part of the cylinder 7, pressure is exerted on the roll 4. The pinch rolls 3 and 4 are suitably driven in any desired manner as are the rolls 12 and 13. The drive for these rolls is conventional and is therefore not illustrated. It may be noted that it is preferable to drive the rolls 12 and 13 at a slightly higher surface speed than the pinch rolls 3 and 4.

When coiling narrow strip of the thinner gauges there is danger of a cobbler between the pinch rolls 3 and 4 and the back carrier roll 12, on account of the fact that the strip 14 is thrust into the circular path for forming the coil by means of rolls 3 and 4. This danger arises on account of the structural weakness of the strip at coiling temperatures. In order to increase the structural strength to eliminate cobbling, we make the roll 3 convex and the roll 4 concave, as may clearly be seen in Fig. 4, thereby producing a concavo-convex strip in cross section whereby greater strength is imparted to the strip to enable it to resist the propulsion force imparted to it by the pinch rolls 3 and 4. In order to reduce the possible damage to the surface of the strip at points along the pinch roll surface where the surface speeds do not coincide, the clearance between the pinch rolls is increased toward their ends. It is desirable that actual contact between the pinch rolls be made within the region of the middle fourth to the middle third of the roll length. In the drawings, R₁ rep-

represents the radius of curvature of the roll 4 throughout its length. R_2 (less average strip thickness) represents the radius of the roll 3 within the region of the middle fourth to the middle third of the roll length. R_3 represents the radius of the roll 3 beyond the limits of the middle contact zone. The apron plate 43 is also provided with a transverse curvature with a radius equal to R_1 as shown in Fig. 5.

The coil forming segments are indicated at 15, 16, and 17. The segments 16 and 17 are hinged together at 29 and are supported by two arms 18 and 28 while the segment 15 is entirely independent of the segments 16 and 17 and is keyed to the transverse shaft 25. The arm 18 which is one of the arms supporting the articulated segments 16 and 17 is keyed to the transverse shaft 59 and serves to actuate other parts of the mechanism, as will presently be described, while the arm 28 is pivoted about the fixed point 30. It will thus be seen that the arm 28 fixes the movement of the end of the segment 17 in a circular path about the fixed point 30.

Also keyed to the shaft 59 is a gear segment 19 which is thus actuated by movement of the arm 18. This segment meshes with the gears 20 and 21. The gear 21 is keyed on the shaft 35 which also carries keyed to it the cam 22, which is adapted to actuate the cam follower 36, which is mounted upon the segment 15. The segments 16 and 17 are counterweighted by the weight 31 through the linkage 32, 33 and 34, the member 34 being pivoted to the gear segment 19. The segment 15 is connected to an air cylinder 23 by means of a lever 24 keyed on the shaft 25 which carries the segment 15. The follower 36 on the segment 15 is maintained in contact with its cam 22 by admitting low pressure air to the left end of the cylinder 23.

It will now be seen that as the coil within the coil forming space grows, the segments 16 and 17 which are counterweighted as above described, rest on the growing coil and are gradually pushed outwardly. As this occurs the gear segment 19 is rotated in a counterclockwise direction, whereby the gear 21 and the cam 22 are moved in a clockwise direction. As the cam 22 turns in a clockwise direction the follower moves to the left because of the air pressure in the cylinder 23 and thus the segment 15 also moves upwardly.

In order to reduce friction of the coil against the forming devices, we provide a roller 29a at the point where the segments 16 and 17 are hinged together and also a roller 15a at the end of the segment 15. Furthermore, we provide for high pressure water between the segment 15 and the strip 14 by means of the nozzle 42. In order to eject the coil after it has been formed, the segments 16 and 17 are raised to clear the coil 37 by the admission of high pressure air to the lower end of the cylinder 27. The piston rod of the cylinder 27 carries the rack 26 which meshes with the gear 20, described above. Thus as the rack 26 moves upwardly the gear 20 is rotated in a clockwise direction and the gear segment 19 is rotated in a counterclockwise direction, whereby the segments 16 and 17 are raised. At this point high pressure air is admitted to the right hand end of the cylinder 23 which rotates the segment 15 in a clockwise direction causing the roller 15a to eject the coil toward the right. After the coil has been ejected the segments 16 and 17 are returned to their initial position by admitting air to the upper end of the cylinder 27 which lowers the rack 26, and through the above de-

scribed connection lowers the segments 16 and 17. The right hand end of the cylinder 23 is then opened to the atmosphere causing the segment 15 to return to its initial position.

The ejected coil rolls out onto the conveyor rollers 38 which are driven from the shaft 39 through the gears 40 and 41. The member 60 is simply a wooden bumper to prevent the coil from rolling off the conveyor.

It will thus be seen that the segment 15 is held in position against the cam by constant low air pressure on the left hand end of the cylinder 23 and that the ejecting movement of the segment 15 is obtained by the admission of high pressure air to the right hand end of the cylinder 23 except during the ejection of the coil when the right hand end of the cylinder 23 is open to the atmosphere. The segments 16 and 17 are operated by the growing coil except during ejection when they are operated by the admission of air to the lower end of the cylinder 27, to raise the segments to clear the coil, and by the admission of air to the upper end of the cylinder 27 to lower them to their initial position. When the segments 15, 16 and 17 are in their initial position both ends of the cylinder 27 and the right hand end of the cylinder 23 are open to the atmosphere. In practice the operations of these cylinders may be conducted from a control station by means of push buttons operating electric valves in any well known manner, and the cylinder 27, for example, may be operable by means of a limit switch to raise the segments 16 and 17 when the coil is completed. It should be noted that during coil growth the coil itself is the sole means for actuating the segments 15, 16 and 17, and the coil is thus fully guided and kept in contact with the carrying rolls at all times, and consequently the finished coil is perfectly round and tightly wound.

It is to be understood that modifications may be made without departing from the spirit of our invention, and that we do not intend to limit ourselves otherwise than as pointed out in the claims which follow.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In a hot coiler, a frame, a guide segment pivotally mounted in said frame, other guide segments articulated together, a shaft, an arm on said shaft supporting said articulated guide segments, a gear segment mounted on said shaft, a cam positioned to be actuated by said gear segment, and a follower for said cam on said first mentioned segment, whereby as the coil grows and pushes said articulated segments outwardly, said first mentioned segment is also moved outwardly.

2. In a hot coiler, a frame, a guide segment pivotally mounted in said frame, other guide segments articulated together, a shaft, an arm on said shaft supporting said articulated guide segments, a gear segment mounted on said shaft, a cam positioned to be actuated by said gear segment, a follower for said cam on said first mentioned guide segment, and means for continuously urging said first mentioned guide segment and follower against said cam, whereby as the coil grows and pushes said articulated segments outwardly, said first mentioned segment is also moved outwardly.

3. In a hot coiler, a frame, a guide segment pivotally mounted in said frame, other guide segments articulated together, a shaft, an arm

on said shaft supporting said articulated guide segments, counterweight means for said articulated segments, a gear segment mounted on said shaft, a cam positioned to be actuated by said gear segment, a follower for said cam on said first mentioned guide segment, and means for continuously urging said first mentioned guide segment and follower against said cam, whereby as the coil grows and pushes said articulated segments outwardly, said first mentioned segment is also moved outwardly.

4. In a hot coiler, a frame, a guide segment pivotally mounted in said frame, other guide segments articulated together, a shaft, an arm on said shaft supporting said articulated guide segments, counterweight means for said articulated segments, a gear segment mounted on said shaft, a cam positioned to be actuated by said gear segment, a follower for said cam on said first mentioned guide segment, means to confine the free end of said articulated segments to a circular path, and means for continuously urging said first mentioned guide segment and follower

against said cam, whereby as the coil grows and pushes said articulated segments outwardly, said first mentioned segment is also moved outwardly, and whereby said segments retain substantially their true circular relationship during coil growth. 5

5. In a hot coiler according to claim 1, separate means for rotating said gear segment in either direction, to raise said articulated segments clear of the coil for ejection thereof, and to lower said articulated segments to their initial position for a successive coiling operation. 10

6. A hot coiler according to claim 2, in which the means for urging said first mentioned guide segment against said cam comprises a double acting pressure cylinder, one side thereof being under low pressure during the coiling operation, and means for applying high pressure to the other side thereof to rock said first mentioned segment in a reverse direction for ejecting the formed coil. 20

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