Sept. 22, 1925. 1,554,548

W. J. BEISEL

SPOKE BENDING APPARATUS

Filed April 4, 1923 3 Sheets-Sheet 1

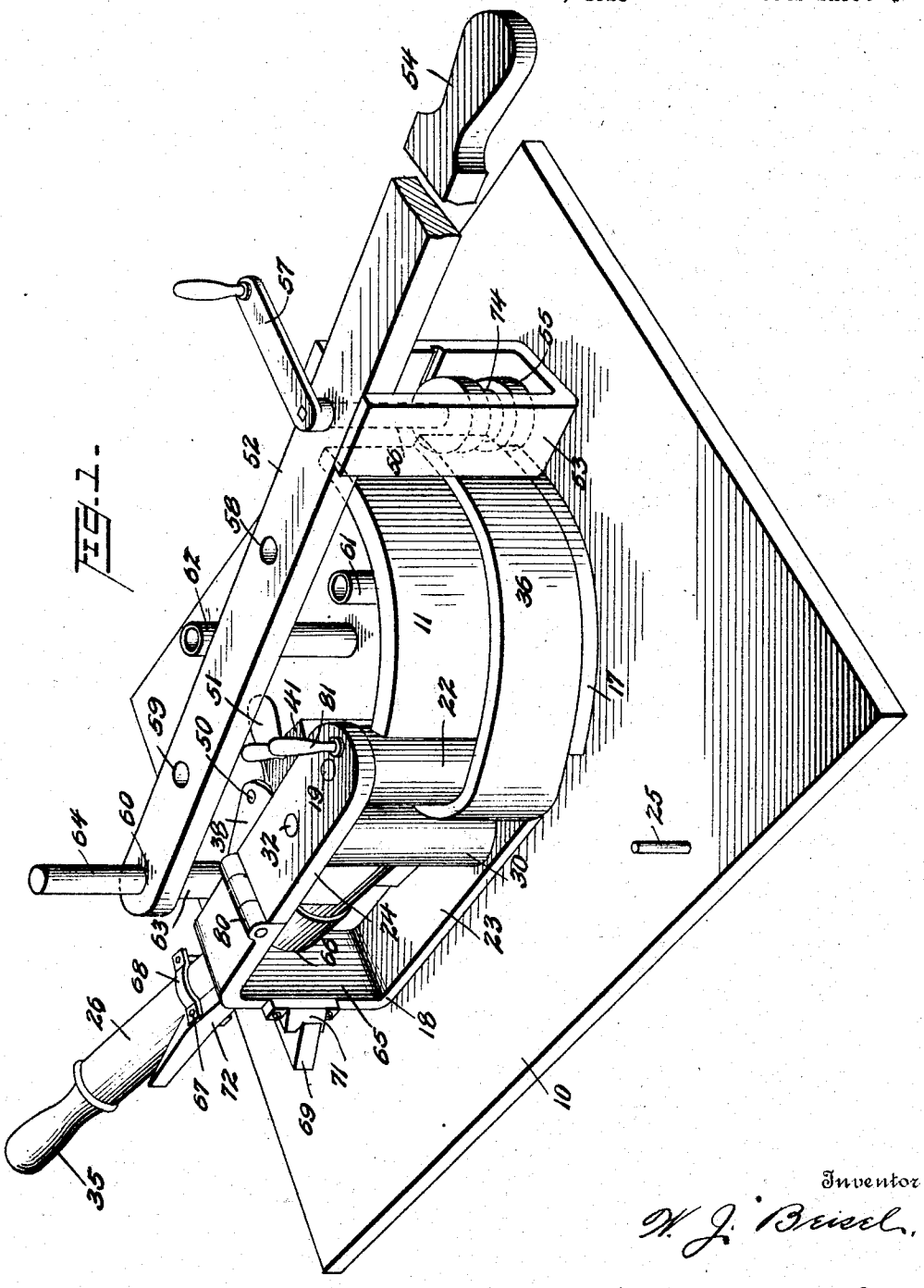


FIG. 1.

Inventor

W. J. Beisel.

By Watson, Cole, Moser & Grindle,

Attorney

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FIG. 2.

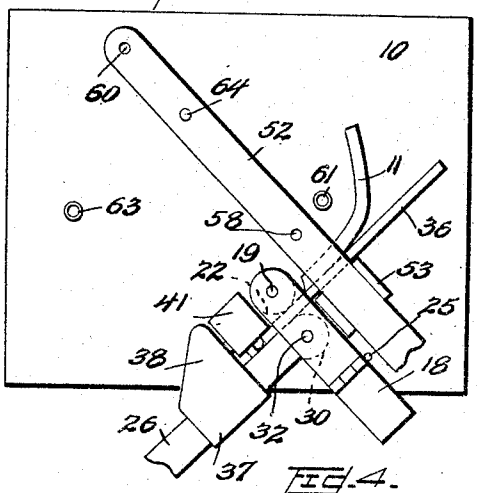


FIG. 3.

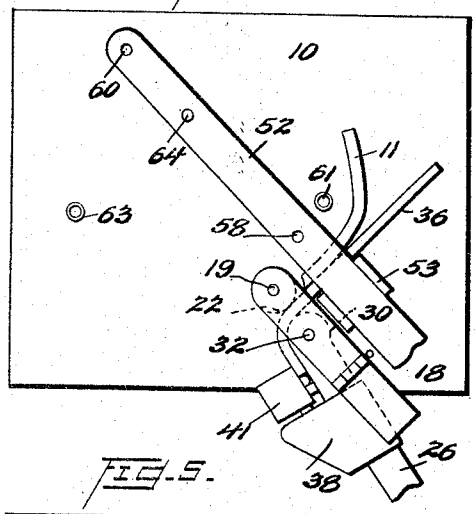


FIG. 4.

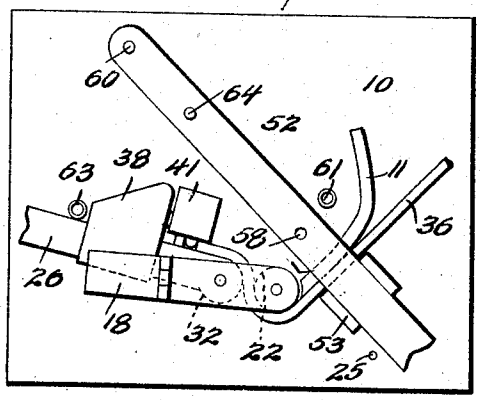


FIG. 5.

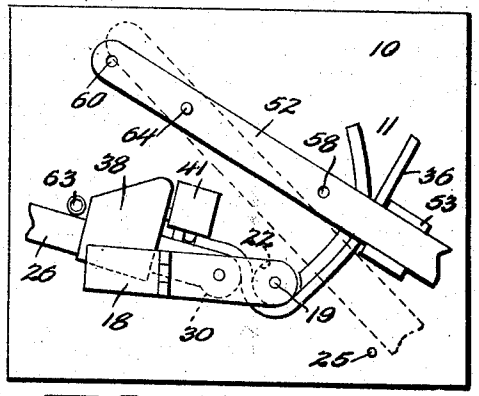


FIG. 7.

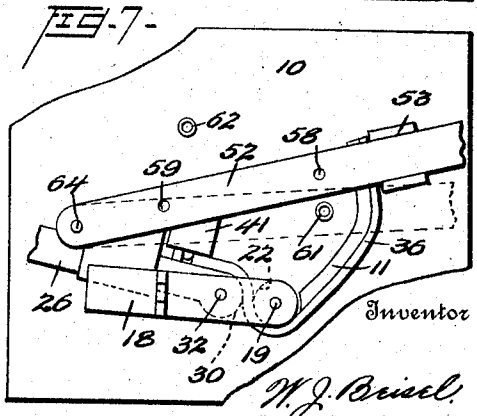
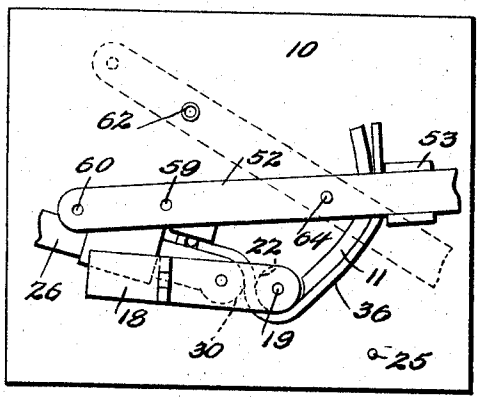


FIG. 6.



Inventor

W. J. Beisel

By Watson, Cole, Grindle & Watson

Attorney

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W. J. BEISEL

SPOKE BENDING APPARATUS

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FIG. 8.

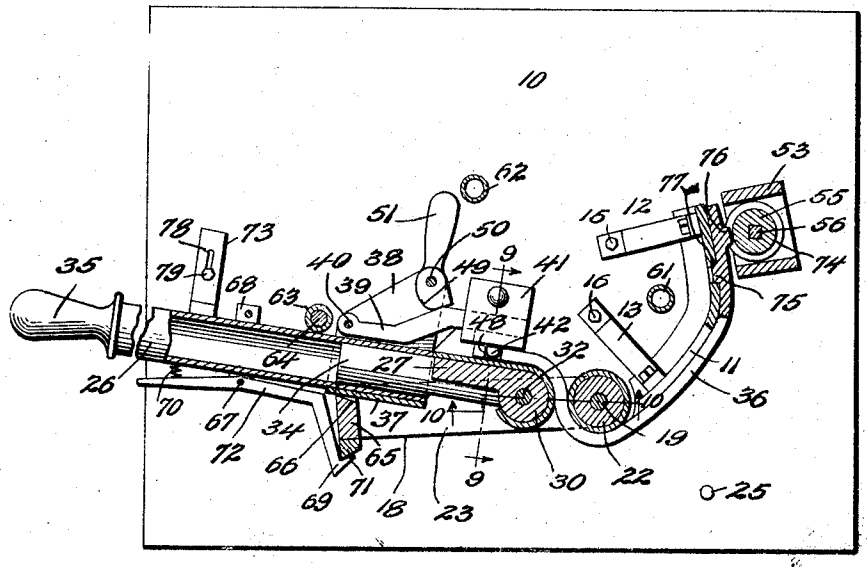


FIG. 9.

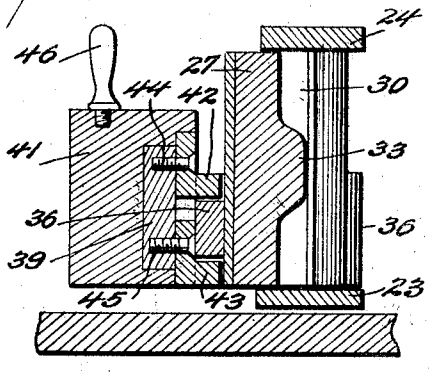


FIG. 11.

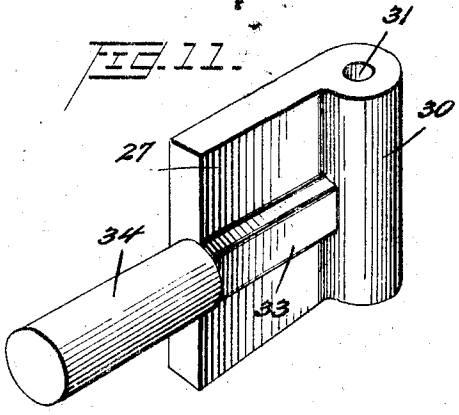


FIG. 10.

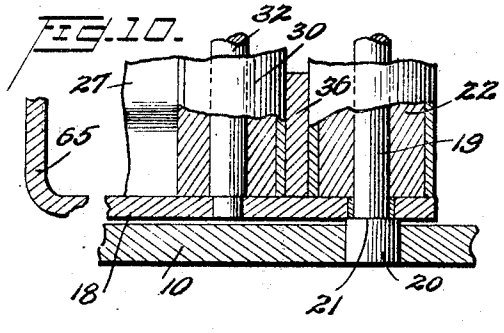
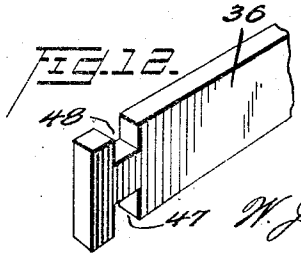


FIG. 12.



Inventor

W. J. Beisel

By Watson, Cole, Morse & Grindle,

Attorney

Patented Sept. 22, 1925. 1,554,548

UNITED STATES PATENT OFFICE.

WILLIAM JAKOB BEISEL, OF PORT RICHMOND, NEW YORK.

SPOKE-BENDING APPARATUS.

Application filed April 4, 1923. Serial No. 629,932.

To all whom it may concern:

Be it known that I, WILLIAM J. BEISEL, a citizen of the United States, and residing at Port Richmond, county of Richmond, State of New York, have invented certain new and useful Improvements in Spoke-Bending Apparatus, of which the following is a specification.

This invention relates to means for bending elongated pliable metal rods or bars of various kinds into various longitudinal shapes desired. The bending may be done hot or cold, since all that is necessary is that the metal shall be sufficiently pliable at the temperature used as to permit the bending without breaking, and the device is made of material which will stand the heat. It embodies a fixed support with parts in fixed position thereon and pivotally mounted parts cooperating with said first mentioned parts to cause the bending, and the nature of the bend at any particular point depends on the form and relations of the parts at that point, and thus it may be made to vary within wide limits by merely changing the form and relations of the adjacent cooperating parts. In the particular embodiment shown for purposes of illustration the device is intended and adapted to so bend a straight strip of spring steel rectangular in cross section and of uniform width into the general longitudinal form of the leaves of spring spokes for vehicle wheels, such as are set forth and claimed in my Reissue Patent No. 15,371, June 6, 1922, and of the specific form of sickle shape spring metal spoke shown in my copending application Ser. No. 609,298 filed December 27, 1922. As above indicated however the invention broadly considered is not limited to the cross sectional shape of the rod or bar being treated nor to any particular longitudinal form produced by the bending. The specific embodiment of the bending device shown consists of a very compact combination of a minimum number of elements occupying very limited space so arranged as to make the successive steps of the operation simple and easy to perform, whereby they can be performed quickly while the metal is still hot, but they have such great strength and bending leverage that it may be operated by hand easily, even on large bars or rods. Although the device shown is operated manually it will of course be understood that it includes novel cooperative structural combinations which would be equally useful in a power-driven or automatic machine for accomplishing the result. The novel features will be more fully understood from the following description and claims taken with the accompanying drawings:

In the drawings:

Figure 1 is a perspective view of a device embodying my invention with the parts in the position which they assume in completing the bending;

Fig. 2 is a diagrammatic view looking down on the device with its parts in position ready for operation with the bar to be bent in place;

Fig. 3 is a similar view of the parts at the end of the bending movement;

Fig. 4 is a similar view with the parts in the position at the end of the second bending movement;

Fig. 5 is a similar view of the parts in position at the end of the third movement;

Fig. 6 is a similar view of the parts at the end of the fourth movement;

Fig. 7 is a similar view of the parts at the end of the last bending movement;

Fig. 8 is a horizontal section through the lower part of the device and through a part of the bar which has been bent in it;

Fig. 9 is a vertical section on the line 9—9 of Fig. 8;

Fig. 10 is a section on the line 10—10 of Fig. 8;

Fig. 11 is a perspective view of the inner end portion of the handle arm which causes the first bending; and

Fig. 12 is a perspective view of the end of the bar which is to be bent showing side notches which may be engaged for bending.

As will be seen by reference to Fig. 1 the device includes a flat support 10 which should be made of metal and which will ordinarily be used in a horizontal position, and a metal form 11 having a smooth outer surface longitudinally curved on lines corresponding to those intended to be produced in the bar which is to be bent, and which is rigidly secured in place on the support 10 projecting upwardly at right angles from it. Angular braces 12 and 13 are bolted to the form 11 at their upper ends and secured to the support 10 by bolts 15 and 16 at their lower ends. At the lower edge of the form 11 there is a metal strip or ledge 17 secured to the support 10 so as to support the bar to be bent a sufficient distance above the sur-

face of the support 10 to permit free engagement by the bending mechanism. It extends outwardly from the form sufficiently far to support a bar of the thickness desired.

Cooperating with this form to bend the rod or bar against it, there is a handle arm adapted to turn on longitudinally spaced pivot points, and having a roller spaced from said successive pivot points distances corresponding to and on curves concentric with the radii of the successive curves along the surface of said form. Beyond the end of the form 11 there is movable mechanism including a pivoted operating handle mechanism for engaging the projecting end of the rod or bar and imparting to it two bends or curves in reverse directions. A U-shaped swinging frame 18 composed of flat metal of uniform width is rotatively supported slightly above support 10 by the spindle 19 passing vertically through its ends. The lower end 20 is enlarged where it enters the socket in the support 10 forming a shoulder 21 slightly above that support. The frame 18 is supported by this shoulder out of contact with the surface 10. A metal cylinder 22 is rotatively mounted on spindle 19 extending vertically from the lower member 23 of the frame 18 to the upper member 24. This cylinder turns on a fixed axis with its surface parallel and close to the end of form 11 and in such position partly in the rear of form 11 that a plane in prolongation of the contact surface of the adjacent part of form 11 will be at a tangent to it. The U-shaped frame 18 when in position for the bending operation is, as shown in Fig. 2, at right angles to the surface of the adjacent end of form 11 and is in side contact with the limiting stop 25 secured to the support 10. Handle arm 26 for bending is pivotally mounted at one end between the upper and lower members 24 and 23 of the frame 18. It has an inner end portion 27 which is wide enough to fit between the upper and lower members of frame 18 and which has a flat surface terminating at a tangent to an integral enlargement 30 on the lines of a cylinder and which has a central bore 31 rotatively fitting a spindle 32 rotatively mounted at its ends in the upper and lower members 24 and 23 of frame 18. The enlargement 30 is parallel to cylinder 22 and of the same diameter and is spaced longitudinally of the frame from it a sufficient distance to receive between them the rod or bar to be bent. On the rear face of the portion 27 extending longitudinally from the enlargement 30 is an integral strengthening rib 33 which is integrally connected to a cylindrical extension 34 which fits in and is rigidly connected to the hollow handle arm 26 provided at its end with hand hold 35. It will be noted that the handle arm 26 and its attached parts are pivotally supported by the swinging frame 18 between its ends by spindle 32 and that the frame may turn on spindle 19 at one end, and thus the frame and handle arm may have different angular relations at different times. When arm 26 and other parts are in the position to commence the bending operation, the flat surface of the end portion 27 is beyond but parallel to the plane of the adjacent facing surface of form 11 and at substantially right angles to frame 18, as shown in Fig. 2.

A bar or strip of metal 36 is placed against the surface of the form 11 at the end next to frame 18 resting on ledge 17 and is moved endwise between cylinder 22 and the enlargement 30 and along the flat surface of end portion 27 of handle arm 26 for a predetermined distance, and its end is then clamped to the flat surface 27. The clamping means includes a sheet metal bracket 37 secured to the handle arm 26 near the end portion 27 having laterally projecting ends 38 from the upper and lower edges of said arm 26 parallel to said support 10 triangular in shape in plan view, and a clamping arm 39 pivoted thereto at their outer ends 40 close to arm 26 extending outwardly at an angle and provided at its other end with a steadying weight 41 and fingers 42 and 43 projecting inwardly towards the flat face of the portion 27, as shown in Figs. 8 and 9. The fingers 42 and 43 may be secured to the clamping arm 39 by any suitable means, such as screws 44 and 45, and the weight 41 may be provided with handle 46 for convenience in releasing it. The fingers 42 and 43 are spaced laterally from each other sufficiently to enter side notches or slots 47 and 48 in the bar 36 near its end, as illustrated in Figs. 9 and 12. In order to force clamping arm 39 inwardly cooperating with the flat face 27 to clamp the bar to that face and to securely hold it in clamped position, a cam 49 is pivotally mounted at 50 to the upper forward edge of the bracket ends 38 and is provided with an operating handle 51.

In order to hold the bar 36 which is to be bent close against the adjacent surface of form 11 during the bending operation of the mechanism carried by the frame 18 which will be described later, a second handle arm 52 is placed in position substantially parallel to frame 18 and close to it, as shown in Fig. 2. This handle arm is flat instead of cylindrical and has a downwardly extending U-shaped support 53 secured to its side edges near its handle end 54, and a roller 55 is mounted in vertical position in said support on a rotary shaft 56 having a bearing in the base of the U and passing upwardly through the handle arm 52 and having a crank arm 57 connected to its upper end above the handle arm, as shown in Fig. 1. This arm 52 is adapted to be

pivotally connected to the support 10 at three different points on that support and at three different points longitudinally of the arm, whereby the location of the center of movement of roller 55 and the length of its radius of movement may be varied greatly. The means for accomplishing this consists in three vertical cylindrical openings 58, 59 and 60 through arm 52 at different distances from roller 55, three vertical tubes 61, 62 and 63 extending through the support 10 and rigidly connected thereto at predetermined points and extending to a height slightly greater than that of form 11, and a pin 64 adapted to fit an opening in said arm and one of said pipes simultaneously, thus pivotally connecting the arm to the support. The pin 64 is preferably longer than the length of the pipes added to the thickness of arm 52, so that its upper end will always project upwardly above arm 52, as shown in Fig. 1, in a convenient position for hand grasping in changing pivots. When properly adjusted to start bending as above stated arm 52 is substantially parallel to frame 18 and at right angles to the adjacent end surface of form 11, and its opening 59 is over tube 62, and pin 64 pivotally connects them and its U-shaped support 53, and its roller 55 projecting downwardly on the outer side of bar 36 holding it close against the surface of form 11.

When the device is in proper adjustment for bending and the bar 36 has been placed in position and clamped to the inner end of handle arm 26, as shown in Fig. 2, and that arm is turned from the position shown in Fig. 2 to that shown in Fig. 3, the end of the bar 36 will be pulled a fixed distance longitudinally between cylinder 22, and the semi-cylindrical end 30 of arm 26 and will in a sense wind part way around the enlarged end 30, forming a curve corresponding to its surface. In order that the arm 26 may approach closely the center line of frame 18 at the end of this movement the base 65 of the U of that frame is partly cut away on the lines of a circle 66 in which the arm 26 partly enters, as shown in Figs. 1 and 8. In order to automatically connect arm 26 to frame 18 at the limit of the last mentioned movement so that they will move together on the return movement, a spring catch in the form of a longitudinally extending member 72 is pivoted between its ends at 67 to a bracket 68 secured to arm 26 and having an outwardly extending hook arm 69 at one end and a spring 70 at the other end between it and arm 26, whereby the inclined surface of the hook will move across in contact with the end wall 65 of the frame 18 until the hook passes a sharp edge catch member 71 on its outer edge and will then automatically interlock with that edge, due to the spring action. On reverse movement of arm 26 from the position shown in Fig. 3 to that shown in Figs. 4 and 8, the turning movement is of course on the spindle 19 at the end of the frame and continues until the arm 26 strikes the adjustable stop 73 which is secured to the support 10 by means of slot 78 and screw 79, as will be seen by reference to Fig. 8. During this movement it will be noted that the swinging movement of frame 18 carrying the end of the bar around the pivot point of spindle 19 will pull the bar 36 longitudinally from form 11 and wrap it partly around cylinder 22, thus causing a bend or curve which is in the reverse direction from but longitudinally joins the first curve.

The handle arm 26 and frame 18 remain stationary throughout the remaining bending movements. The flat handle bar 52, which is mounted on pivot pipe 62 and crosses form 11 at the end next to the bent portion of bar 36, is moved from its dotted line position in Fig. 5 to its full line position, the diameter of the curve followed by the roller 55 bearing on the outer side of bar 36 being concentric with that of the corresponding curve of the outer face of form 11, whereby the bar is bent on that curve. The pin 64 is then withdrawn from opening 59 and pipe 62 and arm 52 so moved that its opening 58 is above pipe 61 and then pin 64 is dropped in place pivotally connecting the bar to the support. The arm is then turned from the dotted line to the full line position, as shown in Fig. 6. It will be noted that the radius on which roller 55 now turns is very short producing a rather sharp curve, but it extends for a greater angle. The last bending movement is brought about by withdrawing pin 64, moving arm 52 until its opening 60 is over pipe 63, then dropping pin 64 in place to make the pivot connection and turning the arm 52 from dotted to the full line position in Fig. 7.

It will be noted by reference to Figs. 1 and 8 that the roller 55 has a peripheral groove 74 midway between its upper and lower ends, and from Fig. 8 that at the outer end of the rectangular metal bar 36 there are two central projections 75 and 76 punched from opposite sides and that the projection 75 fits in a socket 77 in form 11, and projection 76 fits in groove 74 in roller 55. These projections, as well as side notches 47 and 48 at the other end and the longitudinal sickle shape of the metal strip or bar, are features of the spring spokes described and claimed in my copending application above mentioned.

It will be seen by reference to Fig. 1 that the portion of the upper member 24 of the frame 18 next to the end or base 65 is integral therewith but that the remainder extending to the end is made separately and

connected to the integral portion by a hinge 80 which permits it to be turned upwardly, so that the bar 36 may be lifted from between cylinder 22 and the cylindrical enlargement 30 when the bending is finished and the bar has been released from the clamp. An upwardly projecting handle 81 is provided for effecting this turning. It will be understood that roller 55 being keyed to its shaft carried by handle arm 52, the movement of that arm on its pivot may be caused by turning that roller in contact with the bar through its handle 57.

Although I have shown and described a specific embodiment of my invention, it will be understood that it is not limited to the details beyond what is required in the following claims.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. A device for bending metal bars, comprising, in combination, a support, a former mounted thereon and having a curved surface, means for holding a bar to be bent against said former with one end of the bar projecting beyond the former, a member pivotally mounted on said support adjacent the end of said former, a second member pivotally supported on said first member, means for moving said second member in one direction about its pivotal support on the first member to bend one part of the projecting portion of said bar in one way, means for moving said first member in an opposite direction about its pivotal support to bend another part of the projecting portion of said bar in the opposite way, whereby a reverse bend is produced in said projecting portion of the bar.

2. A device for bending metal bars, comprising in combination a support having a flat surface, a former in fixed position thereon having a surface on such curved longitudinal lines as may be desired for one end portion of the bar, means adjacent one end of said former cooperating therewith to slidably hold the bar in operative position with one end projecting beyond said former, means including an elongated handle arm pivoted at one end for engaging the projecting end of said bar and bending it on a reverse curve by two successive pivoted movements in opposite directions, and means for so bending the other portion of the bar as to bring it into contact with said former surface throughout its length.

3. A device for bending metal bars, comprising, in combination, a support, a former mounted thereon and having a curved surface, means for holding a bar to be bent against said former with one end of the bar projecting beyond the former, a member pivotally mounted on said support adjacent the end of said former, a second member pivotally supported on said first member, means on said second member for securing thereto said projecting end of the bar, means for moving said second member in one direction about its pivotal support on the first member to bend one part of the projecting portion of said bar in one way, means for moving said first member in an opposite direction about its pivotal support to bend another part of the projecting portion of said bar in the opposite way, whereby a reverse bend is produced in said projecting portion of the bar, and means for bending the other portion of the bar into contact with said former.

4. A device for bending metal bars, comprising in combination a substantially flat support, a rotary cylinder projecting at substantially right angles therefrom, a frame pivotally mounted on said support, an elongated handle arm having a semi-cylindrical end portion pivotally mounted on said frame parallel to said cylinder and spaced therefrom a sufficient distance to permit said bar to move longitudinally between them, means on said handle arm for clamping the end of said bar to it, whereby when the bar extends along said handle arm from its pivot and is clamped to it at its end and the handle arm is turned the bar will be bent on a curve.

5. A device for bending metal bars, comprising in combination a substantially flat support, a rotary cylinder projecting at substantially right angles therefrom, an elongated handle arm having a semi-cylindrical end portion pivotally mounted on said support parallel to said cylinder and spaced therefrom a sufficient distance to permit said bar to move longitudinally between them, means on said handle arm for clamping the end of said bar to it, whereby when the bar extends along said handle arm from its pivot and is clamped to it at its end and the handle arm is turned the bar will be bent on a curve, means for detachably securing said clamping means to said arm at different distances from its pivot whereby the distance of the bend from the end of the bar may be varied.

6. A device for bending metal bars, comprising in combination a support having a flat surface, a frame having upper and lower members parallel to said surface pivotally mounted at one end on said support and having a vertical rotary cylinder between said members concentric with said pivot, stops on said support for limiting the turning movement of said frame against one of which it normally rests, an elongated handle having a semi-cylindrical portion at one end pivotally mounted on said frame between its upper and lower members parallel to said cylinder and spaced from it a sufficient distance to receive said bar between them, the handle being normally at right angles to the frame, means on said handle adjacent its pivot for clamping the

end of said bar thereto, whereby as the handle is turned until it makes contact with the free end of the frame the bar will be drawn by it between the cylindrical surfaces of contact bending it on a curve.

7. A device for bending metal bars, comprising in combination a support having a flat surface, a frame having upper and lower members parallel to said surface pivotally mounted at one end on said support and having a vertical rotary cylinder between said members concentric with said pivot, stops on said support for limiting the turning movement of said frame against one of which it normally rests, an elongated handle having a semi-cylindrical portion at one end pivotally mounted on said frame between its upper and lower members parallel to said cylinder and spaced from it a sufficient distance to receive said bar between them, the handle being normally at right angles to the frame, stationary means for laterally supporting and guiding said bar on the side where it enters said frame, means on said handle adjacent its pivot for clamping the end of said bar thereto, whereby as the handle is turned until it makes contact with the free end of the frame the bar will be drawn by it between the cylindrical surfaces of contact bending it on a curve.

8. A device for bending metal bars, comprising in combination a support having a flat surface, a frame having upper and lower members parallel to said surface pivotally mounted at one end on said support and having a vertical rotary cylinder between said members concentric with said pivot, stops on said support for limiting the turning movement of said frame against one of which it normally rests, an elongated handle having a semi-cylindrical portion at one end pivotally mounted on said frame between its upper and lower members parallel to said cylinder and spaced from it a sufficient distance to receive said bar between them, the handle being normally at right angles to the frame, stationary means for laterally supporting and guiding said bar on the side where it enters said frame, means on said handle adjacent its pivot for clamping the end of said bar thereto, whereby as the handle is turned until it makes contact with the free end of the frame the bar will be drawn by it between the cylindrical surfaces of contact bending it on a curve, automatic means for connecting said handle arm to said frame when it makes contact therewith, whereby on its reverse movement the frame will turn with it on the frame's pivot to its other limit of movement thus bending a successive portion of the bar on the lines of a reverse curve.

9. A device for bending metal bars, comprising in combination a support having a flat surface, a frame having upper and lower members parallel to said surface pivotally mounted at one end on said support and having a vertical rotary cylinder between said members concentric with said pivot, stops on said support for limiting the turning movement of said frame against one of which it normally rests, an elongated handle having a semi-cylindrical portion at one end pivotally mounted on said frame between its upper and lower members parallel to said cylinder and spaced from it a sufficient distance to receive said bar between them, the handle being normally at right angles to the frame, means on said handle adjacent its pivot for clamping the end of said bar thereto, whereby as the handle is turned until it makes contact with the free end of the frame the bar will be drawn by it between the cylindrical surfaces of contact bending it on a curve, means for longitudinally adjusting said clamping means on said handle whereby the longitudinal point of the bar at which the curve commences may be varied.

10. A device for bending metal bars, comprising in combination a support having a flat surface, a former in fixed position thereon having a surface on such curved longitudinal lines as may be desired for one end portion of the bar, means for holding a bar extending along said former in contact with one end of said former, an elongated handle arm having a roller projecting therefrom at right angles and adapted to bear against the outer surface of a bar in contact with the former at said end, a series of cooperating and corresponding means on said support and handle arm for detachably and pivotally connecting said arm to said support at the successive centers of curvature of the former from said end to the other, whereby when the arm is pivotally connected in proper sequence and moved the proper amount on each pivot the bar will be bent into close contact at all points longitudinally.

11. A device for bending metal bars, comprising in combination a support having a flat surface, a former in fixed position thereon having a surface on such curved longitudinal lines as may be desired for one end portion of the bar, means for holding a bar extending along said former in contact with one end of said former, an elongated handle arm having a roller projecting therefrom at right angles and adapted to bear against the outer surface of a bar in contact with the former at said end, a series of cooperating and corresponding means on said support and handle arm for detachably and pivotally connecting said arm to said support at the successive centers of curvature of the former from said end to the other, whereby when the arm is pivotally connected in proper sequence and moved the proper

amount on each pivot the bar will be bent into close contact at all points longitudinally, and a rotating handle on said arm for turning said roller.

12. A device for bending metal bars, comprising in combination a support having a flat surface, a former in fixed position thereon having a surface on such curved longitudinal lines as may be desired for one end portion of the bar, means for holding a bar extending along said former in contact with one end of said former, an elongated handle arm having a roller projecting therefrom at right angles and adapted to bear against the outer surface of a bar in contact with the former at said end, a series of cooperating and corresponding means on said support and handle arm for detachably and pivotally connecting said arm to said support at the successive centers of curvature of the former from said end to the other, whereby when the arm is pivotally connected in proper sequence and moved the proper amount on each pivot the bar will be bent into close contact at all points longitudinally, each of said means for pivotally connecting said arm and support consisting of a fixed cylindrical pin on one and a fixed cylindrical socket on the other in which the pin rotatively fits.

13. A device for bending metal bars, comprising in combination a support having a flat surface, a former in fixed position thereon having a surface on such curved longitudinal lines as may be desired for one end portion of the bar, means for holding a bar extending along said former in contact with one end of said former, a rod rectangular in section of slightly less width than the bar to be bent, secured to said support and fitting the edge of said former next to the support to space the bar from the former, an elongated handle arm having a roller projecting therefrom at right angles and adapted to bear against the outer surface of a bar in contact with the former at said end, a series of cooperating and corresponding means on said support and handle arm for detachably and pivotally connecting said arm to said support at the successive centers of curvature of the former from said end to the other, whereby when the arm is pivotally connected in proper sequence and moved the proper amount on each pivot the bar will be bent into close contact at all points longitudinally.

14. A device for bending metal bars, comprising in combination a support having a flat surface, a former in fixed position thereon having a surface on such curved longitudinal lines as may be desired for one end portion of the bar, means for holding a bar extending along said former in contact with one end of said former, a rod rectangular in section of slightly less width than the bar to be bent secured to said support and fitting the edge of said former next to the support to space the bar from the former, an elongated handle arm having a roller projecting therefrom at right angles and adapted to bear against the outer surface of a bar in contact with the former at said end, a support for said roller secured to said arm comprising side walls and a connecting end wall, a series of cooperating and corresponding means on said support and handle arm for detachably and pivotally connecting said arm to said support at the successive centers of curvature of the former from said end to the other, whereby when the arm is pivotally connected in proper sequence and moved the proper amount on each pivot the bar will be bent into close contact at all points longitudinally.

In testimony whereof I hereunto affix my signature.

WILLIAM JAKOB BEISEL.