Nov. 18, 1924. 1,515,894

J. H. TAYLOR

MACHINE FOR BENDING PIPES

Filed Sept. 27, 1923 2 Sheets-Sheet 1

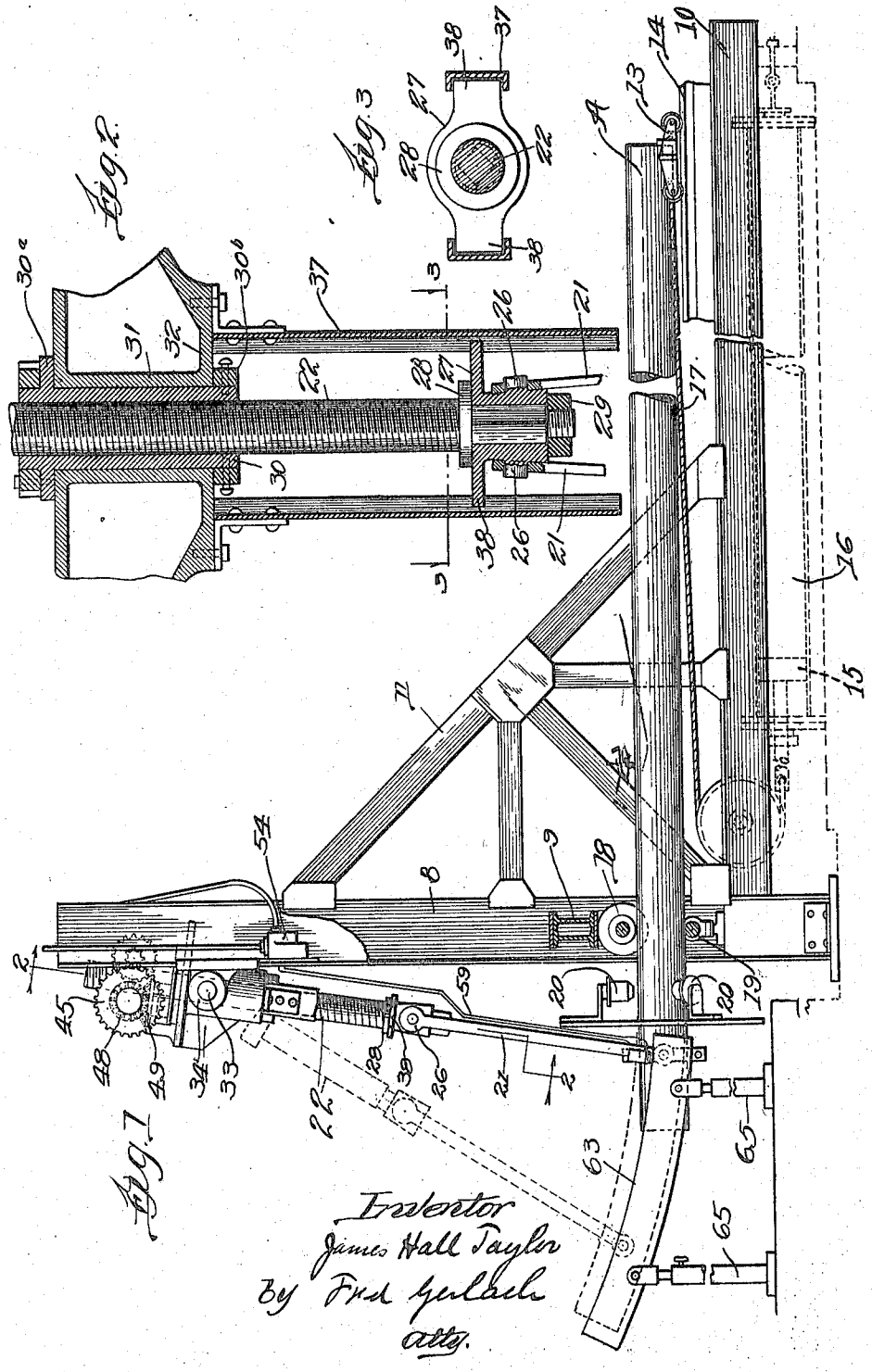

Fig. 1.

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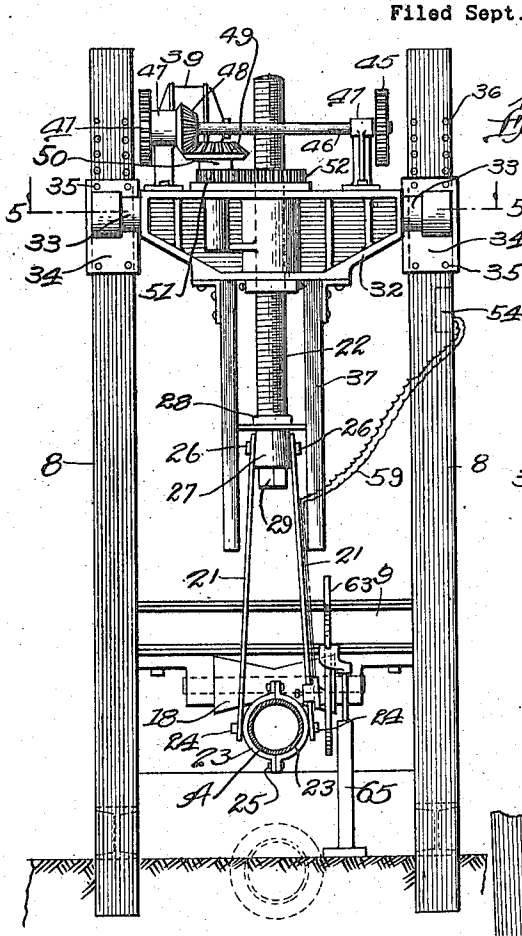

Fig. 4

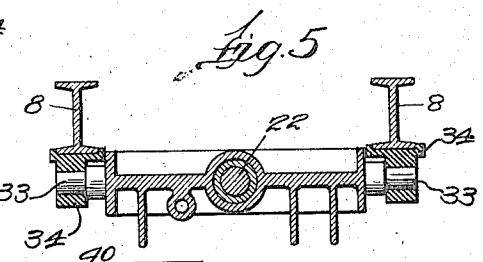

Fig. 5

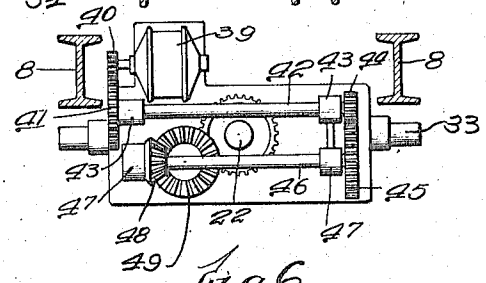

Fig. 6

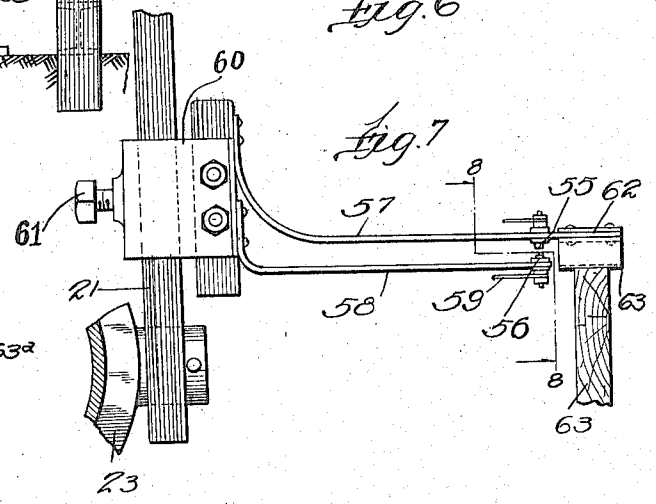

Fig. 7

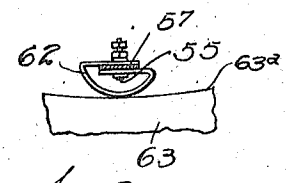

Fig. 8

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UNITED STATES PATENT OFFICE.

JAMES HALL TAYLOR, OF OAK PARK, ILLINOIS.

MACHINE FOR BENDING PIPES.

Application filed September 27, 1923. Serial No. 665,100.

To all whom it may concern:

Be it known that I, JAMES HALL TAYLOR, a citizen of the United States, and a resident of Oak Park, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Machines for Bending Pipes, of which the following is a full, clear, and exact description.

The invention relates to machines for bending pipes and its object is to provide an improvement whereby the pipes may be, when desired, bent on a radius greater than the operative length of the radius-bar or swinging bending member.

In practice, when bending pipes on a long radius, there is in many instances lack of overhead room for a radius-bar of the necessary length and only a limited variation in the adjustment of the length of the bar is possible, so that the range of bending radii in a machine with a radius-bar of a given length is correspondingly limited. The invention is designed to overcome this limitaton and difficulty by providing means to progressively and automatically increase the length of the radius-bar while it is bending the pipe, so that the curvature of the pipe will be the result of the radius of the bar plus its elongation, or upon a radius greater than the length of the bar. This makes it possible to install and use a machine for bending pipes on long radii in places where unusual overhead space is not available, and also greatly increases the possible range of variation in the radii of the bends. This feature also makes possible a compact machine for bends on long radii.

The invention consists in the several novel features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings: Figure 1 is a side elevation of a machine embodying the invention. Fig. 2 is a section on line 2—2 of Fig. 1. Fig. 3 is a section on line 3—3 of Fig. 2. Fig. 4 is a front elevation of the machine embodying the invention. Fig. 5 is a section on line 5—5 of Fig. 4. Fig. 6 is a plan of the driving mechanism for the radius-bar. Figs. 7 and 8 are details on a large scale of the automatic switch for the motor which drives the gearing for varying the length of the radius bar.

The invention is exemplified in a machine comprising a frame-work composed of a pair of standards 8 secured together through cross-beams 9, longitudinal beams 10 and brace-members 11 for securing the standards in upright position. The pipe A to be bent has its rear end supported on a truck 13 which is adapted to run on rails 14 and to push the pipe to the bending mechanism. This truck is usually operated hydraulically by the piston 15 in a cylinder 16, and a flexible connection 17 between the truck and the stem of the piston. A suitably grooved roller 18, which is adjustably supported between standards 8, serves as an abutment or anvil for holding the pipe and resisting the bending strains produced by the mechanism hereinafter described. A suitable lower roll 19 serves to support the pipe when its free end is not supported by the bending mechanism. A suitable heater, such as a gas-burner 20, is used to heat the pipe adjacent the anvil-roller 18. The parts thus far described may be of any suitable construction as well understood in the art.

A depending radius bar or member is provided to bend the pipe as it is slowly fed past the pipe beyond the anvil. In the exemplification of the invention shown, this bar comprises a pair of links 21, and a screw 22. The lower ends of said links are pivoted to studs 24 of a clamp 23 which is formed of semi-circular sections so it can be applied to and removed from the pipe and is provided with bolts 25 for clamping the sections securely on the pipe. The upper ends of these links are connected to studs 26 on a collar 27 which is fixedly secured to the lower end of screw 22 between a shoulder 28 and a nut 29. Screw 22 is threaded to a rotatable sleeve-nut 30 which is journalled in a vertical bearing 31 which is formed in a carriage 32. Sleeve 30 is held against longitudinal movement in the carriage by a flange 30^a adjacent its upper end and a collar 30^b may, if desired, be secured to its lower end. The carriage 32 is provided with pintles 33 at its end which are held in bearing-blocks 34 which are vertically adjustable on and secured to standards 8 by bolts 35 and holes 36. Channel-bars 37 depend from carriage 32 and lugs 38 on collar 27 extend into said bars to hold the collar and screw 22 against rotation while permitting longitudinal adjustment of the

screw. The rotation of sleeve 30 in one direction forces the screw 22 downwardly to elongate the radius-bar and its reverse rotation will raise the screw to shorten the bar.

Carriage 32 supports reducing gearing for operating sleeve 30 to longitudinally adjust the screw 22 of the radius-bar and an electric motor 39 for driving the gearing. The latter comprises a pinion 40 on the motor shaft; a gear 41 meshing with said pinion and fixed to a cross-shaft 42 which is mounted in bearings 43 on the carriage, a pinion 44 fixed to shaft 42; a gear 45 meshing with pinion 44 and fixed to a shaft 46 which is journalled in bearings 47 of the carriage; a bevelled pinion 48 fixed to shaft 46 and meshing with a gear 49 which is mounted on a vertical stud-shaft 50 and fixed to drive a gear 51; and a gear 52 which is bolted to flange 30[a] so that sleeve 30 will be rotated thereby. Motor 39 is of the reversible type so that it may be controlled to drive the reducing gearing and sleeve 30 in either direction and so that the screw 22 after it has been shifted to lengthen the radius-bar during a bending operation, may be raised to shorten the bar for the commencement of the next operation. The carriage is pivotally supported to permit the radius-bar and the reducing gearing to swing as a unit during the bending operations.

Mechanism to automatically control the adjustment of the radius-bar so the curvature of the pipe will be upon the desired radius, comprises an electro-magnetically controlled switch 54 of the solenoid type, which is mounted on one of the standards 8 and is connected to control motor 39, and may be of any suitable or usual construction; a switch comprising contact-members 55 and 56 on spring strips 57 and 58 respectively; and flexible conductors 59 between said contacts and the electromagnet of switch 54 and whereby the operation of the magnet to control the motor-switch, will be controlled through the opening and closing of contacts 55 and 56. Strips 57 and 58 are secured to a bracket 60 which is adjustably secured by a screw 61, to one of the links 21 to cause the contacts 55 and 56 to swing with the radius-bar. A shoe 62 is fixed to the end of contact-strip 57 to ride or slide on a template or controller-bar 63, which is adjustably supported at one side of pipe A, and has its upper edge 63[a] on which the shoe rides, curved conformably to the curvature or radius of the bend desired on the pipe. These templates may, if desired, be formed of wood so they can be readily cut with an edge of any desired curvature and so they can be produced at a low cost. Adjustable supporting-posts 65 are provided for the template so it can be set into correct relation with respect to pipes of different diameters. The shoe 62 when it bears on the curved edge 63[a] of the template, will separate contacts 55, 56 and open the circuit through conductors 59 to cause the magnetic switch 54 to keep the motor circuit open so the motor and reducing-gearing will be idle until the shoe leaves the template, and when that occurs, contacts 55, 56 will spring into engagement and close the circuit for switch 54 to cause the latter to close the motor circuit and cause it to run until said contacts are again separated by the elongation of the radius-bar which will force shoe 62 against edge 63[a] of the template.

The operation of the machine will be as follows:—The rear end of pipe A to be bent is placed on truck 13 and its other end in the heater 20 and between rollers 18, 19. The front end of the pipe is fixed in clamp 23 so it will be secured to and be bent by the radius-bar as the latter swings forwardly by its connection with the pipe. The truck is slowly advanced by hydraulic power applied to piston 15 which will cause the radius-bar to swing forwardly about pintles 33, with the carriage 32 and mechanism thereon. When a template with an edge 63[a] of greater radius than that of the swinging bending-bar is secured in proper position at one side of the pipe, the shoe 62 will automatically control the operation of the motor 39 through contacts 55, 56, and switch 54 so that whenever the shoe leaves the template the motor will be operated to elongate the radius-bar until the shoe again engages the template, the motor effecting this elongation through the reducing-gearing between the motor and sleeve-nut 30. This operation will cause the pipe to be bent on a radius or with a curvature corresponding to the template curve which is of a greater radius than the bar. That is, the radius of the curve is the resultant of compounding the pivotal movement and the elongation of the radius-bar. When the pipe has been bent, the motor can be reversed to drive the gearing to retract screw 22 or shorten the radius-bar in readiness for a succeeding operation. If the bend is to be upon a short radius corresponding to the length of the bar, the template may be omitted and the screw adjusting mechanism will be kept idle. To adapt the machine for varying set-lengths of the radius-bar or for different bars, the carriage bearing-blocks 34 can be raised or lowered on the standards 8.

The invention exemplifies a bending machine, which is adapted to automatically vary the operative length of the swinging bending-member or radius-bar so that the arc or curvature of the bend will be on a

greater or less radius than that of the bar; in which power-operated mechanism is provided for varying the length of the radius-bar; in which the curvature of the bend is controlled by templates which can be cheaply produced; which is adapted to form bends on long radii in installations where space for long radius-bars is not available; and which is adapted for a wide range of variations of curvatures.

The invention is not to be understood as restricted to the construction set forth, but may be modified within the scope of the appended claims without departing from the spirit and scope of the invention.

I claim:—

1. In a machine for bending pipe, the combination of a frame, means for moving the pipe, a swinging bending-member, and means for automatically varying the operative length of said member.

2. In a machine for bending pipe, the combination of a frame, means for moving the pipe, an extensible swinging bending-member, and means for automatically extending the operative length of said member while the pipe is being moved.

3. In a machine for bending pipe, the combination of a frame, means for moving the pipe, an extensible swinging bending-member, and power-operated means for automatically varying the operative length of said member.

4. In a machine for bending pipe, the combination of a frame, means for moving the pipe, an extensible swinging bending-member, mechanism for adjusting the operative length of said member mounted to swing with the member, and means to automatically control said mechanism comprising a stationary template.

5. In a machine for bending pipe, the combination of a frame, means for moving the pipe, an extensible swinging bending-member, power-operated mechanism for varying the length of said bending member, and means for automatically controlling the operating of said mechanism.

6. In a machine for bending pipe, the combination of a frame, means for moving the pipe, an extensible swinging bending-member, an electric motor and gearing for varying the length of said bending member, and means for automatically controlling the operating of said gearing.

7. In a machine for bending pipe, the combination of a frame, means for moving the pipe, an extensible swinging bending-member, a motor and gearing for varying the length of and mounted to swing with said bending member, and means for automatically controlling the operating of said mechanism.

8. In a machine for bending pipe, the combination of a frame, means for moving the pipe, an extensible swinging bending-member, an electric motor and gearing for varying the length of said bending member, and means for automatically controlling the operating of said gearing comprising a switch connected to control the motor and a stationary curved controlling member for the switch.

9. In a machine for bending pipe, the combination of a frame, means for moving the pipe, a swinging member comprising a screw and a link, mechanism for adjusting the screw longitudinally to vary the operative length of the member, and means for automatically controlling said mechanism.

10. In a machine for bending pipe, the combination of a frame, means for moving the pipe, a swinging member comprising a screw and a link, mechanism for adjusting the screw longitudinally to vary the operative length of the member, comprising an electric motor, and means for automatically controlling said motor.

11. In a machine for bending pipe, the combination of a frame, means for moving the pipe, a swinging member comprising a screw and a link, mechanism for adjusting the screw longitudinally to vary the operative length of the member and mounted to swing with the screw, and means for automatically controlling said mechanism.

12. In a machine for bending pipe, the combination of a frame, means for moving the pipe, a swinging member comprising a screw and a link, mechanism for adjusting the screw longitudinally to vary the operative length of the member comprising a nut around the screw, a motor, and reducing-gearing between the motor and the nut, and means for automatically controlling said mechanism.

13. In a machine for bending pipe, the combination of a frame, means for moving the pipe, an extensible swinging bending-member, and power operating mechanism for adjusting the operative length of said member.

14. In a machine for bending pipe, the combination of a frame, means for moving the pipe, an extensible swinging bending-member, and power-operating mechanism for adjusting the operative length of said member comprising an electric motor and reducing-gearing driven by the motor.

15. In a machine for bending pipe, the combination of a frame, means for moving the pipe, an extensible swinging bending-member, and power-operated mechanism for adjusting the operative length of said member mounted to swing with the member.

16. In a machine for bending pipe, the combination of a frame, means for moving the pipe, an extensible swinging bending-member comprising a screw, and power-operated mechanism for adjusting the screw.

17. In a machine for bending pipe, the combination of a frame, means for moving the pipe, an extensible swinging bending-member comprising a carriage, a motor mounted on the carriage, and reducing-gearing connected to vary the operative length of the member, mounted on the carriage and driven by said motor.

18. In a machine for bending pipe, the combination of a frame, means for moving the pipe, an extensible swinging bending-member comprising a carriage, a motor mounted on the carriage, reducing-gearing connected to vary the operative length of the member by said motor, and means to control the gearing comprising a switch and a template.

19. In a machine for bending pipe, the combination of a frame, means for moving the pipe, an extensible swinging bending-member comprising a carriage, a motor mounted on the carriage, reducing-gearing connected to vary the operative length of the member by said motor, and means to control the gearing comprising a switch carried by said member and a stationary template.

20. In a machine for bending pipe, the combination of a frame, means for moving the pipe, a radius bar comprising a screw and a link, a clamp on the link for connection to the pipe, a carriage, a sleeve-nut in the carriage and for adjusting the screw, and an electric motor mounted on the carriage and connected to rotate said sleeve.

21. In a machine for bending pipe, the combination of a frame, means for moving the pipe, a radius bar comprising a screw and a link, a clamp on the link for connection to the pipe, a carriage pivoted to the frame and swinging with the bar, a sleeve-nut rotatable in the carriage and for adjusting the screw, and an electric motor mounted on the carriage and connected to rotate said sleeve.

22. In a machine for bending pipe, the combination of a frame, means for moving the pipe, a swinging bending-member, a radius bar comprising a screw and a link, a clamp on the link for connection to the pipe, a carriage, a sleeve-nut in the carriage and for adjusting the screw, an electric motor mounted on the carriage and connected to rotate said sleeve, and means for automatically controlling the operation of the sleeve-nut.

23. In a machine for bending pipe, the combination of a frame, means for moving the pipe, a swinging bending-member, a radius bar comprising a screw and a link, a clamp on the link for connection to the pipe, a carriage pivoted to the frame and swinging with the bar, a sleeve-nut rotatable in the carriage and for adjusting the screw, an electric motor mounted on the carriage and connected to rotate said sleeve, and means for automatically controlling the operation of the nut.

Signed at Chicago, Illinois, this 14th day of Sept., 1923.

JAMES HALL TAYLOR.