Aug. 24, 1926. 1,597,125

B. H. URSCHEL

STRAIGHTENING AND QUENCHING MACHINE

Filed June 15, 1925 4 Sheets-Sheet 1

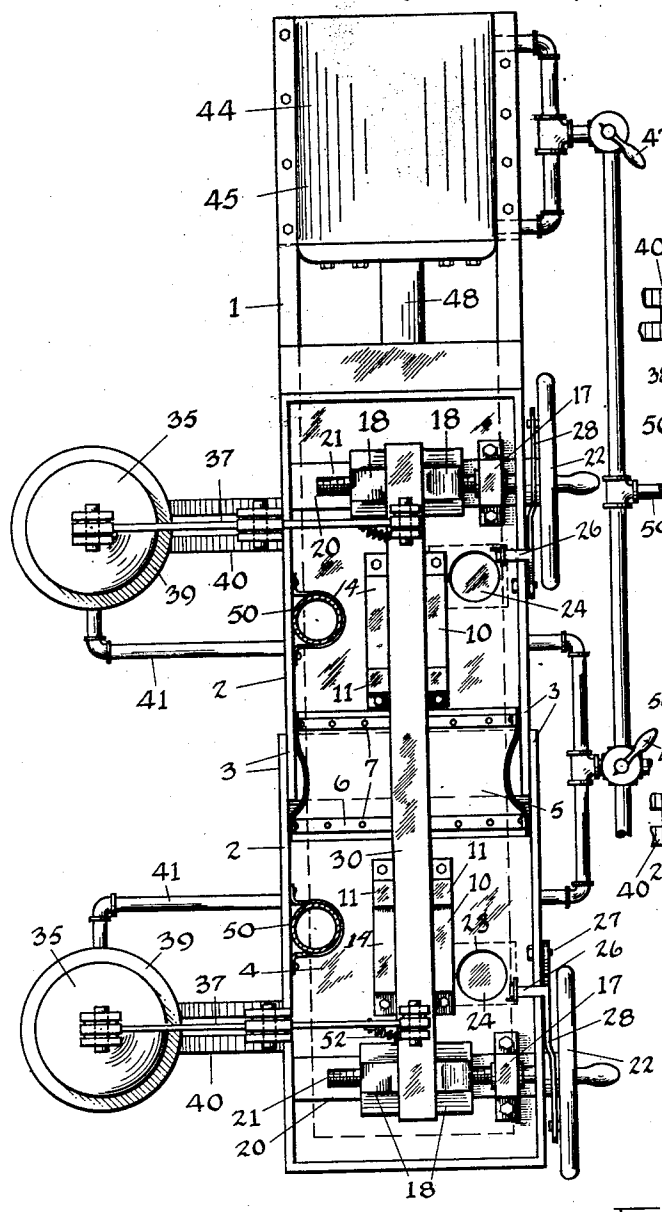


Fig 1

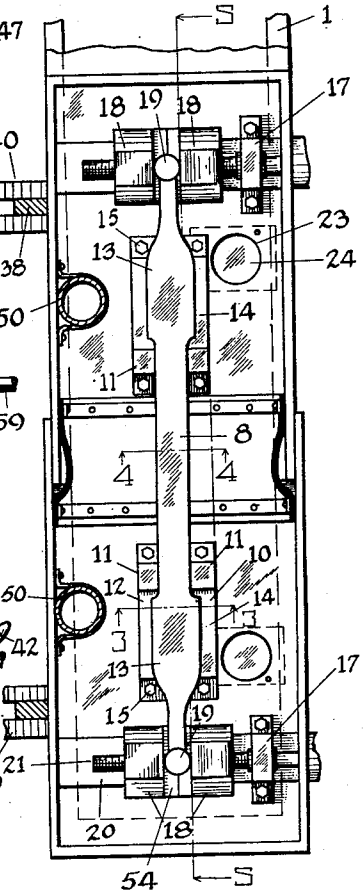


Fig 2

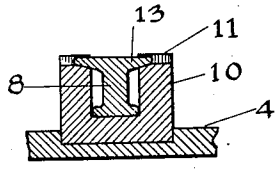


Fig 3



Fig 4

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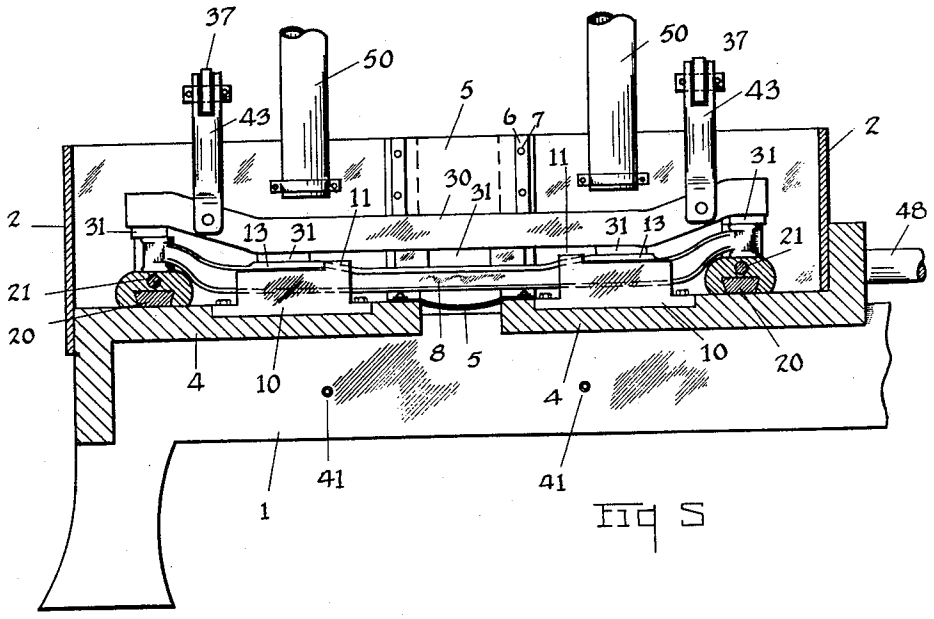


Fig 5

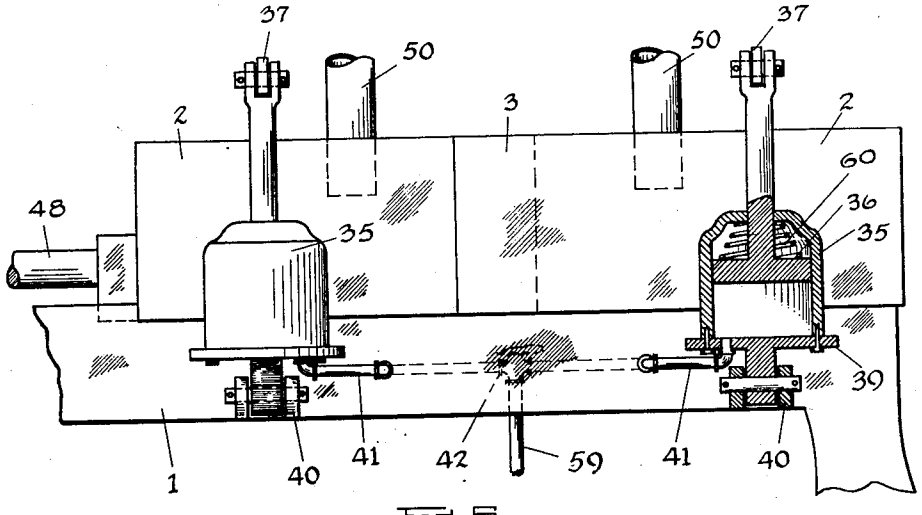


Fig 6

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STRAIGHTENING AND QUENCHING MACHINE

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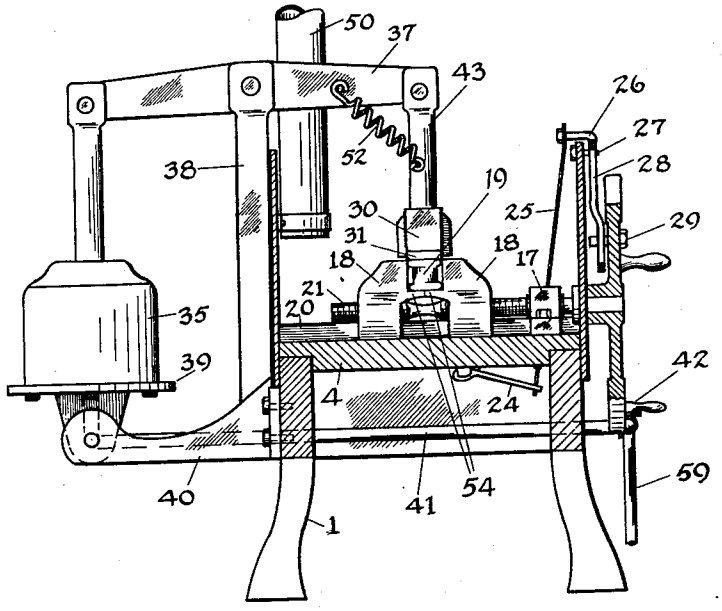


Fig 7

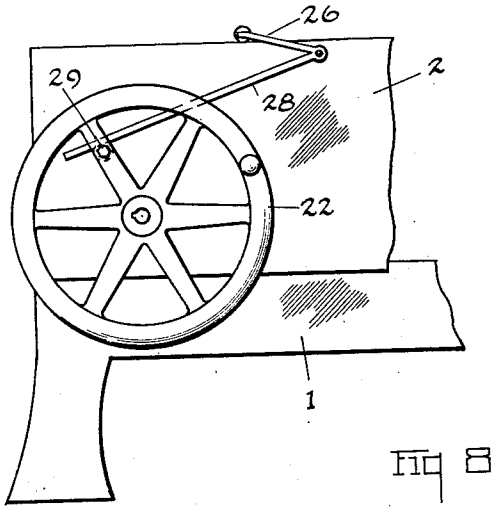


Fig 8

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STRAIGHTENING AND QUENCHING MACHINE

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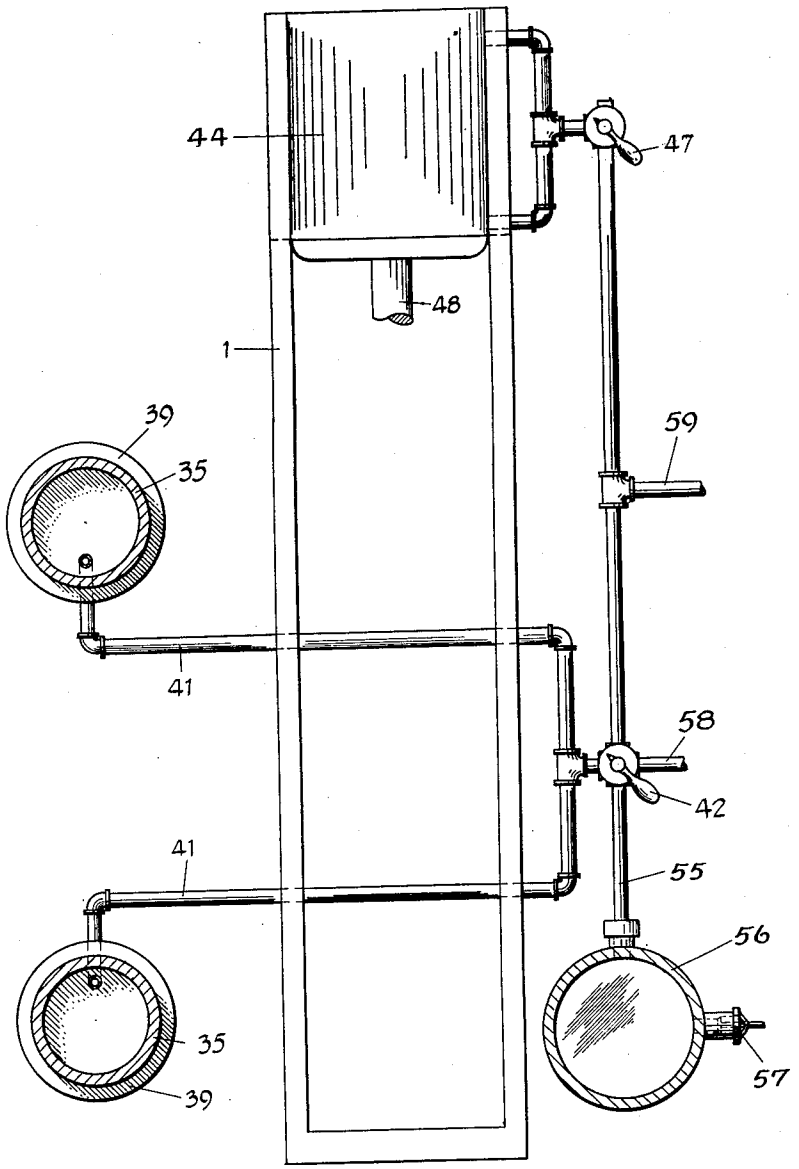


Fig 9

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UNITED STATES PATENT OFFICE.

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STRAIGHTENING AND QUENCHING MACHINE.

Application filed June 15, 1925. Serial No. 37,096.

My invention has for its object to provide a machine for stretching, straightening and quenching heated forgings in order that they may be so formed that they will have the required dimensions and conform to the required shape and their parts be in proper alinement or position with respect to each other. Only inexact formation of the steel can be produced in the forging operations since the metal is controlled manually and upon cooling, except where the cross-configuration is other than cylindrical or rectangular, that is, other than simple in form, there is distortion by reason of unequal rate of cooling of the parts of the metal. Furthermore, the operator cannot always place the steel in exactly the right position and consequently variations of form are produced and inexact dimensions result. My invention provides a means whereby the forgings may be formed with only moderate skill in order that the pieces may conform substantially or roughly to the desired dimensions and when the forging has been completed the piece may be heated and quickly made to conform to the required shape and its parts correctly alined and positioned to each other and then cooled while it is retained in its desired form. By proper heating and cooling of bodies such as steel bodies may be tempered as well as straightened. I have thus provided means for quick separation of the objects treated and the cooling medium.

The invention may be contained in structures that vary in their arrangement of parts and may be used for straightening metal pieces having a great variety of shapes and used for a great variety of purposes. In the preferred form of the invention, the forging is heated preferably to about 50° above the proper quenching temperature of steel and then it is dropped, usually forced, into position in the machine and onto suitable anvils and between forming devices or parts and when the parts are manipulated to stretch or shape the more or less distorted piece to required specifications the piece is flooded and covered with water for the prescribed time and the water is quickly evacuated from the piece. This may be varied according to the tempering that is desired to produce in objects.

In order to illustrate the practical application of the invention and indicate the manner in which the invention may be utilized I have selected a machine containing the invention as an example of machines in which my invention may be embodied and shall describe it hereinafter. The machine selected as an illustration is shown in the accompanying drawings.

Figure 1 of the drawings illustrates a top view of the machine referred to. Fig. 2 illustrates a top view of the machine, parts being shown removed or broken away. The figure shows the front axle of an automobile in position to be made to conform to the exact dimensions and quenched while in the required shape. Fig. 3 is a view of a section taken on the plane of the line 3—3 indicated in Fig. 2. Fig. 4 is a section taken on the plane of the line 4—4 indicated in Fig. 2. Fig. 5 is a view of a section taken on the plane of the line 5—5 indicated in Fig. 2. Fig. 6 is a side view of the machine, a part being shown as broken away. Fig. 7 is a view of a transverse section taken on a vertical plane at one end of the machine. Fig. 8 illustrates a clamping wheel and means for automatically closing a water outlet. Fig. 9 illustrates diagrammatically the system of air pressure utilized in the operations of the machine.

The machine shown in the drawings is provided with a suitable base or bed 1 for supporting a trough having a pair of telescoping parts 2. If desired the sides 3 of the parts 2 only may slide relative to each other while the bottoms 4 may have inner edges that are located in spaced relation relative to each other. The connection between the boxes is sealed by means of a rubber strip 5 having its edge portions clamped to the sides 3 and the bottoms 4 by means of strips 6 and screws or bolts 7 in order to prevent the escape of water in the central portion of the trough which is thus formed. The pieces to be straightened and made to conform to required specifications, are placed in the trough. The parts of the machine being so constructed that the piece may be readily dropped into the machine and then forced with a high pressure, if required, to compel a preliminary conformation and enable a secure gripping for further changes to required exactness.

The parts of the trough are provided with brackets or anvils 10 for receiving the piece. The brackets are shaped according to the form of the pieces that are to be manipulated before being quenched. Where I-beams

that form axles of automobiles are to be shaped to the required form, the brackets 10 are provided with a pair of lugs 11 that form shoulders 12 for receiving and engaging the platforms 13 that are so shaped to better connect the axle to the frame of the automobile. The brackets 10 are also provided with the horizontal surfaces 14 that form anvil surfaces on which the axle is supported. The brackets 10 are secured to the bottoms 4 of the parts 2 of the trough by means of the bolts 15 and thus the brackets are moved relative to each other as the parts of the trough are moved relative to each other.

Other forming or shaping means may be also secured in the trough according to the shape of the piece that is to be straightened and its parts alined. The axle is provided with enlargements for receiving the bearing bushings and parts connected to the stub axle of the automobile wheels and since the axes of these parts must necessarily be in the same vertical plane and also preferably in the vertical plane of the longitudinal axis of the I-beam that forms the axle the said enlarged parts or heads of the axle must be forced into proper alinement with respect to each other and with respect to the body of the axle. The ends of the trough are provided with clamping jaws 18 that are so positioned as to clamp the enlarged portions or heads 19 of the axle and in the clamping operation force the heads 19 in position such that the axes of these parts will be located in a vertical plane and also in the plane of the longitudinal axis of the body portion of the axle. The jaws 18 slide on guides 20 that are secured to or formed integral with the bottoms of the trough and right and left screw members 21 are threaded into the jaws 18 so that the jaws will approach each other at the same rate from points equidistant and on opposite sides of the vertical plane of the longitudinal axis of the axle and thus the axle may be bent largely between the heads 19 and the platforms 13, lateral movement of the body of the axle being prevented by the lugs 11 that engage the sides of the axle. The opposing faces of the jaws 18 being located in vertical planes, they will force the heads into such a position that the vertical axes of these parts will lie in the vertical plane of the body of the axle. The jaws may be provided with suitable abutting stops 54 to limit the clamping of the heads 19 between the jaws 18.

The jaws 18 are manipulated by any suitable means such as by the hand wheels 22 which are connected to the screw members 21 that revolve in and are secured from endwise movement by the brackets 17. The hand wheels may also be used to close the outlets 23 of the trough. The outlets 23 are formed in the bottoms 4 of the parts of the trough and a valve member 24 is hingedly connected to the under side of the bottoms to close the outlets 23. The valve members 24 are also connected to links 25 and the links 25 are connected to bell crank levers 26 that are pivoted on suitable pins 27. The arms 28 of the bell crank levers 26 extend across the inner faces of the hand wheels 22 and the wheels are provided with pins 29 that are adapted to engage the arms 28 when the wheels have completed their rotations so as to clamp the heads 19 of the axle and raise the arms 28 to close the valves 24.

To properly locate the parts of the axle relative to a horizontal plane the machine is provided with a number of clamping members having clamping faces located in horizontal planes. In the form shown the brackets 10 and the members 18 have anvil parts on which the axle rests and a beam 30 is placed on the anvil. The beam 30 may be made to conform to the upper surface of the finished axle. Preferably the beam 30 is provided with protruding parts 31 that engage corresponding portions of the axle whereby the axle will be shaped and made to conform to the desired outline as measured with reference to a horizontal plane. The protruding parts 31 make contact with the axle at desired points, such as on the platforms 13 and the ends of the axle and also, if desired, in the central part of the axle so as to force these parts in proper relation to each other. When the beam 30 has been positioned it is pressed down with considerable pressure against the axle which is, preferably, thereafter clamped by the jaws 18.

The pressure may be produced by any suitable device such as a hydrostatically or pneumatically operated piston. In the construction shown pneumatic pressure devices are used for forcing the beam against the axle. A pair of cylinders 35 are provided with pistons 36 that are connected to walking beams or levers 37 that are pivotally supported on standards 38. In order to allow for the movements of levers 37, the cylinders 35 may be connected to heads 39 that are pivotally supported on brackets 40. The cylinders are connected through suitable pipes 41 to a source of supply of air under the required pressure. The flow of the air to and from the cylinders 35 may be controlled by a suitable four-way valve 42. A pair of uprights 43 are connected to the beam 30 and the levers 37. When, therefore, the beam 30 is placed in position the connection with the source of supply of air under pressure is established through the operation of the valve 42. When all the parts have been properly positioned with reference to the axle, which is at a high temperature the shoulders 11 and the clamping members that engage the ends of the axle may be drawn apart to stretch the axle

and straighten intermediate portions bring all of its parts in proper alinement and causing it to accord with required specifications.

The axle is stretched or drawn by any suitable mechanism such as a hydrostatically or pneumatically operated piston whereby the engaging members 11 may be drawn relative to each other. The engaging members being secured to the parts of the trough, a pneumatic device 44 is connected to one of the parts of the trough while the other part is secured to the bed of the machine. As shown in the drawings a suitable cylinder 45 is connected to a source of air pressure supply by means of the pipe 46 and the flow of the air to and from the cylinder 45 is controlled by means of the valve 47. The piston of the cylinder 45 is connected to one of the parts of the trough by means of the piston rod 48. When the parts of the trough are separated and the hot axle stretched to the required length, water is directed into the trough.

The axle may be quickly flooded by means of water that is directed through the pipes 50 which are made large to quickly fill the trough and cover the axle to produce a substantially uniform and rapid cooling of the axle. When the axle has been allowed to remain in the water for the required time the valves 24 are opened by reverse rotation of the wheels 22, which allow the arms 28 to drop and open the valve 24. The outlets are also large so that the trough may be quickly emptied. This is of particular value where exact tempering is to be performed. If desired oil or other liquid material may be used for the proper rate of cooling to enable the formation of the desired compounds or precipitations in the metal to produce the desired temper in the object treated.

In the operation of the machine the axle is taken from a furnace where it is raised to and maintained at the required temperature and quickly placed in position in the machine. The beam 30 being supported on links it may be readily pushed to one side and allowed to swing into position above the axle. The valve 47 is connected to the source of supply of air under very great pressure through the pipe 59. This raises the pistons 36 and forces the beam 30 against the axle with great pressure to force it in position as well as to bend it and force it against the anvils on the bottom of the trough. The wheels 22 are rotated to clamp and bend, if necessary, to position the heads 19 correctly. The stops 54, however, prevent drawing on the heads in case of some give at the shoulders or engaging members 11. The jaws 18 thus have the desired clearance relative to the heads 19. Rotation of the wheels 22 closes the valves 24. The valve 42 is then turned to reduce the pressure of the beam 30 on the axle. The cylinders 35 are connected through the pipes 41 and 55 to the tank 56. The tank 56 has a safety valve 57 which retains the air at sufficient pressure to cause the beam 30 to hold the axle in position and yet permits all parts of the axle between the members 11 to draw proportionately. The valve 47 is then opened which connects the cylinder 44 to the pipe 59 and the parts of the axle are drawn to the required longitudinal dimensions. The trough is then flooded through the pipes 50. At the expiration of the required time, the wheels 22 are rotated in the reverse direction which opens the valve 24, the cylinders 35 are exhausted through the operation of the valve 42 which connects them to the pipes 58 and at the same time the part 2 of the trough to which the piston rod 48 is connected is returned by the reverse operation of the valve 47. The springs 60 aid the return of the piston 36 and raising of the beam 30. Immediately upon releasement of the beam by opening of the valve 42, the beam 30 is swung to one side by the springs 52 which are connected to uprights 53 that are secured to the beam 30. The axle may be quickly removed and another placed in position and the operations repeated.

I claim:

1. In a straightening machine for metal bodies, a trough for receiving the bodies and for containing a liquid, clamping members having opposing surfaces for forcing parts of each body in a definite relation to each other, means for flooding the body with the liquid and means for evacuating the liquid from the trough to remove the liquid from the body.

2. In a straightening machine for metal bodies, a trough for receiving the bodies and for containing a liquid, clamping members having opposing surfaces for forcing parts of each body in a definite relation to each other, a mechanism for forcibly separating one set of clamping members from another set of the clamping members in a longitudinal direction with respect to the body, and means for flooding the body with the liquid and means for evacuating the liquid from the trough to remove the liquid from the body.

3. In a straightening machine for metal bodies a trough for receiving the bodies and for containing liquid, clamping members having opposing surfaces located in definite relation to each other for forcing parts of each body in the same definite relation to each other, means for flooding the body with the liquid and means for evacuating the liquid from the trough to remove the liquid from the body.

4. In a straightening machine for metal bodies a trough for receiving the bodies and for containing liquid, clamping members

having opposing parallel surfaces located parallel to definite planes of reference and for forcing parts of each body in the same definite relation to each other, means for flooding the body with the liquid, and means for evacuating the liquid from the trough to remove the liquid from the body.

5. In a straightening machine for metal bodies, a trough for receiving the bodies and for containing liquid, clamping members having opposing parallel surfaces located parallel to definite planes of reference and for forcing parts of each body in the same definite relation to each other, a mechanism for forcibly separating one set of the clamping members from another set of the clamping members in a longitudinal direction with respect to the body, and means for flooding the body with the liquid and means for evacuating the liquid from the trough to remove the liquid from the body.

6. In a straightening machine for metal bodies, a trough for receiving the bodies and for containing liquid, clamping members having opposing surfaces, certain of the surfaces being located substantially parallel to vertical planes and other of the surfaces being located substantially parallel to horizontal planes for forcing parts of each body in the same definite relation to each other, means for flooding the body with the liquid and means for evacuating the liquid from the trough to remove the liquid from the body.

7. In a straightening machine for metal bodies and for containing liquid, a plurality of sets of clamping members having opposing surfaces for forcing parts of each body in definite relation to each other, a mechanism for forcibly separating one set of clamping members from another set of clamping members and means for flooding the body with the liquid.

8. In a straightening machine for metal bodies and for containing liquid, a plurality of sets of clamping members having opposing surfaces for forcing parts of each body in definite relation to each other, a mechanism for forcibly separating one set of clamping members from another set of clamping members in a longitudinal direction with respect to the body and means for flooding the body with the liquid.

9. In a straightening machine for metal bodies, a trough for receiving the bodies and for containing liquid, clamping members having opposing surfaces, certain of the surfaces being located substantially parallel to vertical planes and other of the surfaces being located substantially parallel to horizontal planes for forcing parts of each body in the same definite relation to each other, a mechanism for forcibly separating one set of the clamping members from another set of the clamping members, and means for flooding the body with the liquid and means for evacuating the liquid from the trough.

10. In a straightening machine for metal bodies, a trough for receiving the bodies and for containing a liquid and having parts movable relative to each other, a clamping member secured to each of the parts for clamping each body at two points and mechanism for forcibly moving the parts of the trough one relative to the other to stretch the body, means for flooding the body with the liquid and means for evacuating the liquid from the trough.

11. In a straightening machine for metal bodies, a trough for receiving the bodies and for containing a liquid and having parts movable relative to each other, a set of clamping members for alining parts of each body with reference to one plane and secured to the parts of the trough, a second set of clamping members for alining other parts of the body with reference to another plane, and mechanism for forcibly moving the parts of the trough one relative to the other to stretch the body and force other parts of the body in alinement with reference to the said planes, means for flooding the body with the liquid and means for evacuating the liquid from the trough.

12. In a straightening machine for metal bodies, a trough for receiving the bodies and for containing a liquid and having parts movable relative to each other, clamping members for forcing parts of each body into predetermined alinement and means for securing parts of each body to the parts of the trough and mechanism for forcibly moving the parts of the trough one relative to the other to stretch the body while its parts are being held in predetermined alinement.

13. In a straightening machine for metal bodies, a trough for receiving the bodies and for containing a liquid and having parts movable relative to each other, clamping members for forcing parts of each body into predetermined alinement and means for securing parts of each body to the parts of the trough mechanism for forcibly moving the parts of the trough one relative to the other to stretch the body while its parts are being held in predetermined alinement, means for flooding the body with the liquid and means for evacuating the liquid from the trough.

14. In a straightening machine for metal bodies, a two part bed for receiving the bodies, the parts of the bed being movable relative to each other clamping parts for forcing parts of the body into predetermined alinement and mechanism for forcibly moving the parts of the bed one relative to the other to stretch the body while the clamping members maintain the parts of the body in predetermined alinement.

15. In a straightening machine for metal bodies, a bed having parts movable relative

to each other, clamping members for shaping each body, means for forcing the body into position with relatively high pressure, means for connecting the body at two points to the parts of the bed, means for reducing the pressure to maintain the body in its alined position and mechanism for forcibly moving the parts of the bed one relative to the other to stretch the body while its parts are being maintained in the desired alinement.

16. In a straightening machine for heated metal bodies, a bed having parts movable relative to each other, clamping members for shaping each body, means for forcing the body into position with relatively high pressure, means for connecting the body at two points to the parts of the bed, means for reducing the pressure to maintain the body in its alined position and mechanism for forcibly moving the parts of the bed one relative to the other to stretch the body while its parts are being maintained in the desired alinement, means for cooling the body.

In testimony whereof I have hereunto signed my name to this specification.

BERTIS H. URSCHEL.