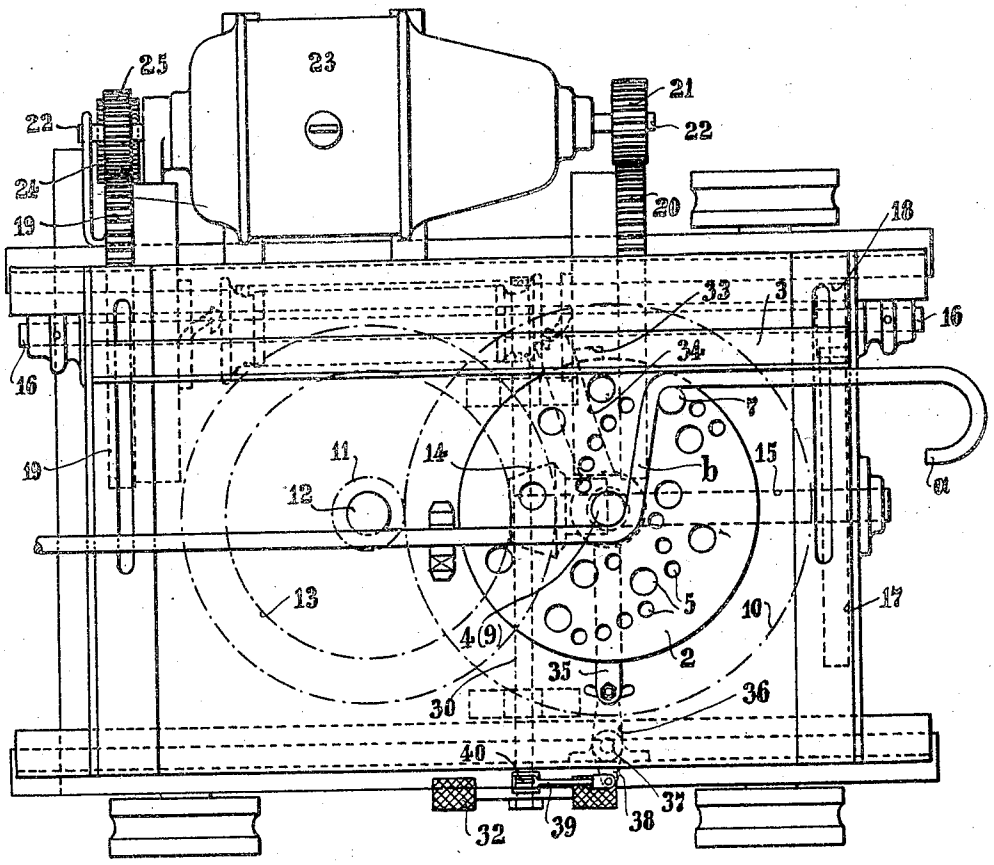
March 3, 1931. A. WAGENBACH 1,795,188

BENDING MACHINE FOR ROD AND PROFILE IRON

Filed March 14, 1928 4 Sheets-Sheet 1

Fig. 1



INVENTOR.

Anton Wagenbach

BY Paul B. Schilling

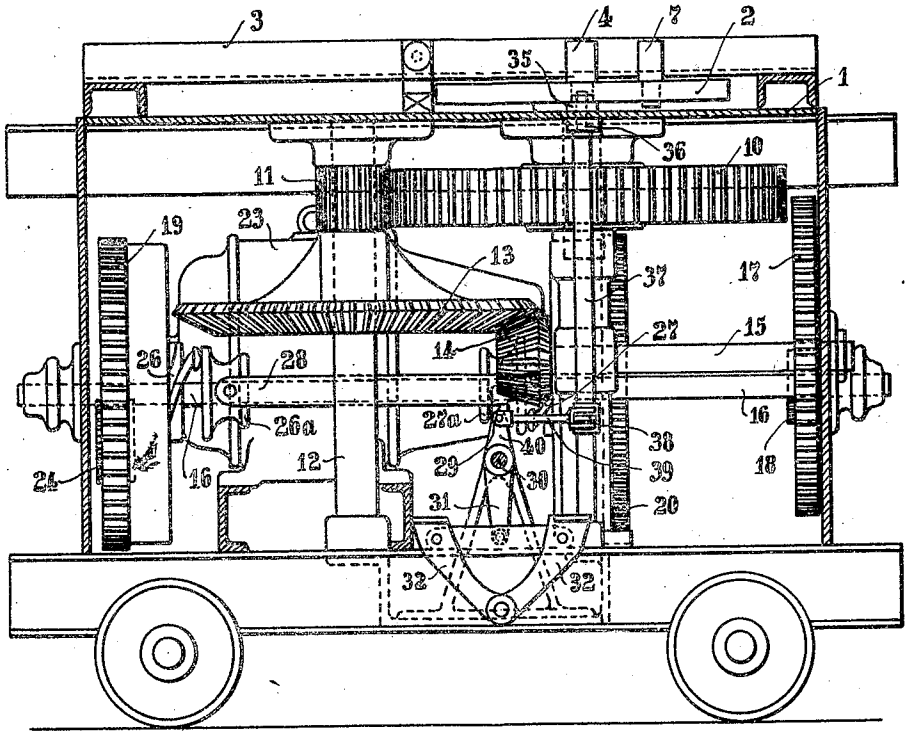
ATTORNEY.

March 3, 1931. A. WAGENBACH 1,795,188

BENDING MACHINE FOR ROD AND PROFILE IRON

Filed March 14, 1928 4 Sheets-Sheet 2

Fig. 2



INVENTOR.

Anton Wagenbach

BY Frank L. Schieiss

ATTORNEY.

March 3, 1931 A. WAGENBACH 1,795,188

BENDING MACHINE FOR ROD AND PROFILE IRON

Filed March 14, 1928 4 Sheets-Sheet 3

Fig. 3

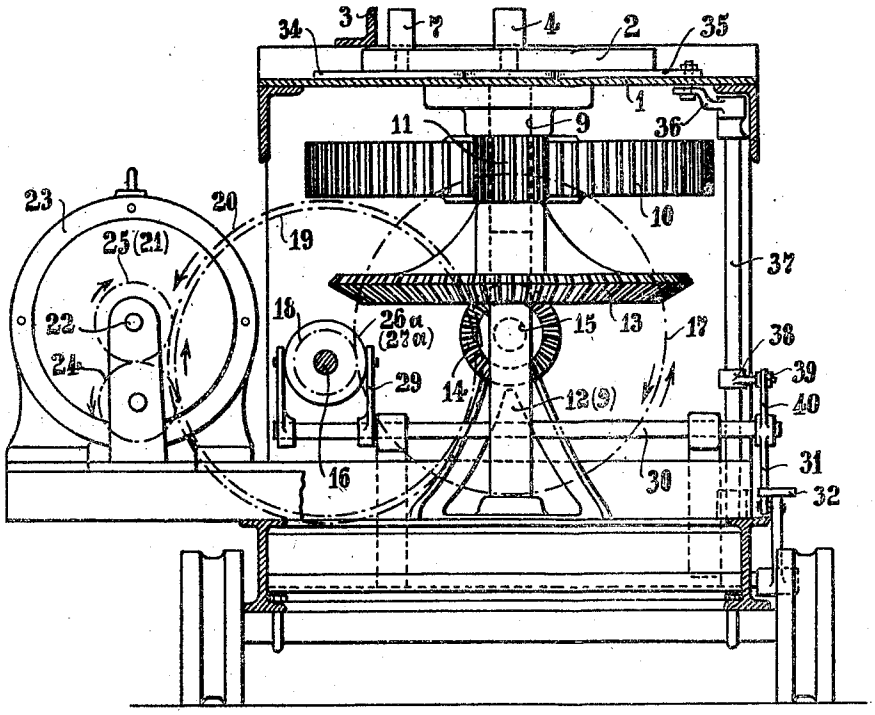


Fig. 4

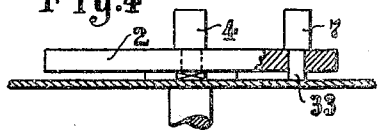


Fig. 5

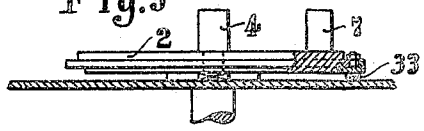
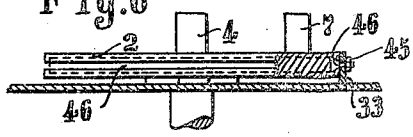


Fig. 6



INVENTOR.

Anton Wagenbach

BY

ATTORNEY.

March 3, 1931. A. WAGENBACH 1,795,188

BENDING MACHINE FOR ROD AND PROFILE IRON

Filed March 14, 1928 4 Sheets-Sheet 4

Fig. 7

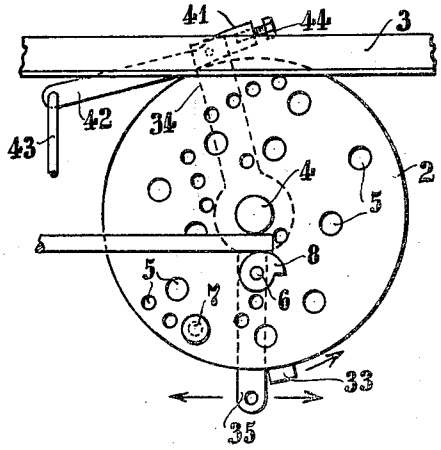


Fig. 8

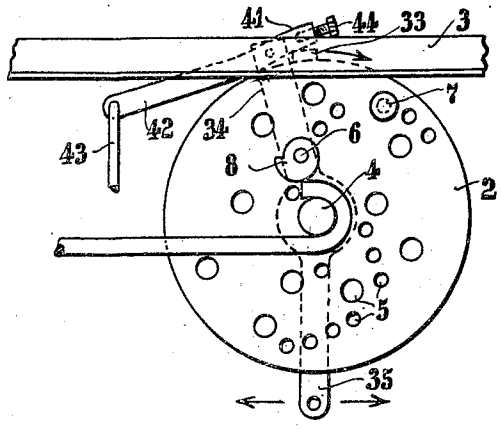


Fig. 9

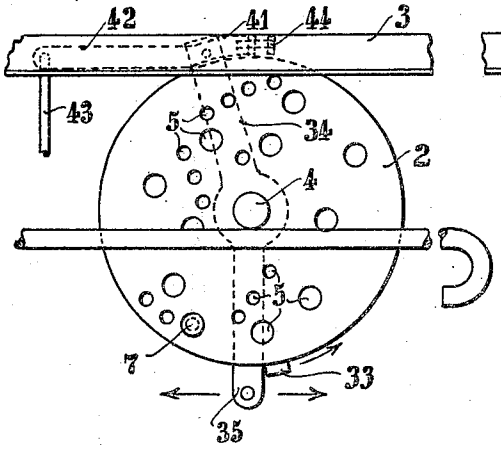
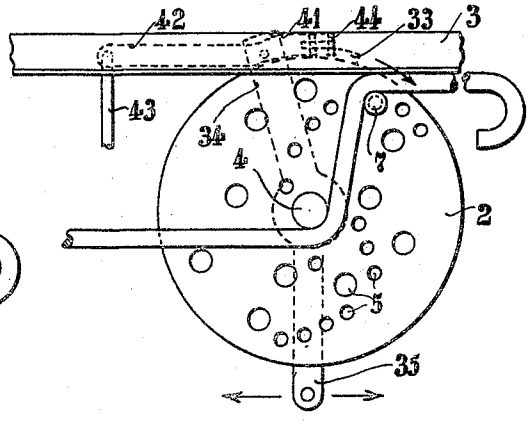


Fig. 10



INVENTOR.

Anton Wagenbach

BY

ATTORNEY.

Patented Mar. 3, 1931 1,795,188

UNITED STATES PATENT OFFICE

ANTON WAGENBACH, OF ELBERFELD, GERMANY

BENDING MACHINE FOR ROD AND PROFILE IRON

Application filed March 14, 1928, Serial No. 261,512, and in Germany March 14, 1927.

This invention relates to a bending machine for bar, rod, and/or profile iron, especially iron for use in ferro-concrete work. It has reference in particular to that type of bending machine which has a bending lever or rotatable disk actuated by reversing gear, whereof the movable reversing device is adapted for location in a middle, or neutral, position as well as in each of its two terminals, clockwise driving and counter-clockwise driving positions, while a stop, moving with the bending lever or rotatable disk, influences said reversing device to stop the drive at the end of a bending operation.

While, in known machines of this type, an automatic stop or halt of the drive takes place at the end of the working stroke of the bending lever or rotatable disk, the drive at the end of the return stroke has to be disengaged by the operator or attendant of the machine. It is true that a bending machine has been proposed, having a reversing gear and a clutch mechanism separate therefrom, the clutch being permitted to disengage under spring action and stop the drive at the end of each stroke of the bending lever or rotatable disk. However this known machine had no provision for automatically shifting the reversing gear into "neutral" or "reverse", this having to be done by the attendant after the automatic withdrawal of the clutch aforesaid.

According to the present invention a bending machine of the type herein first above defined is so constructed that a pair of levers or slides mounted on the machine framework and co-acting with the stop on the bending lever or rotatable disk, are so connected with the reversing device of the reversing gear that the said reversing device is always brought automatically to its middle or neutral position at the end of every stroke of the bending lever or rotatable disk, irrespective of whether the stroke be in clockwise or in counter-clockwise direction and irrespective of whether it be a working stroke or a return stroke.

As a further feature of the invention the reversing device may, at the end of a working stroke, at the end of a return stroke, or at the end of both strokes, actually be moved past the neutral position to the opposite terminal position in which a reversed drive is engaged. This and other optional or subsidiary features are hereinafter further referred to and set forth in the claims hereunto annexed.

With the arrangement herein described it is possible, in a simple manner and with a minimum of attendance, to use the bending lever or the rotatable disk selectively, in one or other direction of rotation, for the execution of a bending operation and, therefore, to bend the iron for use in ferro-concrete construction selectively in a clockwise or counter-clockwise direction.

If, instead of the bending lever or the rotatable disk becoming stationary at the end of each operative stroke, the direction of drive is completely reversed at the end of one or both strokes of the said lever or disk, the latter automatically runs back at the end of the bending operation or oscillates continuously between its two terminal positions. In this case the service is particularly simple. The operator need only introduce the iron to be bent into the machine and when necessary remove it again. A substantially higher output than heretofore is thus possible, while at the same time it is ensured that all bends shall be correctly made.

If the machine is intended to be employed for operating on ferro-concrete iron or the like in such a manner that two different ends are made each time one after the other, there can be arranged on that controlling lever or slide which effects, at the end of the bending operation, the disengagement or switching over of the drive, a stop-arm which at will is capable of being set in the path of the stop on the rotary disk or on the bending lever and which is capable of being removed from said path again, the arrangement being such that the stop on the bending lever strikes either directly against the controlling lever or against its stop-arm according to the position of said stop-arm on said lever. In the first case the disengagement or change-over of the drive occurs after a comparatively large angular rotary movement of

the bending lever and in the latter case after a smaller one. Consequently no adjustment of the stop on the rotary disk or on the bending lever is necessary for the two different bendings which are to be performed alternately, but it is always necessary only for the stop-arm, on the controlling lever or controlling slide to be put into or out of gear, which may be effected by means of a handle or the equivalent provided on the service side of the machine, or, if desired, automatically.

The drawing illustrates as a constructional example of the subject-matter of the invention a bending machine for iron for ferro-concrete with a change-gear for the driving mechanism of the rotary disk carrying the bending pin.

In said drawing:—

Fig. 1 is a view from above;

Fig. 2 a view from the front, and

Fig. 3 a view of the left side in Figs. 1 and 2 in which the left side of the machine frame is cut away.

In Figs. 4 to 6 there are represented three examples of the arrangement of the adjustable stop on the rotary disk, each being represented with said disk in part sectional side elevation; while

Figs. 7 to 10 represent the mode of operation of the new arrangement in four plans of a part of the machine.

In the case of the machine illustrated, the bending tools consist substantially of a horizontal rotary disk 2 arranged above the machine table 1 and of a stop-rail 3 which is adjustable parallel to itself relatively to said rotary disk. The rotary disk 2 carries on the one hand a central fixed bending pin 4 and on the other hand it contains a comparatively large number of holes 5, which can be utilized at will, for the insertion of two bending pins 6, 7, of which the one 6 carries an eccentric 8 for clamping fast the iron to be bent against the central pin 4. The rotary disk 2 is secured on the upper end of a vertical shaft 9 which is coupled through a spur wheel 10 and pinion 11 with a second vertical shaft 12 mounted on the machine frame. The latter carries below the pinion 11 a bevel wheel 13 with which a bevel pinion 14 engages. The latter is fixedly mounted on a horizontal shaft 15 which is coupled with a second horizontal shaft 16 by means of a pair of spur wheels 17, 18. The shaft 16 carries on opposite sides of the bevel wheel 13 two loosely revoluble spur wheels 19, 20. Of the latter the one 20 engages directly with a pinion 21 on the shaft 22 of a driving motor 23 secured at the back of the machine frame, while the other engages through an intermediate wheel 24 with a pinion 25 on the motor shaft 22. The two toothed wheels 19, 20 consequently rotate in opposite directions when driven by the motor 23. They can be coupled alternately with their shaft 16 with the aid of two spring couplings 26, 27 of a type well known, which are controlled by means of two sleeves 26*a*, 27*a*, which are longitudinally displaceable on the shaft 16. The two sleeves 26*a*, 27*a* are on the one hand connected together by means of a rod 28 and on the other hand are connected through the adjusting fork 29, shaft 30, and lever 31 with a two-armed pedal lever 32 mounted on the front of the machine frame which lever serves to switch over the change-gear formed by the wheels 20, 21 and 19, 24, 25. According as to whether the one or the other coupling 26 or 27 is closed the disk 2 carrying the bending pin rotates in the clockwise or anti-clockwise direction. The coupling sleeves 26*a*, 27*a* may also be brought into a middle position in which both couplings 26, 27 are released, so that the rotary disk 2 is stopped.

The machine thus far described is well known. It may be utilized at will to bend the ends of iron for ferro-concrete into the form of hooks, as is shown at *a* in Fig. 1, or to bend the iron at right angles as shown at *b* in Fig. 1. For the forming of the hooks the end of the iron is clamped in (Fig. 7) between the eccentric 8 of the pin 6 and the middle bending pin 4, whereupon the rotary disk 2 is rotated (Fig. 8) in the counter-clockwise direction. For the purpose of bending the iron at right angles the latter is inserted on that side of the rotary disk 2 which is opposite to that at which the fixed stop rail 3 is situated between the middle bending pin 4 and the pin 7 whereupon the disk 2 is likewise rotated counter-clockwise. After the completion of each bending operation the disk 2 is rotated backwards empty, the clamping of the work between the eccentric 8 and the bending pin 4 being automatically released. According as to whether the hook at the end of the iron is to be closed more or less and according as to whether the iron is to be bent more or less, the rotary disk 2 must be rotated through a smaller or greater angular amount. Moreover as a rule the formation of the hook *a* requires always a greater angular rotation of the disk 2 than the formation of the bend *b*.

Now according to the invention the change-gear 20, 21 and 19, 24, 25 for the driving mechanism of the rotary disk 2 is so to be automatically switched over in dependence on its to and fro rotary motion that the rotary disk automatically runs back at the end of each bending operation and at the end of the return movement begins again automatically its working stroke. For this purpose there is on the one hand provided on the rotary disk 2 a stop 33 which can be adjusted in correspondence with the disk's angle of rotation requisite for the bending to be performed at the time, and on the other hand there are arranged underneath the rotary disk 2 and in

the path of the disk-stop 33 two central levers 34, 35 which co-operate with the latter and which in the example illustrated are formed by means of the two arms of a two-armed lever 34, 35 revoluble about the shaft 9. The forwardly directed arm 35 of this lever is coupled with a single-armed lever 36 which is secured on a vertical auxiliary shaft 37 which carries below a second two-armed lever 38. The lever 38 is coupled by means of a draw-rod 39 with an arm 40 mounted on the control-shaft 30 of the couplings 26, 26*a*, so that in this manner the two lever arms 34, 35 are connected with the setting device 28, 29 for the coupling sleeves 26*a*, 27*a* in such a manner that when the lever 34, 35 rotates in the one or the other direction alternately the coupling 26 or 27 is closed and consequently the change-gear 20, 21 and 19, 24, 25 is switched over. As is evident the effect is thus obtained that the switching over of the change-gear is automatically effected in dependence on the position of the rotary disk 2. And indeed each time at the end of a bending operation through the stop 33 on the disk 2 striking against the lever arm 34 and turning the latter counter-clockwise (Figs. 8 and 10) the change-gear is switched over for the return of the rotary disk 2, while at the end of the return movement by the stop 33 meeting the lever arm 35 (Figs. 7 and 9) and the clockwise rotation of the lever 34, 35 effected thereby the change-gear is switched over again for the working stroke of the rotary disk 2. The disk consequently rotates uninterruptedly to and fro between two limits determined by the setting of the stop 33 so that the workman requires to do nothing further than to insert the iron to be bent and to remove it again.

In order that when iron for ferro-concrete is being bent the hook *a* at the end of the iron and the neighboring bend *b* may be formed one after the other without the stop 33 on the rotary disk 2, which stop acts on the lever 34, 35, requiring to be adjusted each time for this purpose, there is also provided on the arm 34 of the double-armed lever 34, 35 a special stop-arm 41 for cooperation with the stop 33 of the disk 2. The arm 41 revolubly supported on the lever 34 may at will be set in the path of the stop 33 (Figs. 9 and 10) or out of the way of the same (Figs. 7 and 8), which may suitably be effected with the aid of a counter-arm 42 and a rod 43 pivotally connected therewith through a handle (not shown) arranged in front on the machine. According to the position of the stop-arm 41 the stop 33 of the rotary disk 2 strikes either directly against the lever 34 or against the free end of the arm 41 mounted thereon. In the first case the rotary disk 2 executes a comparatively large angular rotary movement for the formation of a hook *a*, whereas in the latter case it performs a smaller angular rotary movement for forming a bend *b*. The attendant consequently always only requires during the alternate bending of the hooks at the ends of the iron for ferro-concrete and for the making of the simple bends of the iron to turn the stop-arm 41 into its working position and to remove it therefrom again.

Finally in order also to be able to adjust in correspondence with the requirements of each case the difference in the magnitude of the two angular rotary movements of the disk 2 requisite for the different bends, the stop 33 on the rotary disk 2 does not strike directly against the free end of the arm 41, but on the end of this arm there is provided a set-screw 44 the head of which cooperates with the stop 33. One is thus able by adjusting the screw 44 to adjust as desired the difference in the angle of rotation of the disk 2 in the formation of hooks and on the formation of simple bends, according as the desired shaping of the iron for ferro-concrete being treated at the time renders necessary.

The stop 33 on the rotary disk may be constructed as desired. In Fig. 4 it is formed by the downwardly extended shaft of the bending pin 7. According to Fig. 5 the head of a screw serves as a stop, which screw may at will be fixed into the one or the other of a comparatively large number of holes provided on the reduced edge of the rotary disk 2. Finally according to Fig. 6 the stop 33 is formed by a small plate which with the aid of a screw 45 (which engages in a dovetail-shaped groove 46 on the edge of the rotary disk 2) can be clamped fast at any desired part of the edge of the disk.

Obviously the invention is not limited to the example illustrated, other constructions also being possible. Thus the new arrangement might be such that an automatic switching over of the change-gear takes place only at the end of the bending operation, while the switching over at the end of the return stroke of the rotary disk 2 is effected by the attendant. Or, at the end of each bending operation there might take place instead of the switching over of a change-gear merely the disengagement of a driving coupling. Further the rotary disk 2 might instead of being fitted with holes be fitted with slots for the attachment of the bending pins, or there might be provided a bending lever instead of a rotary disk carrying the bending pins. If the machine is intended to be utilized for the purpose of bending the iron for ferro-concrete alternately to the one and the other side, in which case the rotary disk 2 or the bending lever performs the working movement first during the rotation in the clockwise direction and then during the rotation in the counter-clockwise direction, then there is arranged also on the lever 35 a stop-arm, corresponding to the arm 41 on

the lever 34, which can be set at will in the path of the stop 33. The machine then works in the case of the bending of iron for ferro-concrete towards the one side in the manner described with reference to the drawing, while in effecting bends towards the opposite side the switching over for the return stroke is effected by the action of the stop 33 on the lever 35 or of its stop-arm, while the switching over for the next working operation is effected by the direct action of the stop 33 on the lever 34. Moreover it is immaterial for the invention whether the drive of the machine is obtained through toothed wheel gear from a motor built directly on the machine or through the instrumentality of a belt drive of a motor erected independently or of a transmission shaft. Likewise it is unimportant whether the change-gear is constructed as drawn as a spur-wheel gear or as a bevel-wheel gear or as a belt drive with an open and a crossed belt. If belts are substituted for toothed wheels the belt forks take the place of the coupling sleeves to be adjusted by the stop 33 and levers 34, 35, which forks push the belt or belts from the fast to the loose pulleys. The stop 33 for adjusting the control lever for the coupling might, instead of being arranged on the rotary disk 2 carrying the bending tools or on the bending lever, be arranged on another part rotating with this disk or with the lever, for example, on one of the wheels 10 or 13 mounted on the shaft 9 or on a special dividing disk fixed on the shaft 9. This arrangement of a dividing disk as a support for the adjustable stop is specially advantageous if the coupling sleeve of the change-gear is mounted on a vertical axis. In this case the stop instead of operating on a special control-lever with the aid of oblique surfaces can operate directly on the adjusting fork of the coupling sleeve. If desired the adjustable stop may be entirely dispensed with and the adjustment of a lever which controls the coupling sleeve at least at the end of the bending operation be effected by means of the bending tool which in this case serves as a stop. Instead of the adjustable stop in cooperation with a control lever effecting the complete switching over, it might only start the shifting of the coupling, the shifting being completed in a manner well known, by means of a weight mounted on a lever swinging to and fro or by means of a spring. This arrangement is to be recommended particularly when the disengagement of the drive or the switching over of the change-gear is to be effected by one or more belts being shifted from fast to loose pulleys and vice versa.

I claim:—

1. In a bending machine, a bending member rotatable in opposite directions for right and left-hand bending, a driving motor, a reverse gear having a neutral position and gear elements adjustable to positions for driving the bending member in a clockwise or counter-clockwise direction, a stop on the bending member, and shifting elements adapted to be respectively engaged by the stop at the ends of opposite strokes of the bending member for respectively shifting the reverse gear to its different driving positions, said elements being so connected with the reverse gear and coacting with the stop as to automatically bring the reverse gear to its neutral position at the end of each working or return stroke of the bending member.

2. A bending machine according to claim 1, wherein the shifting elements comprise oppositely extending lever arms for adjusting the gear elements of the reverse gear for clockwise or counter-clockwise driving actions.

3. A bending machine according to claim 1, characterized in that the stop and shifting elements are adapted for coaction to automatically reverse the motion of the bending member at least at one end of a stroke thereof.

4. A bending machine according to claim 1, characterized in that the stop and shifting elements are adapted for coaction to automatically reverse the motion of the bending member at both ends of a stroke thereof.

5. A bending machine according to claim 1, wherein a power-storing device is provided and connected with the reversing device of the reversing gear and energized by the movement of the latter into the neutral position from one operative position for moving said device into its opposite operative position.

6. A bending machine according to claim 1, in which a stop arm is mounted upon one of the shifting elements and which is movable, at will, into and out of the path of movement of the stop on the bending member.

7. A bending machine according to claim 1, in which one of the shifting elements is provided with a stop arm movable, at will, into and out of the path of the stop upon the bending member, said arm being adjustable as to length.

8. A bending machine according to claim 1, wherein each shifting element is provided with a stop arm adjustable, at will, into and out of the path of movement of the stop on the bending member.

9. A bending machine according to claim 1, in which the bending member is provided with a bending pin forming or carrying the stop coacting with the shifting elements.

In testimony whereof I affix my signature.

ANTON WAGENBACH.