April 26, 1927. 1,626,190

W. S. ELLIOT

HANDLE BENDING MACHINE

Filed May 2, 1925 3 Sheets-Sheet 1

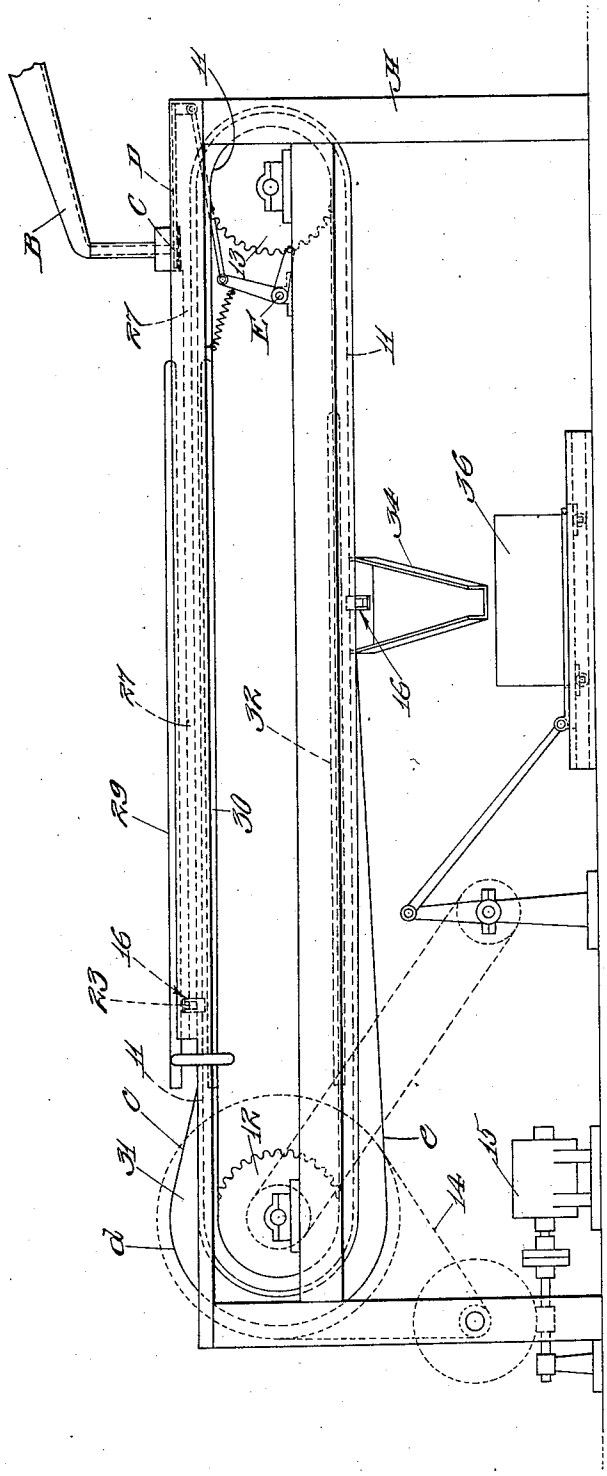


Fig-1-

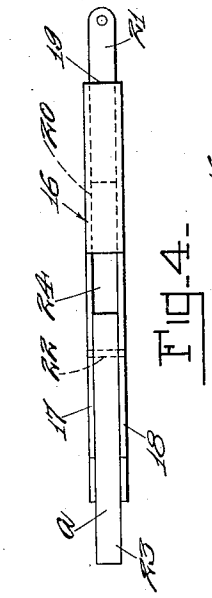


Fig-4-

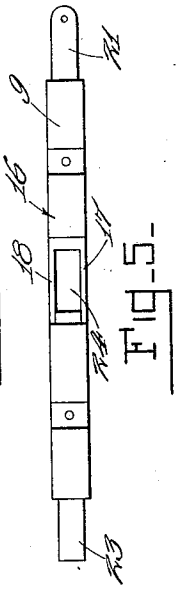


Fig-5-

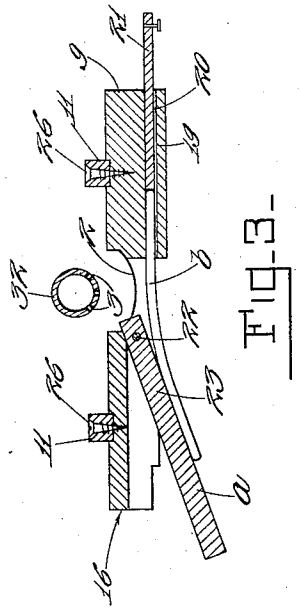


Fig-3-

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HANDLE BENDING MACHINE

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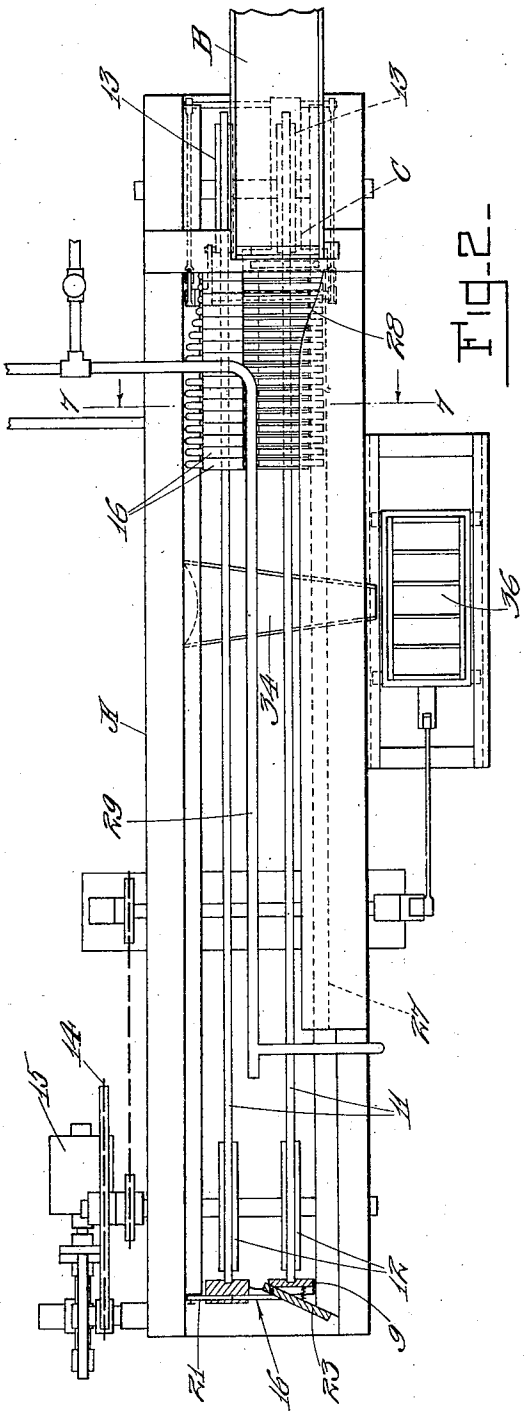


Fig. 2.

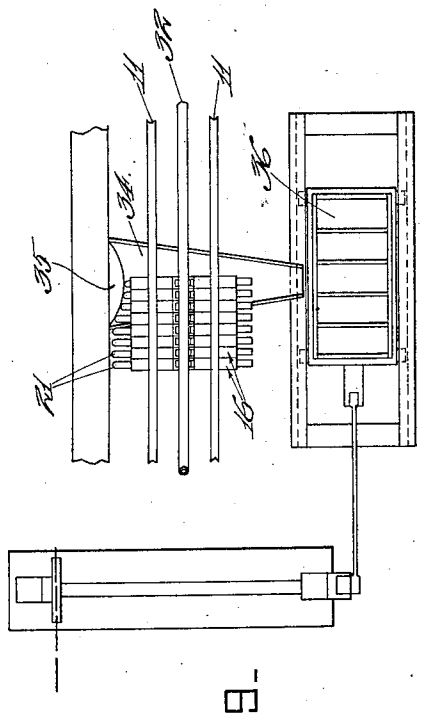


Fig. 3.

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April 26, 1927. 1,626,190

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HANDLE BENDING MACHINE

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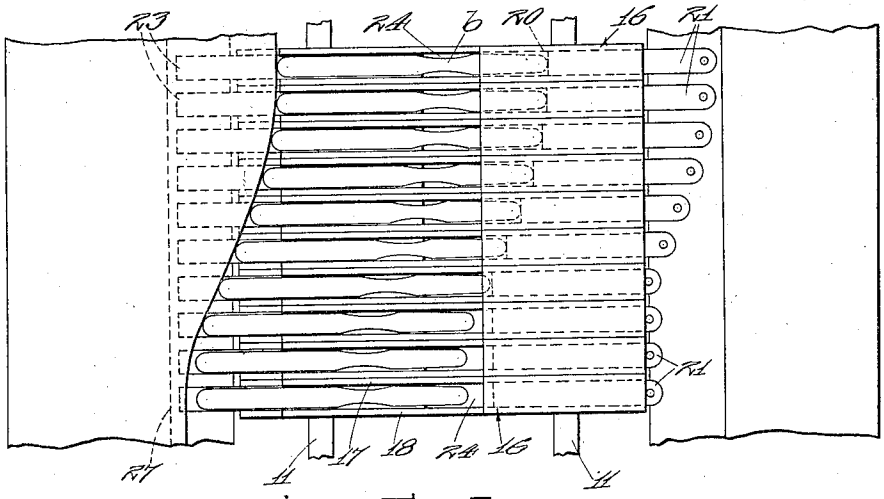


Fig. 6.

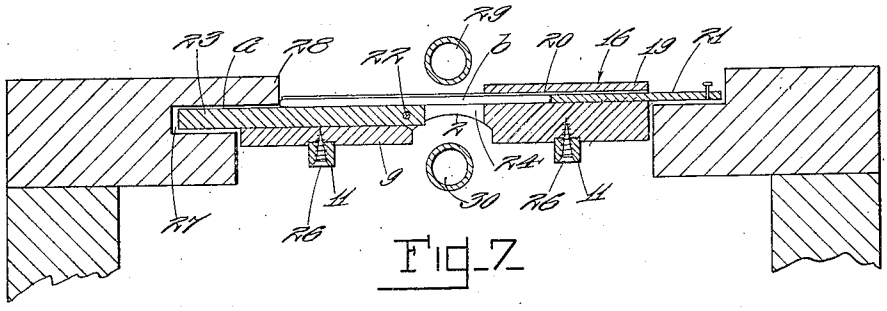


Fig. 7.

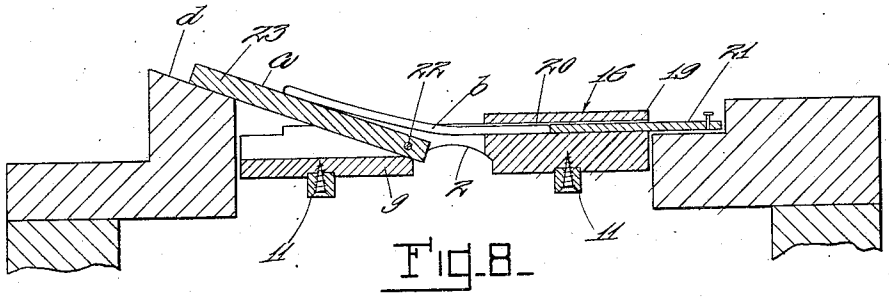


Fig. 8.

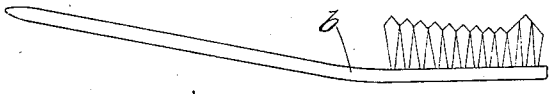


Fig. 10.

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Patented Apr. 26, 1927. 1,626,190

UNITED STATES PATENT OFFICE.

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HANDLE-BENDING MACHINE.

Application filed May 2, 1925. Serial No. 27,493.

In the manufacture of tooth brushes of the style shown in Fig. 10 hereof, the handles are made of molded strips of pyroxylin compound, sometimes known as celluloid, and are bent after having been molded. Heretofore the work of bending the handles has been a hand operation performed by workmen with the assistance of a frame in which several handles can be bent at one time. This operation is expensive, wasteful, and unsatisfactory, not only on account of the expenditure of time by the operator, but also because the bending is not uniform and the handles are sometimes cracked or strained so that they break in use and also because under some conditions the handles themselves are broken during the bending. This is due in part to lack of uniformity of heating the portion to be bent.

The present invention therefore has for its object to produce an automatic machine which will bend the handles of tooth brushes and do away altogether with the hand operation just described. The machine embodying my invention is entirely automatic, receiving the brush-handles from suitable feeding mechanism, softening the portion to be bent, then bending them and finally depositing the bent handles in a suitable receiving box. The heating is uniform and therefore can be of exactly the right amount to give the best results. This does away completely with broken or defective handles. The amount of the bend is also uniform in every case. The machine is simple and inexpensive and is capable of running indefinitely without adjustment or renewal.

In the accompanying drawings I have shown a series of cells each one of which receives a brush handle, these cells being secured to a conveyor which in the form shown in the drawings is an endless chain. The heating means is adjacent the top run of the endless chain, and the cooling means is adjacent the bottom run, the handles being bent as they pass around the sprocket at one end of the endless chain. However I do not limit myself to this form of conveyor, nor to this arrangement of the several parts except as expressly stated in the claims forming part of this application.

In the drawings:

Fig. 1 is a side elevation of a machine embodying my invention.

Fig. 2 is a top plan view of the machine shown in Fig. 2.

Fig. 3 is a sectional view of one of the cells showing the handle in place, the parts being in a position occupied as the cells travel along the bottom run of the conveyor.

Fig. 4 is a top plan view of one of the cells.

Fig. 5 is a bottom plan view of one of the cells.

Fig. 6 is a plan view on an enlarged scale of a portion of the top run of the conveyor showing the action of the positioning cam.

Fig. 7 is a section on the line 7—7, Fig. 2.

Fig. 8 is a similar view but showing the cell as it passes the bending cam.

Fig. 9 is a plan view illustrating the action of the ejector or third stationary cam.

Fig. 10 is a side elevation of a brush, the handle of which has been bent in the machine shown herein.

Referring now to the drawings, at A is shown the frame of the machine and at B a spout through which the handles pass to the feeding mechanism C. This mechanism includes a slotted slide D operated by a rock shaft E and one of the sprockets 13 which actuates the conveyor. This feeding mechanism deposits the handles of the brushes one at a time in the cells which, as will be described, have been moved lengthwise of the machine by the conveyor, and forms the subject matter of an application for Letters Patent of the United States filed February 24, 1925, Serial No. 11,091. Accordingly, it is not described in detail herein. The conveyor shown in the drawings is an endless chain 11, passing over sprocket wheels 12 and 13, the former of which is driven continuously by a chain 14 and a variable speed motor 15.

Transversely of the conveyor is secured a series of cells 16, (see Figs. 3, 4 and 5), each of which is adapted to receive one handle and hold it in proper position during the operation of the machine. The cells are conveniently made of wood and have sides 17 and 18 and a bottom or bed member 9, the space between the sides being just wide enough to receive the handle of the tooth brush. At one end, the space which receives the handle is enclosed by a top piece 19 so that when the end of the tooth brush handle is slid lengthwise into the slot 20,

formed thereby, the end will be held against lateral displacement, as shown in Figs. 6 and 7. In the slot 20 is a sliding member 21 which performs the function of an ejector, as will be described hereinafter. The cell is cut away on the bottom, as shown at 2 in Fig. 3, and slotted, as shown at 24 in Figs. 4 and 5, so that the portion of the tooth brush handle which is located in this area may be exposed to heat or cold as it is carried along by the conveyor. At 23 is shown a lever pivoted at 22 to the cell. The upper surface *a*, i. e., the lower surface when the cell is on the bottom run of the conveyor, as shown in Fig. 3, contacts with that portion of the back of the brush blank, which is at the left of the cut-away portion 2, so that a swinging movement of the lever 23 about its pivot 22 will bend the brush handle at the waist *b*, this being the portion which, as will be later explained, is softened by the action of heat. Each of the cells is secured to the conveyor 11 by screws 26.

As has already been explained, the feeding mechanism D deposits the brush handle in the open portion of the cell, as shown in Fig. 6. At this time, the end of the pivoted lever 23 is in a slot 27 in the frame of the machine, the lever being in horizontal position so that the brush handle can lie flat in the cell. Adjacent the left-hand side of the carrier is a stationary cam 28 forming the upper side of the slot 27 through which the lever 23 travels. This cam 28 is of the shape shown in Figs. 2 and 6 and pushes the handles to the right as they pass it, as shown in Fig. 6, until the ends of the handles are in the slot 20 in the cell, thus locating the handle in the proper position to be softened and bent. The handle pushes the ejector 21 back as it enters the slot.

Lengthwise of the top run of the conveyor and adjacent the cut-away portions of the cells are heating pipes 29 and 30. The cut-away portion 2 of the cells and the slot 24 expose the waist of the brush to heat on both upper and lower sides, as shown in Fig. 7, but the remainder of the brush handle is not exposed to heat. Accordingly, the softening of the pyroxylin is localized and the bending is confined to the softened portion. The length of the heating pipes and the length of the corresponding part of the top run of the conveyor are such that, taken in connection with the temperature in the pipes, the brush handles will be softened to the proper extent. For further adjustment to properly temper the handles, the speed of the motor may be varied.

At 31 is shown a stationary cam adjacent the conveyor and in the path of the levers 23 of the cells 16. This stationary cam includes an incline *c*, a rest *d*, and a second incline *e*. The incline *c* gradually swings the lever 23 about its pivot 22 and displaces the end of the handle laterally, that is, bending upwardly the handle at the waist *b*. The rest portion *d* of the cam holds the lever 23 in displaced position until the incline *e* is reached. Thereafter the lever tends to remain in a position shown in Fig. 3 being held in part by gravity and in part by the set it has received, the handle of the brush having at this time set sufficiently so that it will not resume its original position. In the form shown in the drawings the rest portion of the cam is made concentric with the axle about which the sprockets 12 of the conveyor 11 revolve, but I do not limit myself to this construction since it is obvious that the handle bending cam may be located elsewhere and if a different form of conveyor is employed, will be of corresponding form.

Adjacent the bottom run of the conveyor and in line with the cut away portions 2 of the cells 16 is a cooling pipe 32 provided with ports 3 through which compressed air can be blown on to the waist portions of the brush handles as they are carried along by the conveyor. The sudden expansion of the compressed air chills the pyroxylin and rapidly sets it in the shape previously given it by the swinging movement of the bending lever 23.

At 34 is shown a spout. As the cells reach a point about adjacent the spout 34 the ends of the ejectors 21 contact with a third stationary cam 35 and slide them lengthwise, successively pushing each handle out of the enclosed portion and freeing it so that it can drop into the spout 34 from which it falls into a receiving tray 36.

In the operation of my machine, the brush handles are deposited one by one in the cells 16 by the feeding mechanism D. The conveyor moves the cells along until the handles contact with the first stationary cam 28. This slides the ends of the handles into the enclosed portion of the cell pushing back the ejector 21. Further movement of the conveyor carries the cells and the brush handles contained therein past the heating pipes 29 and 30, which heat and soften the exposed waist portions of the brush handles. By the time the brush handles reach the end of the heating pipes they are in proper condition to be bent. The further movement of the conveyor causes the lever 23 of each cell to ride up the incline *c* of the stationary cam 31, thus displacing the handle laterally and bending it where it has been softened. As the cell travels around the end of the conveyor, the rest *d* of the stationary cam 31 holds the pivoted lever in displaced position. Thereafter the further movement of the conveyor carries the bent handles past the cooling pipe 32, which blows the compressed air on the bent portion of the handles and renders the bend permanent. Finally, the

movement of the conveyor causes the ejectors 21 to engage the third stationary cam 35 and slide them lengthwise pushing the handles out of the enclosed portion of the cells and causing them to drop one by one into the spout 34.

What I claim is:

1. In a machine of the character described and in combination, means for heating the handle locally intermediate its ends, a conveyor to carry the handle past the heating means, and means acting on the handle to displace an unheated part of it laterally and thereby to bend it at the heated portion.

2. In a machine of the character described and in combination, a conveyor, a series of cells secured to said conveyor and adapted to protect certain portions of the articles contained therein, heating means adapted to heat unprotected portions of the articles in the cells, and means acting on the handles to displace them laterally after they have passed the heating means.

3. In a machine of the character described and in combination, a conveyor, a series of cells secured to said conveyor and each cut away midway of the ends to expose a portion of the articles contained therein, heating means adjacent the cut away portion and means acting on the handles to displace them laterally after they have been carried past the heating means by the conveyor.

4. In a machine of the character described and in combination, a conveyor, a series of cells secured to said conveyor and each cut away midway of the ends to expose a portion of the article contained therein, stationary heating means adjacent the cutaway portion and acting simultaneously on a plurality of articles in said cells and means acting on the handles to displace them laterally after they have been carried past the heating means by the conveyor.

5. In a machine of the character described and in combination, a conveyor, a series of cells secured to said conveyor and containing the articles to be bent, heating means, means acting on said articles to bend them, and cooling means, said heating means, said bending means and said cooling means acting successively on said articles as they are carried past by the conveyor.

6. In a machine of the character described and in combination, a conveyor, a series of cells secured to said conveyor and each including an enclosed portion, a cutaway portion and a pivoted bending lever, means to slide the articles lengthwise until a part of the article is in the enclosed portion of the cell, heating means adjacent the cutaway portion of the cells, and means to actuate the bending levers, said means acting successively on the articles in the cells.

7. In a machine of the character described, and in combination, a conveyor, a series of cells secured to said conveyor, each having an enclosed portion to receive the end of the article to be bent, means to slide the articles endwise into the enclosed portion, and means acting on the article to displace the protruding portion laterally of the cell.

8. In a machine of the character described and in combination, a conveyor, a series of open ended cells secured thereto, and two stationary cams acting successively on the articles in said cells to move them longitudinally in opposite directions.

9. In a machine of the character described and in combination, a conveyor, a series of open ended cells secured thereto, and three stationary cams acting successively on the articles in the said cells, the first of said cams moving the articles longitudinally in the cells, the second displacing a portion of each article laterally, and the third moving the article longitudinally in the reverse direction to the first cam.

10. In a machine of the character described and in combination, a conveyor, a series of cells secured to said conveyor, each having an enclosed portion to receive the end of the articles to be bent, an ejector in said enclosed portion, means acting on the article to displace the protruding portion laterally of the cell, means acting on the handle to move it lengthwise into the enclosed portion, and means subsequently acting on the ejector means to move the handle in the reverse direction.

11. In a machine of the character described and in combination, a conveyor, a series of cells secured to said conveyor each having an enclosed portion to receive the end of the article to be bent, an ejector in said enclosed portion to slide the article endwise therein, two stationary cams, one of which acts on the ends of the handles to move them lengthwise into the enclosed portion of the cells and the other of which acts on the ejector to move the handle in the reverse direction.

12. In a machine of the character described and in combination, a conveyor, a series of cells secured to said conveyor each having an enclosed portion to receive the end of the article to be bent and each including a lever acting to displace a portion of the handle laterally and a stationary cam acting on the said levers as the cells are moved past it.

13. In a machine of the character described and in combination, a conveyor, a series of cells secured to said conveyor, each having an enclosed portion to receive the end of the article to be bent and each including a lever acting to displace a portion of the handle laterally and a stationary cam having a rest, said cam acting to swing the pivoted levers and the rest on the cam acting to hold them in the displaced position.

14. In a machine of the character described and in combination, an endless chain, sprocket wheels therefor, a series of cells secured to said endless chain each having an enclosed portion to receive the end of the article to be bent and a stationary cam having a portion concentric with the axis of one of said sprockets and acting to displace a portion of the handles laterally and hold them in displaced position.

15. In a machine of the character described and in combination, a conveyor, a series of cells moved lengthwise of the machine by the conveyor, said cells being cut away to expose a portion of the article therein, heating means adjacent the cutaway portion of the cells, a stationary cam adjacent the conveyor and adapted to displace laterally the portion of the handles within the cells, cooling means adjacent the cutaway portion and means for ejecting the handles from the cells.

16. In a machine of the character described, the hereindescribed cell comprising an open portion and an enclosed portion and having a cut away portion to expose a part of the handle to be contained therein and a pivoted lever to displace the exposed portion laterally of the cell.

17. In a machine of the character described, the hereindescribed cell comprising an open portion and an enclosed portion and having a cutaway portion to expose a part of the handle to be contained therein, a pivoted lever to displace the exposed portion laterally of the cell, and an ejector in said enclosed portion.

18. In a machine of the character described and in combination, an endless chain, a series of cells, each of which is open on the top for a portion of its length the remainder being enclosed, means on the top run of the endless chain to feed handles into the successive cells, a stationary cam adjacent said top run to move said handles longitudinally into said enclosed portion, a second stationary cam to displace a portion of said handles laterally and a third stationary cam adjacent the bottom run of said endless belt and adapted to slide the handle longitudinally in the opposite direction to the first mentioned cam.

19. In a machine of the character described and in combination, an endless chain, a series of cells each of which is open on the top for a portion of its length, the remainder being enclosed and having a cutaway portion on its under side to expose the portion of the handle to be bent, means on the top run of the endless chain to feed handles into the successive cells, a stationary cam adjacent said top run to move said handles longitudinally into said enclosed portions, a heating means adjacent the top run of the endless chain and in line with the exposed portions of said cells, a second stationary cam to displace a portion of said handles laterally, cooling means adjacent the bottom run of said endless belt and in line with the exposed portions of said cells, and a third stationary cam adjacent the bottom run of said endless belt and adapted to slide the handle longitudinally in the opposite direction to the first mentioned cam.

20. In a machine of the character described, in combination, means for heating the handle locally intermediate its ends, a conveyor to carry the handle past the heating means, variable speed mechanism controlling the speed of movement of the conveyor, and means acting on the handle to displace a part of it laterally and thereby to bend it at the heated portion.

In testimony whereof I affix my signature.

WILLIAM S. ELLIOT.