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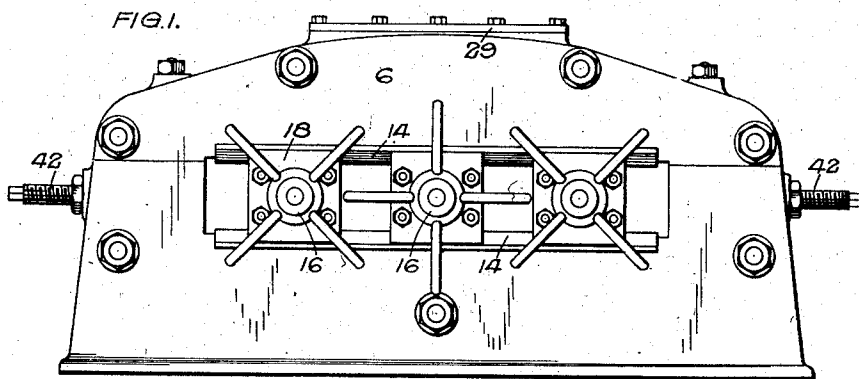
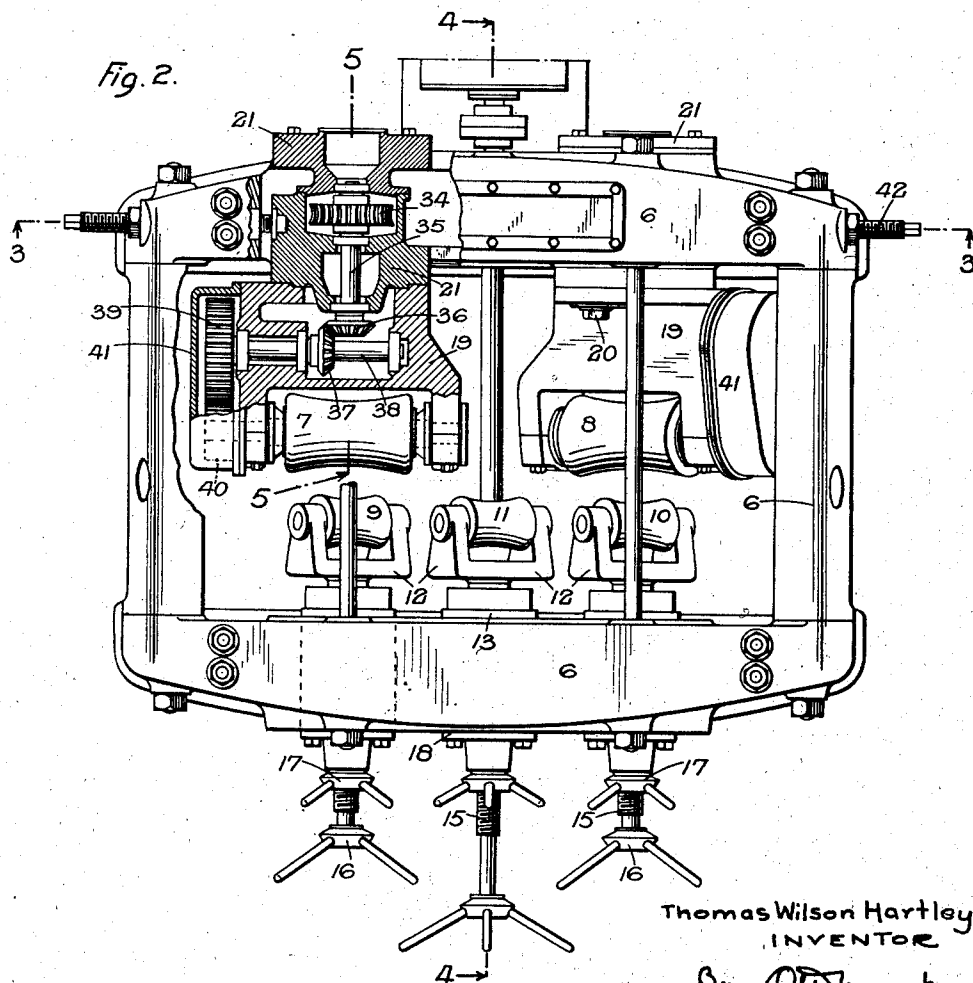
T. W. HARTLEY

2,016,038

MACHINE FOR STRAIGHTENING RODS OR PIPES

Filed April 4, 1935

3 Sheets-Sheet 1



Thomas Wilson Hartley
INVENTOR

By Arthur
his ATT'Y.

Oct. 1, 1935.

T. W. HARTLEY

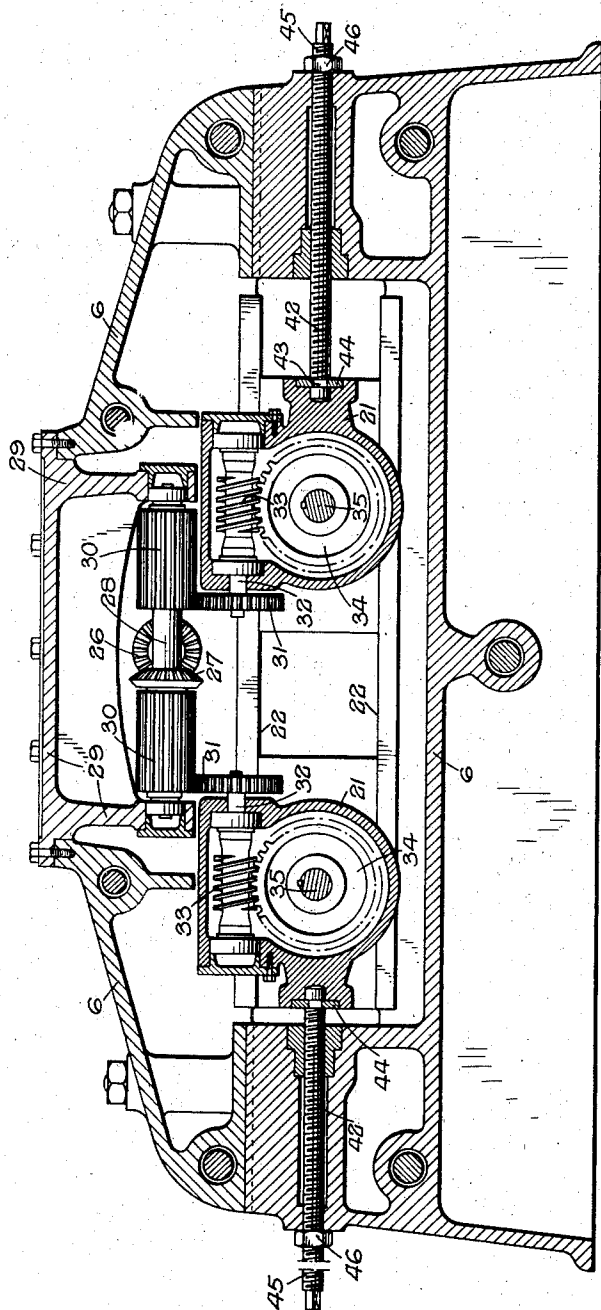
2,016,038

MACHINE FOR STRAIGHTENING RODS OR PIPES

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3 Sheets-Sheet 2

FIG. 3.



Thomas Wilson Hartley
INVENTOR

By *O. O. Hartley*
his ATT'Y.

Oct. 1, 1935.

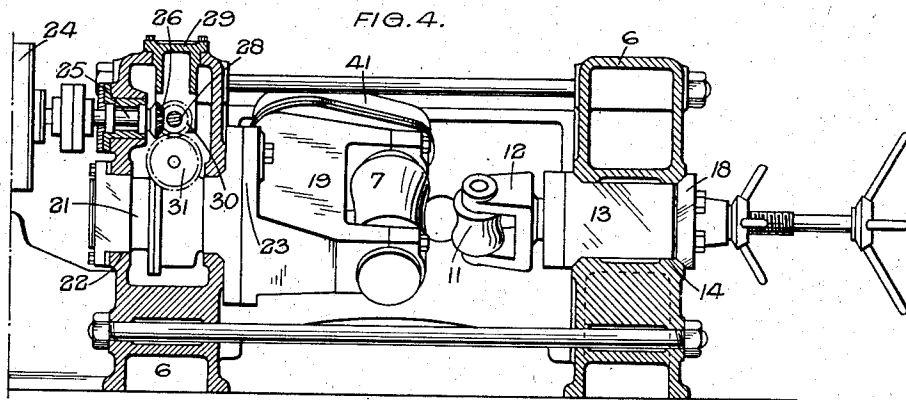
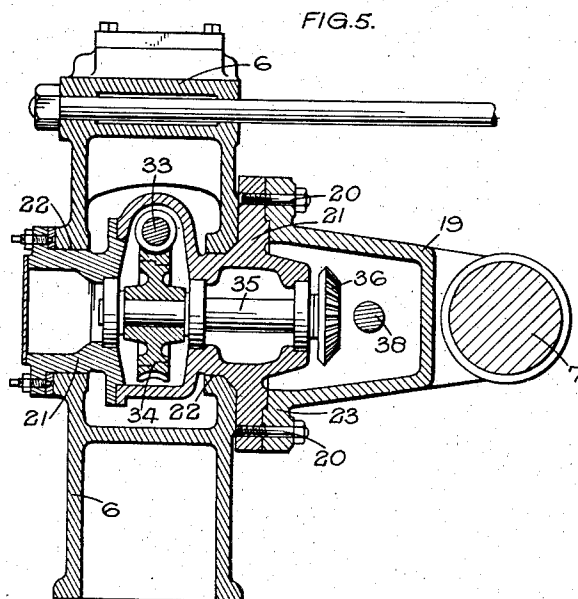
T. W. HARTLEY

2,016,038

MACHINE FOR STRAIGHTENING RODS OR PIPES

Filed April 4, 1935

3 Sheets-Sheet 3



Thomas Wilson Hartley
INVENTOR

By *Atty.*
his ATT'Y.

UNITED STATES PATENT OFFICE

2,016,038

MACHINE FOR STRAIGHTENING RODS
OR PIPESThomas Wilson Hartley, Scisdon, near
Wolverhampton, EnglandApplication April 4, 1935, Serial No. 14,610
In Great Britain January 5, 1935

14 Claims. (Cl. 153—60)

This invention relates to machines for straightening rods or tubes and of the kind including a frame in which are arranged a plurality of passes of rolls (usually two passes), each comprising a primary roll with two separated bearing surfaces for engaging the rod or tube, and a secondary roll having a bearing surface located intermediate the two separated bearing surfaces of the primary roll and the two rolls of each pass being arranged on crossed or skew axes.

When two passes are employed, these are disposed at a suitable distance apart, and a further roll, hereinafter referred to as the pressure roll, is mounted between the two secondary rolls and is located opposite the space between the two primary rolls, the secondary rolls and the pressure roll being adjustably mounted for movement (1) longitudinally of the machine, i. e. parallel to the plane containing the primary rolls, (2) transversely of the machine, i. e. to and from the primary rolls, and (3) angularly to vary the angle of skew between the axes of such rolls and the direction of feed.

The invention is particularly concerned with improvements in or modifications of the invention forming the subject of my Patent No. 1,832,631, which covers, in a machine of the kind referred to, means for adjusting the primary rolls angularly, instead of, or in addition to, the means for adjusting angularly the secondary rolls to enable the primary rolls to be set to have maximum contact with a tube or rod being straightened, whereby tubes or rods of diameters widely different from the diameter of tube or rod for which the machine was primarily designed could be straightened without imparting to the tube or rod a wavy or sinuous formation such as had hitherto been the case due to the fact that such tubes or rods of different diameters had hitherto been inefficiently supported by the primary rolls.

When straightening bars or tubes it is necessary to stress the material beyond its elastic limit so that a permanent set is obtained, since stresses below the elastic limit cause temporary straightening but have no permanent straightening effect, as the tube or bar returns to its original shape when it leaves the machine.

With tubes or rods of different diameters however, the degree to which stress can effectively be applied, varies with the distance separating the primary rolls, and with tubes or rods of small diameter this distance is required to be small in order that the stress applied to the tube exceeds the elastic limit, and if the distance between the

primary rolls is too great a poor or negligible straightening effect results.

Conversely with tubes or rods of larger diameter it is necessary to have the distance separating the primary rolls large in order to obtain the desired straightening effect.

Further, in order to straighten bars or tubes of hard material, or having short bends or kinks, it is necessary for the distance between the primary rolls to be smaller than would otherwise be the case.

Hitherto it has been usual to construct these machines with the primary rolls at a definite distance apart, mainly on account of the difficulty of maintaining the drive thereto, and it has consequently been necessary to construct a range of sizes of such machines, since it was impossible to straighten tubes or rods of small diameter on machines designed for tubes or rods of large diameter.

The primary object of the invention is to provide a machine of the kind referred to which can be used to straighten a greater range of diameters of tubes or rods than has hitherto been possible, so that tubes or rods of small and large diameters can be treated effectively.

A further object is to provide a machine with which an improved straightening effect can be obtained in that the machine can be more effectively adjusted to suit tubes or rods of different diameters.

Referring to the drawings:—

Figure 1 is a front elevation of one form of machine constructed in accordance with this invention.

Figure 2 is a plan view of same partly in section.

Figure 3 is a section on line 3—3 of Figure 2.

Figure 4 is a section on line 4—4 of Figure 2.

Figure 5 is a section on line 5—5 of Figure 2.

In the machine illustrated in the accompanying drawings two passes of rolls are provided in the machine, and 6 is the frame of the machine, 7 and 8 are the primary rolls, 9 and 10 the corresponding secondary rolls, and 11 is the pressure roll.

The secondary rolls and the pressure roll are each carried in a yoke 12 to which is attached a shank which is rotatably mounted in a bearing block 13 slidably mounted in a pair of parallel guides 14 which extend longitudinally of one of the side members of the frame and parallel to the direction of feed of the material through the machine.

The secondary rolls and the pressure roll are

all capable of similar adjustments, and like references will be used to indicate the corresponding parts for each of these rolls.

Each roll is adjustable to and from the vertical plane containing the primary rolls, and for this purpose an adjusting screw 15 is operated by means of a handle 16, this screw engaging with the shank of the yoke 12.

In addition, each roll is angularly adjustable to vary the angle of skew between the axis of the roll and the direction of feed of material through the machine, and this adjustment is obtained by means of a further handle 17 also operating upon the shank of the yoke 12.

In addition to the above, each of these three rolls is adjustable longitudinally of the machine, i. e. parallel to the plane containing the primary rolls, and the bearing block 13 in which is mounted the shank of the yoke 12 is adjustable along the guides 14 and can be clamped in an adjusted position by means of a clamping plate 18 and bolts screwing into the block 13.

Each primary roll is mounted in a yoke 19 which is attached by means of bolts 20 to a bearing block 21 mounted in a pair of parallel guides 22 in the opposite side member of the frame 6.

The yoke 19 is provided with a flange 23 for attachment to a corresponding flange on the block 21, and the bolts 20 pass through arcuate slots in the flange 23 and engage in screw threaded holes in the flange on the block 21.

Thus when the bolts 20 are loosened, the yoke 19 can be rotated upon the flange of the block 21 within the limits of the slots in the flange 23, and by this means the primary rolls can be adjusted angularly to vary the angle of skew between the axis of these rolls and the direction of feed of the material.

If desired the angular adjustment of these primary rolls may be controlled by means of worms mounted upon a manually operable shaft in bearings on the machine frame and engaging with teeth at the peripheral edge of each of the flanges 23 as described in Patent No. 1,832,631 above referred to.

The drive means for the primary rolls includes an electric or other motor 24, to the spindle of which is coupled an extension spindle 25 mounted in bearings in the machine frame and carrying at its inner end a bevel wheel 26 which gears with a further bevel wheel 27 on a spindle 28 disposed parallel to the length of the guides 22 and mounted in bearings in a cover member 29 bolted over an aperture in the top of the frame of the machine.

To this spindle 28 are attached a pair of long driving wheels or pinions 30, each adapted to gear with a driven wheel 31 secured on the end of a shaft 32 mounted in bearings in an extension at the top of the bearing block 21 carrying one of the yokes 19.

At the centre of this shaft 32 is attached a worm 33 which gears with a worm wheel 34 mounted upon a transverse spindle 35 supported in bearings in the block 21 and extending at right angles to the length of the guides 22 and at right angles to the direction of feed of material through the machine.

At the end adjacent the primary roll 7 each shaft 35 projects through the bearing carried by the block 21, and to this projecting end is secured a bevel wheel 36 gearing with a further bevel 37 on a spindle 38 disposed parallel to the

axis of the roll 7 and carried in bearings mounted in the yoke 19.

This spindle 38 projects from one end of the yoke 19 and carries a gear wheel 39 which gears with a pinion 40 attached to the end of the spindle to which the primary roll 7 is secured and which is mounted in suitable bearings in the side arms of the yoke 19.

The whole of the gearing for the primary rolls, with the exception of the wheels 39 and 40, is enclosed within the hollow side member of the frame or within the block 21 or the yoke 19 carried thereby, and these wheels 39 and 40 are enclosed in a cover plate 41 attached to the end of the yoke 19.

Each primary roll can be moved in a direction parallel to the direction of feed of the material through the machine by sliding the corresponding block 21 along the guides 22, and whilst the range of movement is limited by the length of the driving wheels or pinions 30, each block 21 can be moved along the guides 22 within this range of movement without interrupting or interfering with the drive from the motor 24 to the primary rolls.

The position of each primary roll is controlled by means of a manually adjustable screwed rod 42 which is provided at one end with a neck 43 engaging with a clamping plate 44 secured to the block 21, the rod passing through screwed holes or portions in the frame 6 and being provided at its projecting end with a non-circular portion 45 operable by means of a hand wheel or other manually operable member. By rotating either of the rods the block 21 associated therewith is moved in the guides 22 and the driven wheel 31 moves along the driving wheel 30 whilst maintaining driving engagement therewith, so that the position of the block 21 does not affect the continuity of drive to the primary roll.

The block 21 is retained in position after adjustment by means of a clamping nut 46 on the projecting end of the rod 42.

With the machine described above the secondary rolls and the pressure roll are capable of adjustment in any one of three directions as described in Patent No. 1,832,631 above referred to, namely longitudinally of the machine along the guides 14, transversely of the machine, i. e. to and from the primary rolls, and angularly to vary the angle between the axis of the roll and the feed direction.

In addition, the primary rolls can be adjusted angularly to vary the angle of skew relative to the direction of feed by means of the clamping bolts 20 engaging in the arcuate slots in the flanges 23 of the yokes for the primary rolls, and this angular adjustment may be controlled by a manually operable control spindle as described in the parent Patent No. 1,832,631.

According to the present invention the primary rolls can be adjusted in a direction parallel to the direction of feed, i. e. towards and away from one another so that the distances between the primary rolls can be varied to suit the diameter and form of tube or rod being treated by the machine.

According to this invention tubes or rods within a large range of different external diameters can be treated and straightened effectively, since the distance between the primary rolls can be made small for straightening tubes or rods of small diameter, so that these latter are stressed beyond the elastic limit and are effectively straightened.

When it is required to straighten tubes or rods of larger diameter, the distance between the primary rolls in the direction of feed can be increased in order to give the desired straightening effect to these larger diameter tubes or rods, and further, the distance between the rolls can be adjusted to suit any particular requirements of the material from which the tubes or rods are formed.

For example, for straightening tubes or rods of hard material, or having relatively short bends or kinks, the spacing between the primary rolls can be decreased to effect the necessary straightening with the particular requirements under these circumstances.

All these modifications and adjustments can be effected rapidly without dismantling the machine or, in fact, without interfering with the operative mechanism in any way, and the spacing between the primary rolls can be adjusted in an extremely simple manner by means of the adjusting screws, whilst the arrangement of the drive means described above permits this adjustment to be made without interfering with the drive to the primary rolls.

Thus a single machine may be used to perform the work hitherto requiring a number of machines of different capacities, and the range of the machine is increased to a substantial degree since it can be adapted to deal equally well with tubes or rods of small or large diameters, whilst a better straightening effect can be obtained with the machine than has hitherto been possible, since the spacing between the primary rolls can be adjusted in addition to the adjustments of the secondary and pressure rolls, and all the factors can be regulated in a manner most suitable for the particular material or diameter being treated.

What I claim then is:—

1. A machine for straightening rods or tubes including a frame, a pressure roll, and a plurality of passes of straightening rolls mounted in said frame, each pass including a primary roll and a secondary roll, means for adjusting said pressure roll and said secondary rolls longitudinally and also transversely of said frame, and means for adjusting the primary rolls of said passes relative to one another in a direction substantially parallel to the direction of feed of material through the machine.

2. A machine for straightening rods of tubes including a frame, a pressure roll, and a plurality of passes of straightening rolls mounted in said frame, each pass including a primary roll and a secondary roll, means for adjusting each of said rolls angularly about an axis perpendicular to the length thereof, means for adjusting said pressure roll and said secondary rolls longitudinally and also transversely of said frame, and means for adjusting the primary rolls of said passes relative to one another in a direction substantially parallel to the direction of feed of material through the machine.

3. A machine for straightening rods or tubes including a frame, two passes of straightening rolls spaced along the length of said frame, a pressure roll mounted in said frame opposite the space between said two passes, each pass including a primary roll and a secondary roll, a yoke for each of said rolls, means for adjusting each of said rolls angularly about an axis perpendicular to the length thereof, means for adjusting said pressure roll and said secondary rolls longitudinally and also transversely of said

frame, and means for adjusting the primary rolls of said passes relative to one another in a direction substantially parallel to the direction of feed of material through the machine.

4. A machine for straightening rods or tubes including a frame having spaced longitudinal side walls, longitudinal guides in each of said walls, two passes of straightening rolls spaced along the length of said frame, a pressure roll mounted in said frame opposite the space between said two passes, each pass including a primary roll and a secondary roll, a yoke for each of said rolls, a bearing slide for each of said yokes, means for adjusting each of said rolls angularly about an axis perpendicular to the length thereof, the slides for the pressure and secondary rolls being mounted for movement along the guides in one side of said frame, the slides for the primary rolls engaging in the guides in the other side of said frame, and means for adjusting the primary rolls of said passes relative to one another along said guides.

5. A machine for straightening rods or tubes including a frame having spaced longitudinal side walls, longitudinal guides in each of said walls, two passes of straightening rolls spaced along the length of said frame, a pressure roll mounted in said frame opposite the space between said two passes, each pass including a primary roll and a secondary roll, a yoke for each of said rolls, a bearing slide for each of said yokes, means for adjusting each of said rolls angularly about an axis perpendicular to the length thereof, means for adjusting said pressure roll and said secondary rolls transversely of said frame, the slides for the pressure and secondary rolls being mounted for movement along the guides in one side of said frame, the slides for the primary rolls engaging in the guides in the other side of said frame and screw and nut means for adjusting the primary rolls of said passes relative to one another along said guides.

6. A machine for straightening rods or tubes including a frame, a plurality of passes of straightening rolls mounted in said frame, each pass including a primary roll and a secondary roll, means for adjusting the primary rolls of said passes relative to one another in a direction substantially parallel to the direction of feed of material through the machine, and drive means for said primary rolls including a drive motor, a gear wheel secured to the end of each primary roll, gearing connecting said gear wheels to said drive motor, said gearing including for each primary roll a driving pinion geared to said motor, a driven pinion gearing with said driving pinion, said driven pinion being geared to and movable with said primary roll and being slidable along said driving pinion in constant mesh therewith, said driving pinion being of sufficient length to enable the driven pinion to engage therewith at any adjusted position of the primary roll.

7. A machine for straightening rods or tubes including a frame having spaced longitudinal side walls, longitudinal guides in each of said walls, two passes of straightening rolls spaced along the length of said frame, a pressure roll, each pass including a primary roll and a secondary roll, a yoke for each of said rolls, a bearing slide for each of said yokes, the slides for the pressure and secondary rolls being mounted for movement along the guides in one side of said frame, the slides for the primary rolls engaging in the guides in the other side of said frame, means for

adjusting the primary rolls of said passes along said guides, and drive means for said primary rolls including a drive motor, a gear wheel secured to the end of each primary roll, gearing connecting said gear wheels to said drive motor, said gearing including for each primary roll, a driving pinion geared to said motor, a driven pinion gearing with said driving pinion, said driven pinion being geared to and movable with said primary roll, and being slidable along said driving pinion in constant mesh therewith, said driving pinion being of sufficient length to enable the driven pinion to engage therewith at any adjusted position of the primary roll.

8. A machine for straightening rods or tubes including a frame having spaced longitudinal side walls, longitudinal guides in each of said walls, two passes of straightening rolls spaced along the length of said frame, a pressure roll mounted in said frame opposite the space between said two passes, each pass including a primary roll and a secondary roll, a yoke for each of said rolls, a bearing slide for each of said yokes, means for adjusting each of said rolls angularly about an axis perpendicular to the length thereof, means for adjusting said pressure roll and said secondary rolls transversely of said frame, the slides for the pressure and secondary rolls being mounted for movement along the guides in one side of said frame, the slides for the primary rolls engaging in the guides in the other side of said frame, and drive means for said primary rolls including a drive motor, a gear wheel secured to the end of each primary roll, gearing connecting said gear wheels to said drive motor, said gearing including for each primary roll a driving pinion geared to said motor, a driven pinion gearing with said driving pinion, said driven pinion being geared to and movable with said primary roll and being slidable along said driving pinion in constant mesh therewith, said driving pinion being of sufficient length to enable the driven pinion to engage therewith at any adjusted position of the primary roll.

9. A machine for straightening rods or tubes including a frame having spaced longitudinal side walls, longitudinal guides in each of said walls, two passes of straightening rolls spaced along the length of said frame, a pressure roll mounted in said frame opposite the space between said two passes each pass including a primary roll and a secondary roll, a yoke for each of said rolls, a bearing slide for each of said yokes, means for adjusting each of said rolls angularly about an axis perpendicular to the length thereof, means for adjusting said pressure roll and said secondary rolls transversely of said frame, the slides for the pressure and secondary rolls being mounted for movement along the guides in one side of said frame, the slides for the primary rolls engaging in said guides in the other side of said frame, means for adjusting the primary rolls of said passes along said guides and drive means for said primary rolls including a drive motor, a shaft rotatably mounted in said frame parallel to said guides, a pair of driving pinions secured to said shaft, gearing connecting said pinions to said drive motor, a spindle rotatably mounted in the bearing slide for each primary roll, a driven pinion secured to said spindle, said driven pinion gearing with one of said driving pinions, gearing connecting said spindle to said primary roll, said driven pinion being slidable along said driving pinion in constant mesh therewith and said driving pinion

being of sufficient length to enable the driven pinion to engage therewith at any adjusted position of the primary roll.

10. A machine for straightening rods or tubes including a frame having spaced longitudinal side walls, longitudinal guides in each of said walls, two passes of straightening rolls spaced along the length of said frame, a pressure roll mounted in said frame opposite the space between said two passes, each pass including a primary roll and a secondary roll, a yoke for each of said rolls, a bearing slide for each of said yokes, means for adjusting each of said rolls angularly about an axis perpendicular to the length thereof, means for adjusting said pressure roll and said secondary rolls transversely of said frame, the slides for the pressure and secondary rolls being mounted for movement along the guides in one side of said frame, the slides for the primary rolls engaging in said guides in the other side of said frame, means for adjusting the primary rolls of said passes along said guides and drive means for said primary rolls including a drive motor, a shaft rotatably mounted in said frame parallel to said guides, a pair of driving pinions secured to said shaft, gearing connecting said pinions to said drive motor, a spindle rotatably mounted in the bearing slide for each primary roll, a driven pinion secured to said spindle, said driven pinion gearing with one of said driving pinions, a worm gear mounted on said spindle, a transverse spindle rotatably mounted in said bearing slide, a worm wheel on one end of said transverse spindle, said worm wheel gearing with said worm gear, a bevel wheel on the other end of said transverse spindle, a further bevel wheel gearing therewith, gearing connecting said further bevel wheel to said primary roll, said driven pinion being slidable along said driving pinion in constant mesh therewith, and said driving pinion being of sufficient length to enable the driven pinion to engage therewith at any adjusted position of the primary roll.

11. A machine for straightening rods or tubes including a frame having spaced longitudinal side walls, longitudinal guides in each of said walls, two passes of straightening rolls spaced along the length of said frame, a pressure roll mounted in said frame opposite the space between said two passes, each pass including a primary roll and a secondary roll, a yoke for each of said rolls, a shank on said yoke perpendicular to the axis of said roll, a bearing slide for each of said yokes, said shank engaging rotatably in said bearing slide to allow angular adjustment of said roll relative to said slide, means for adjusting each of said rolls angularly about an axis perpendicular to the length thereof, means for adjusting said pressure roll and said secondary rolls transversely of said frame, the slides for the pressure and secondary rolls being mounted for movement along the guides in one side of said frame, the slides for the primary rolls engaging in said guides in the other side of said frame, means for adjusting the primary rolls of said passes along said guides and drive means for said primary rolls including a drive motor, a shaft rotatably mounted in said frame parallel to said guides, a pair of driving pinions secured to said shaft, gearing connecting said pinions to said drive motor, a spindle rotatably mounted in the bearing slide for each primary roll, a driven pinion secured to said spindle, said driven pinion gearing with one of said driving pinions, a worm

gear mounted on said spindle, a transverse spindle rotatably mounted in said bearing slide, a worm wheel on one end of said transverse spindle, said worm wheel gearing with said worm gear, a bevel wheel on the other end of said transverse spindle, a further bevel wheel gearing therewith, gearing connecting said further bevel wheel to said primary roll, said driven pinion being slidable along said driving pinion and said driving pinion being of sufficient length to enable the driven pinion to engage therewith at any adjusted position of the primary roll.

12. A machine for straightening rods or tubes including a frame, a plurality of passes of straightening rolls mounted in said frame, each pass including a primary roll and a secondary roll, a yoke for each of said rolls, a bearing slide for each of said yokes, longitudinal guides in said frame, the slides for the primary rolls engaging in said guides, screw and nut means for adjusting each of said rolls angularly along said guides and drive means for said primary rolls including a drive motor, a gear wheel secured to the end of each primary roll, gearing connecting said gear wheels to said drive motor, said gearing including for each primary roll a driving pinion geared to said motor, a driven pinion gearing with said driving pinion, said driven pinion being geared to and movable with said primary roll, and being slidable along said driving pinion in constant mesh therewith, said driving pinion being of sufficient length to enable the driven pinion to engage therewith at any adjusted position of the primary roll.

13. A machine for straightening rods or tubes including a frame, a plurality of passes of straightening rolls mounted in said frame, each pass including a primary roll and a secondary roll, a yoke for each of said rolls, a shank on said yoke perpendicular to the axis of said roll, a bearing slide for each of said yokes, said shank engaging rotatably in said bearing slide to allow angular adjustment of said roll relative to said slide, longitudinal guides in said frame, the slides

for the primary rolls engaging in said guides, screw and nut means for adjusting each of said rolls angularly along said guides and drive means for said primary rolls including a drive motor, a gear wheel secured to the end of each primary roll, gearing connecting said gear wheels to said drive motor, said gearing including for each primary roll a driving pinion geared to said motor, a driven pinion gearing with said driving pinion, said driven pinion being geared to and movable with said primary roll and being slidable along said driving pinion in constant mesh therewith, said driving pinion being of sufficient length to enable the driven pinion to engage therewith at any adjusted position of the primary roll.

14. A machine for straightening rods or tubes including a frame, two passes of straightening rolls spaced along the length of said frame, each pass including a primary roll and a secondary roll, a yoke for each of said rolls, a shank on said yoke perpendicular to the axis of said roll, a bearing slide for each of said yokes, said shank engaging rotatably in said bearing slide to allow angular adjustment of said roll relative to said slide, longitudinal guides in said frame, the slides for the primary rolls engaging in said guides, screw and nut means for adjusting each of said rolls angularly along said guides and drive means for said primary rolls including a drive motor, a shaft rotatably mounted in said frame parallel to said guides, a pair of driving pinions secured to said shaft, gearing connecting said pinions to said drive motor, a spindle rotatably mounted in the bearing slide for each primary roll, a driven pinion secured to said spindle, said driven pinion gearing with one of said driving pinions, gearing connecting said spindle to said primary roll, said driven pinion being slidable along said driving pinion in constant mesh therewith and said driving pinion being of sufficient length to enable the driven pinion to engage therewith at any adjusted position of the primary roll.

THOMAS WILSON HARTLEY.