

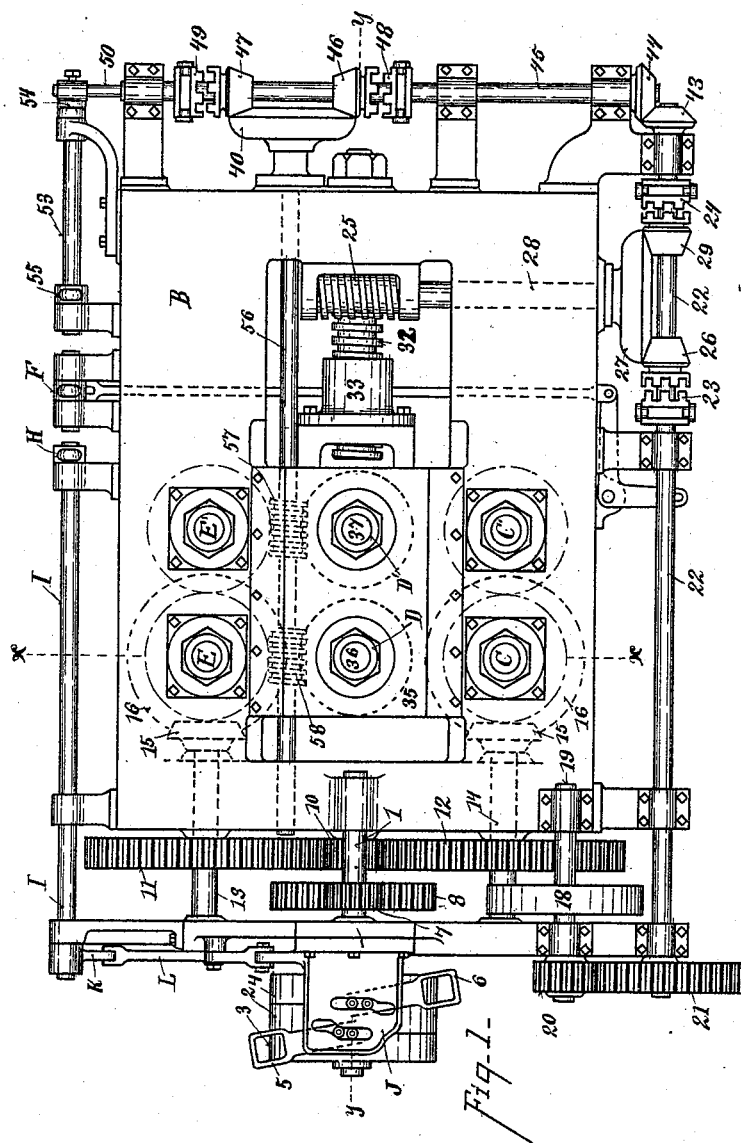
(No Model.)

4 Sheets—Sheet 1.

F. C. WEIR & E. W. HARDEN.  
RAIL CURVING MACHINE.

No. 494,450.

Patented Mar. 28, 1893.



Witnesses  
C. W. Miles  
T. L. Lamm

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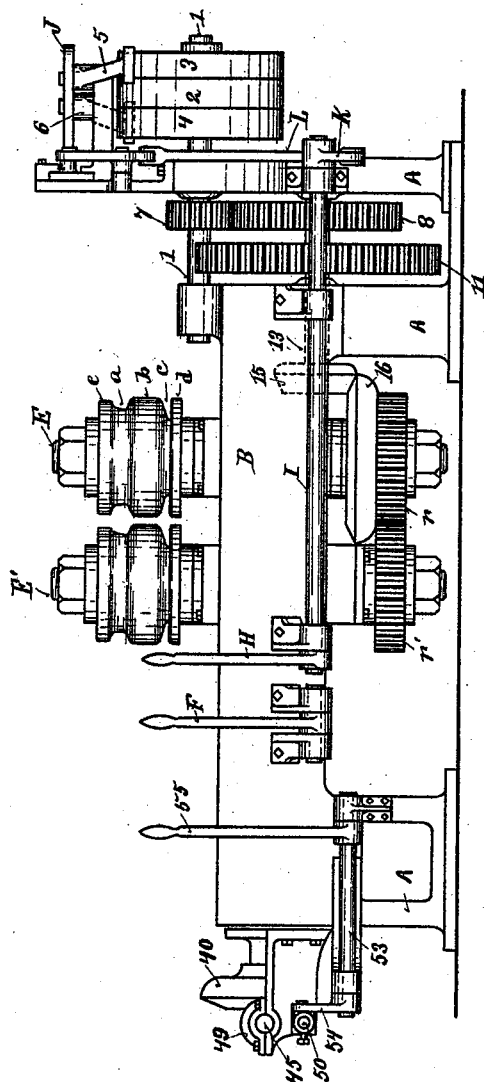


Fig. 2-

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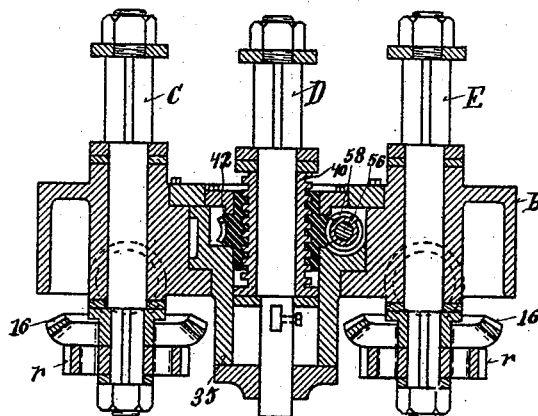
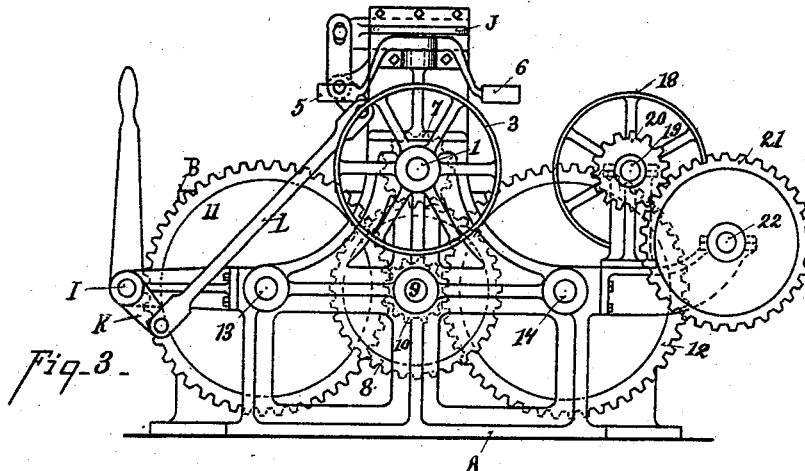


Fig. 4.

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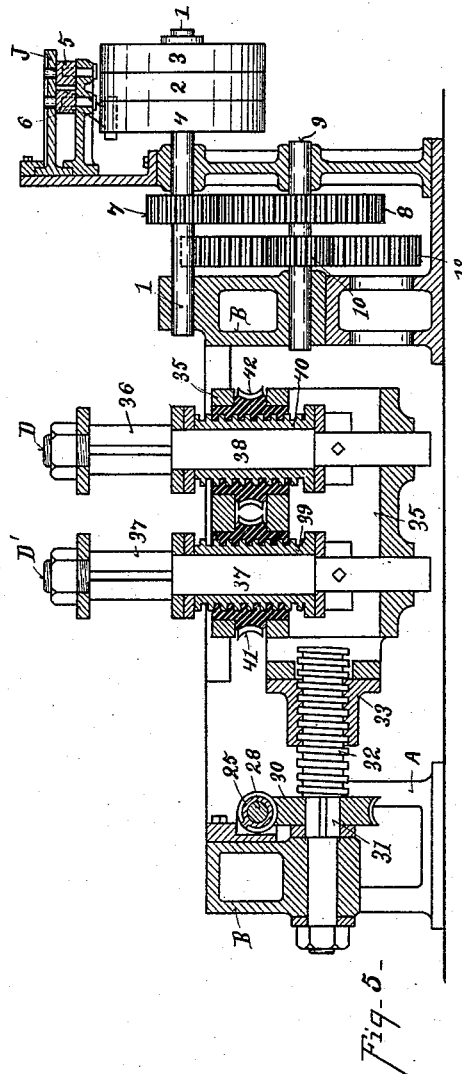
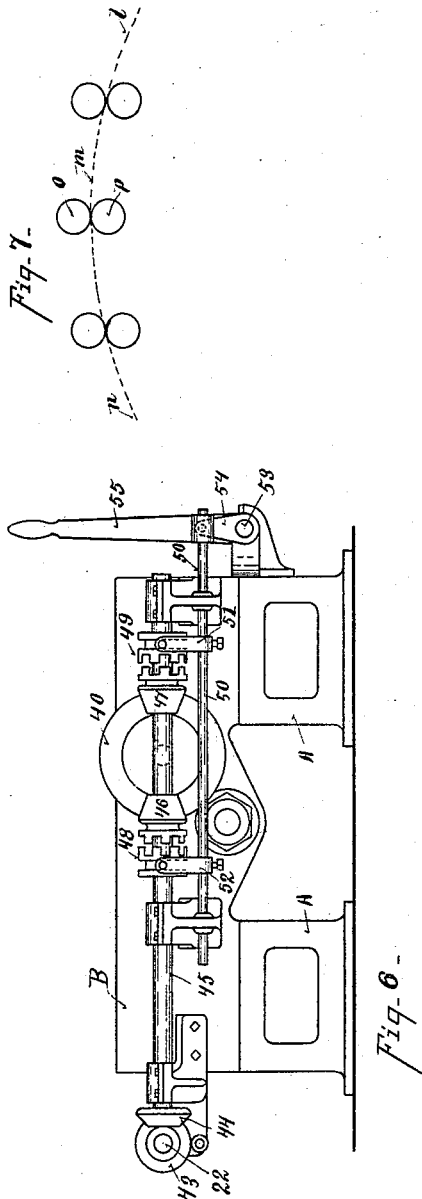
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# UNITED STATES PATENT OFFICE.

FREDERIC C. WEIR AND EDWARD W. HARDEN, OF CINCINNATI, OHIO,  
ASSIGNORS TO THE WEIR FROG COMPANY, OF OHIO.

## RAIL-CURVING MACHINE.

SPECIFICATION forming part of Letters Patent No. 494,450, dated March 28, 1893.

Application filed September 12, 1892. Serial No. 445,675. (No model.)

*To all whom it may concern:*

Be it known that we, FREDERIC C. WEIR and EDWARD W. HARDEN, citizens of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Rail-Curving Machines, of which the following is a specification.

One of the objects of our invention is to provide means for curving railway rails, beams, or other bars, to any desired curve or angle.

Another object of our invention is to provide means for putting pressure upon the top or bottom side of the rail or beam as occasion requires to prevent cambering in curving, or to take out a camber from the curved work. The machine is constructed so that the operator may apply the strains in various directions at will.

The various features of our invention are fully set forth in the description of the accompanying drawings making a part of this specification, in which—

Figure 1 is a top plan view of our improvement. Fig. 2 is a front elevation of the same. Fig. 3 is a right side elevation of the machine. Fig. 4 is a section on line *x, x*, Fig. 1. Fig. 5 is a section on line *y, y*, Fig. 1. Fig. 6 a left hand side elevation. Fig. 7 is a diagram representing the mode of operation.

A represents the supporting posts. B the bed plate or frame.

1 represents the main driving shaft. 2 represents the driving pulley keyed thereon. 3, 4, loose pulleys. Two driving belts are employed and they are controlled by the shifters 5, 6, so that when shifter 5 and its belt is moved over the driving pulley 2 the main shaft is driven in one direction, and when the shifter 6 with its belt is moved on the driving pulley the machine is run in the reverse direction.

The bending devices are formed of three pairs of rolls, C C', D D' and E E'; and the faces of these rolls are turned with the desired configurations to grasp appropriately the head, the web, and flange of the rails upon either side by each pair of rolls. Fig. 2 shows one form of rolls adapted to bending, say the ordinary railway rail. The groove *a* grasps

the head of the rail; the swells *b* grasp the web of the rail, and the groove *c* grasps the flange of the rail, and the collars *d, e*, bear upon the top and bottom and hold the head and flange respectively. The curving is accomplished by moving the axis of the inner rolls out of line with the axis of the two outer, which are stationary and driven by power.

The following are the instrumentalities for conveying motion to the driving rolls, C C' and E E': 7 represents a spur gear on the shaft 1, driving the gear 8 on shaft 9. 10 represents a transmitting gear on shaft 9, meshing and driving gear wheels 11 and 12, mounted on shafts 13 and 14. These shafts transmit power by means of the bevel gears 15, 16, respectively, to the rollers C and E, and the opposite rollers of said pairs C' and E' are driven by means of transmitting gear *r r'* keyed to the bottom end of said rollers. The outside pairs of rolls C, E, are supported in stationary journals, and therefore, revolve in fixed planes. The inside rolls are movable in two directions; first, in a horizontal plane to adjust their axes out of or in line with the axis of the outside pairs of rollers; and second, in the line of their own axes. As shown in the drawings these rolls are supported vertically in the frame and movable in a vertical direction either up or down to cause a greater or less bearing either upon the head or flange of the rolls, to prevent cambering, or to take out cambering, as required. These motions are secured in the following manner:

18 represents a driving pulley mounted upon shaft 19. 20 represents a spur gear mounted on said shaft driving gear 21, mounted on shaft 22.

23 represents a clutch for locking bevel gear 26 to said shaft 22, and 24 clutch for locking bevel gear 29 to shaft 22.

29 is a bevel gear for driving bevel gear 27 in opposite direction to that of bevel gear 26. When the clutches are in position shown in Fig. 1 neither of the bevel gears 26 or 29, are in engagement with shaft 22, and shaft 28 is not driven. 25 represents a worm on said shaft 28 meshing with worm gear 30 on shaft 31, see Fig. 5.

32 represents a screw on shaft 31 engaging

with the nut 33 on the movable journal box frame 35; said journal frame 35 carries the journals for supporting the shafts 36, 37, of the rolls D D' so that said rolls and their  
 5 journals may be moved laterally in or out to align their axis to or from the axis of the outside pair of rolls C C' and E E'. The said roller shafts 36, 37 are supported in screw sleeve journals 39, 40.

10 41, 42 represent worm wheel nuts engaging the screwsleeves 39, 40, upon the inside, journaling in the frame 35, and being rotated upon their journals by means of worms 57, 58, and the worm wheels 41, 42, cut upon the  
 15 outer faces of said nuts which are driven to raise or lower the rolls D D', mounted on the shafts 36, 37. Motion is transmitted from shaft 22 by means of bevel gears 43, 44, to shaft 45; on said shaft 45 are mounted bevel  
 20 gears 46, 47, which normally run as idlers.

48, 49, represent clutches which are operated by means of the reciprocating rod 50 connected thereto by shackles 51, 52.

53, Fig. 2, represents a shaft. 54 a crank  
 25 hinged to the reciprocating rod 50, and 55 a hand lever rocking said shaft 53 to bring clutches 48, 49, alternately into engagement with the bevel gears 46, 47, or to disengage both of said clutches, as occasion requires.

30 56 represents the shaft on which bevel gear 40 is keyed; 57, 58, represent worm gears on said shaft 56, engaging with the worm wheels 41, 42, so that when motion is transmitted to drive shaft 56 the shafts 36, 37, are either  
 35 raised or lowered according to the direction in which the motion is given.

Mode of operation: When the machine is to be driven forward for bending a rail the rolls D D' are moved to bring their axes out  
 40 of line, see Fig. 7. The line *l, m, n*, will constitute the curve to which the rails are bent when the axis of the rollers D D' are moved to the point *o, p*. This movement of the rolls D D' is accomplished by throwing in either  
 45 the clutch 36 or 39, driving shaft 28, worm 25, worm gear 30, screw 32, moving the journal box frame 35 and its contained roller shafts 36, 37, either out or in, as occasion requires. When these rollers are adjusted to  
 50 the desired position shaft 28 is turned out of gear, and motion is applied to drive the rollers C C' and E E'. The rail is presented to rollers C C', and grasped by the inner bearing surface, the rail is driven through  
 55 said rollers, delivered to rollers D D', and thence, to rollers E E'. If in bending the rail the operator should observe that the rail is liable to camber, either upward or downward, he applies motion to raise or lower the rollers  
 60 D D' by moving hand lever 55. The rollers will be raised and lowered in accordance with the direction in which the hand lever 55 is moved; if it is moved outward it brings into engagement clutch 49, and locks the bevel gear  
 65 47 to the shaft; bevel gear 46 running as an idler, and it will raise the rolls D D'. If the lever moves inward it will engage clutch 48

and lock bevel gear 46 to the shaft, and drive the bevel gear 40, and its shaft 56 in opposite  
 direction, and lower the rollers. The worm  
 70 gears 57, 58, 39, 40, 41, 42, are provided so that a very slow motion, and hence power, is obtained and a very slight pressure either up or down, is sufficient to prevent cambering, and a slight vertical movement is only required for  
 75 this purpose. This vertical movement may be accomplished in either direction where the rolls C C' and E E' are being driven, to force the rail through between said three pair of rollers. So, likewise, if the operator dis-  
 80 covers that the rail is being bent too much, or too little, he will, while the rollers are in motion, increase or decrease the curve by operating hand lever F to engage either clutch 23 or 24, to drive the worm 25 in the desired di-  
 85 rection, and move said rollers D D' out or in. By means of the worm and screw gear here employed this lateral movement of the rollers D D' is slow, as but a very slight change will materially increase or decrease the curve; so,  
 90 too, if the operator desired to go back and bend a rail more or less, he may reverse the direction of the driving rollers C C' E E', by moving hand lever H, rocking shaft I, which is provided with the crank K, moving con-  
 95 necting rod L, which operates the shifter J, and the shifter brackets 5, 6, to bring either of the belts operated by said brackets under the driving pulley 2, according to the direction in which he wishes to drive the said two  
 100 outside pair of rollers. In the construction herein shown it will be observed that the outside pair of rollers grasp and drive the railway rails, and bend to a curve according to the alignment of the inner or curving roller  
 105 D D'. If the operator wishes simply to remove cambers from a straight rail the rollers are all aligned as shown in Fig. 1, but the inner rollers D D' are adjusted vertically to exert pressure upward or downward upon that  
 110 portion of the rail between the rollers C C', E E'.

In curving bars, beams or rails, which have a greater amount of metal in some portions of their cross section than in others, the tendency to camber is great; and in steel rails and  
 115 beams there is a difference in the elasticity of different rails or beams in the same lot, some will hold their curve or impression, while others will spring back more or less; varying with the quality of the metal; hence, it is very  
 120 essential in curving rails or beams that the exact curve be maintained and it is necessary to set the middle pair of rolls during the operation of curving. With the device herein shown this lateral movement can be im-  
 125 parted while under operation; or, if an article to be curved as it is passed through the rolls contains either too much or too little curve, the operator can readily adjust the middle curving rail to increase or decrease the curve  
 130 while running backward, as well as running forward. So, likewise, the camber may be taken out or the rails straightened in the same manner, as the central rolls may be moved

out or in while in the operation of curving easier than when the rolls are stationary, but with the worm and screw gear herein shown the central rollers may be adjusted even  
5 when they are idle.

By the use of three pairs of rolls a material advantage is obtained; not only can the rail be run backward or forward for curving and cambering, but the inner rolls form an  
10 abutment upon each side of the point where the bend is made and take out the spring because of the clamping between two rolls at the curving point; hence, the three pairs of rolls are more positive in their action than  
15 the use of the single roll.

Having described our invention, what we claim is—

1. In a curving machine the combination with driving rolls and curving rolls, of laterally and vertically movable journal boxes carrying said curving rolls, and mechanism for driving said driving rolls, substantially as described.

2. In combination with the two outside pairs  
25 of driving rolls, the inside curving rolls, mounted in movable journal boxes, with reverse driving mechanism for moving said journal boxes laterally and vertically, and unshipping device for reversing motion, and  
30 throwing said laterally moving mechanism in and out of gear, substantially as specified.

3. In combination with the two outside pairs of driving rolls, the inside curving rolls  
35 D D', mounted in a vertically moving journal box frame 35, the nut and screw gear applied to the shafts of said rolls, the worm

wheels 41, 42, the worms 57, 58, mounted on shaft 56, and the reversing clutches 48, 49, operated by the shipping lever 55, and connecting mechanism, substantially as specified.  
40

4. In a curving machine the combination with driving rolls, of laterally and vertically movable journal boxes, and rolls carried by said journal boxes and provided with collars  
45 to bear upon the top and bottom of article operated upon, and mechanism for driving said driving rolls, substantially as described.

5. In combination with the outside pairs of driving rolls C C' E E', respectively inter-  
50 geared, reversing driving and shipping mechanism, the inside curving rolls D D', mounted in a journal box frame 35, supported vertically and laterally by nut and screw mechanism, and worm mechanism for driving  
55 either or both of said laterally or vertically supporting screws by the power of the machine at the will of the operator, substantially as specified.

6. In a curving machine, the combination  
60 with driving rolls, of laterally and vertically movable curving rolls provided with collars to bear upon the top and bottom of the article operated upon, and means for driving said driving rolls, substantially as described.  
65

In testimony whereof we have hereunto set our hands.

FREDERIC C. WEIR.  
EDWARD W. HARDEN.

Witnesses:

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