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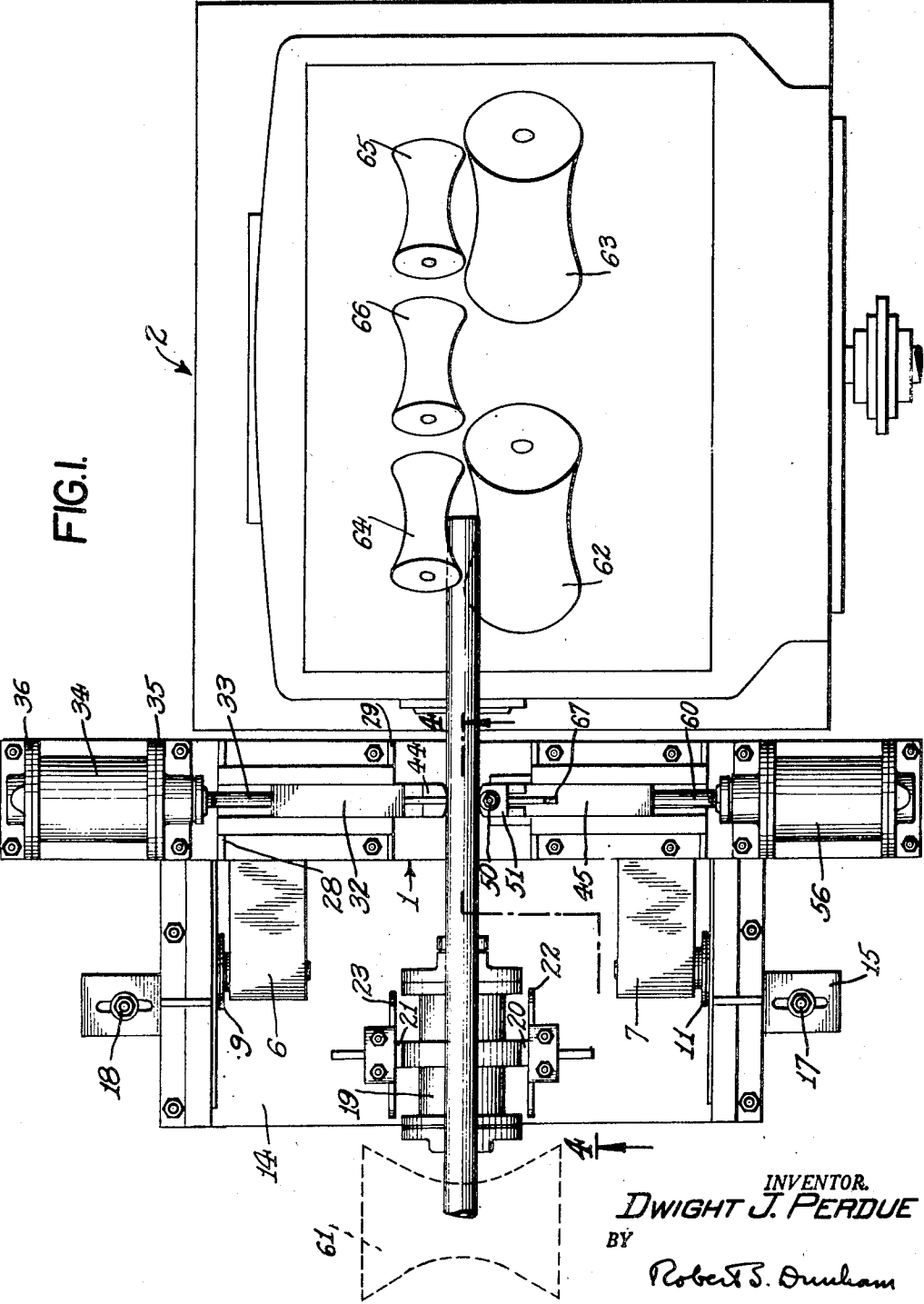
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FEEDING APPARATUS FOR STRAIGHTENING MACHINES

Filed Jan. 24, 1947

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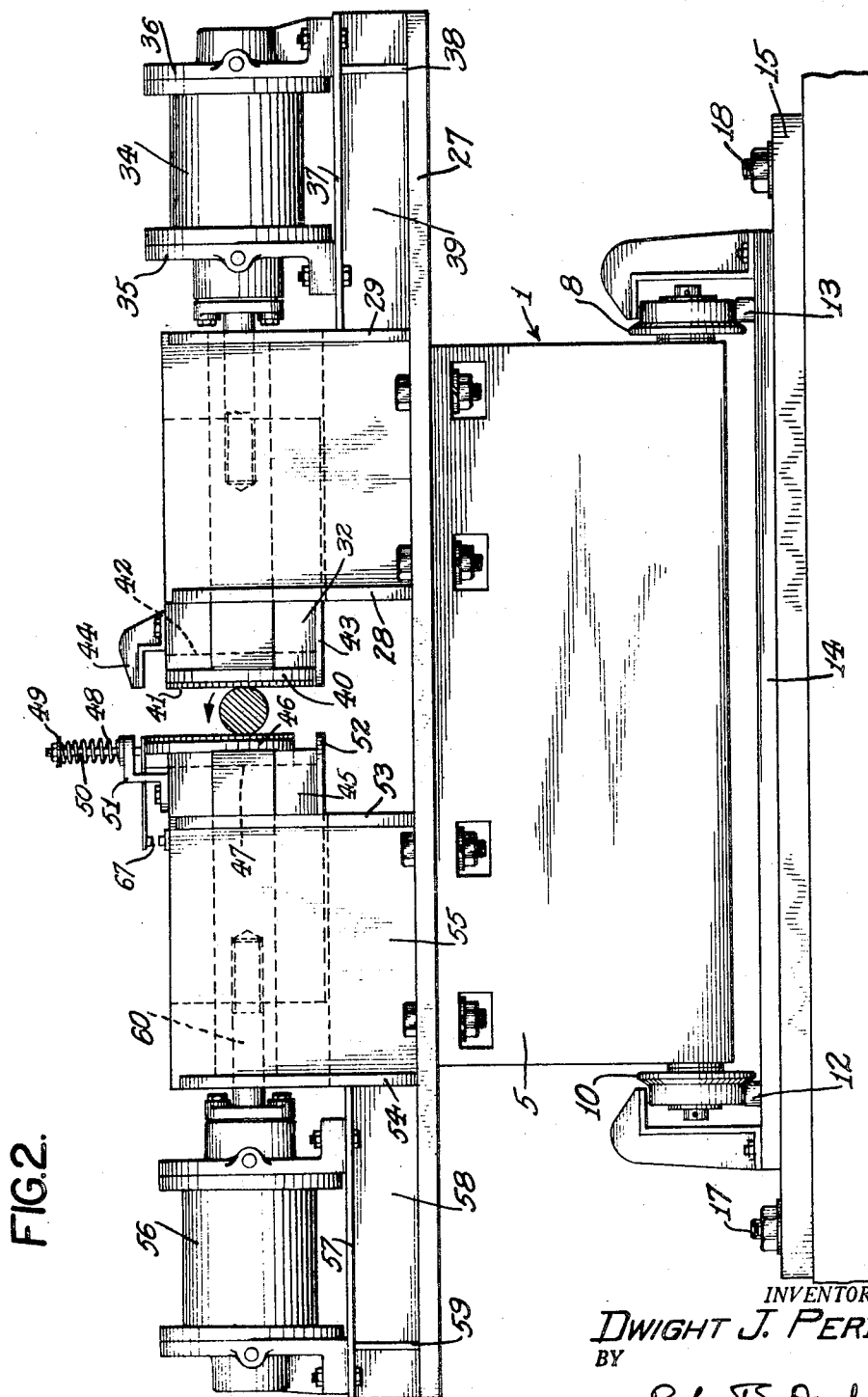
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FEEDING APPARATUS FOR STRAIGHTENING MACHINES

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FEEDING APPARATUS FOR STRAIGHTENING MACHINES

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FIG.3.

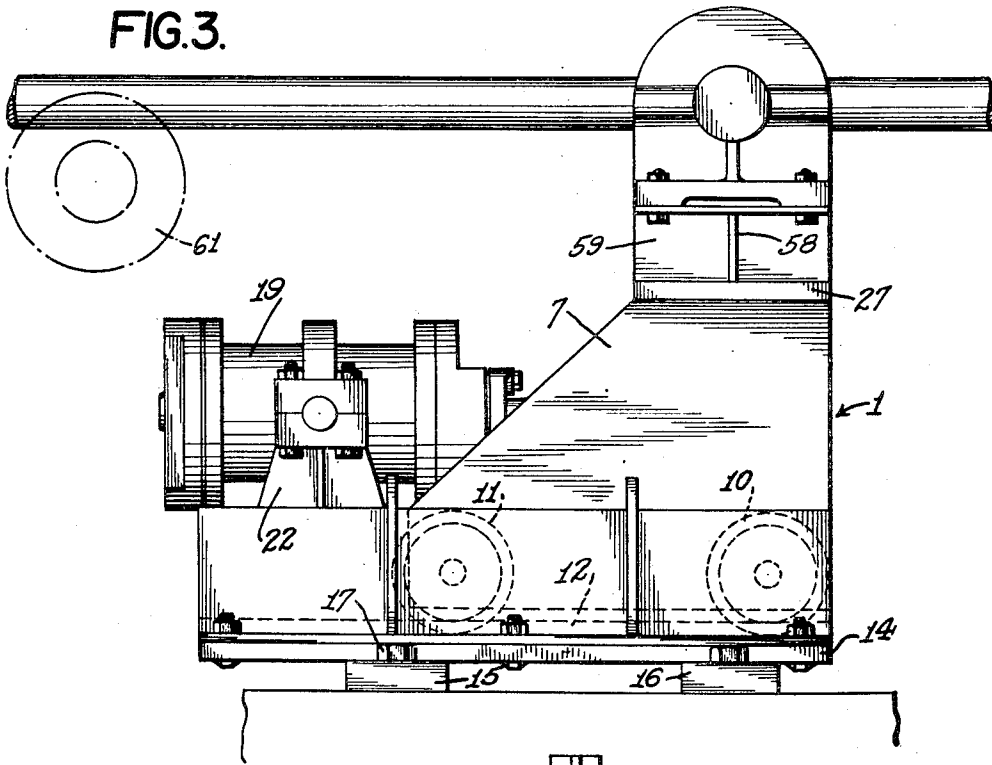
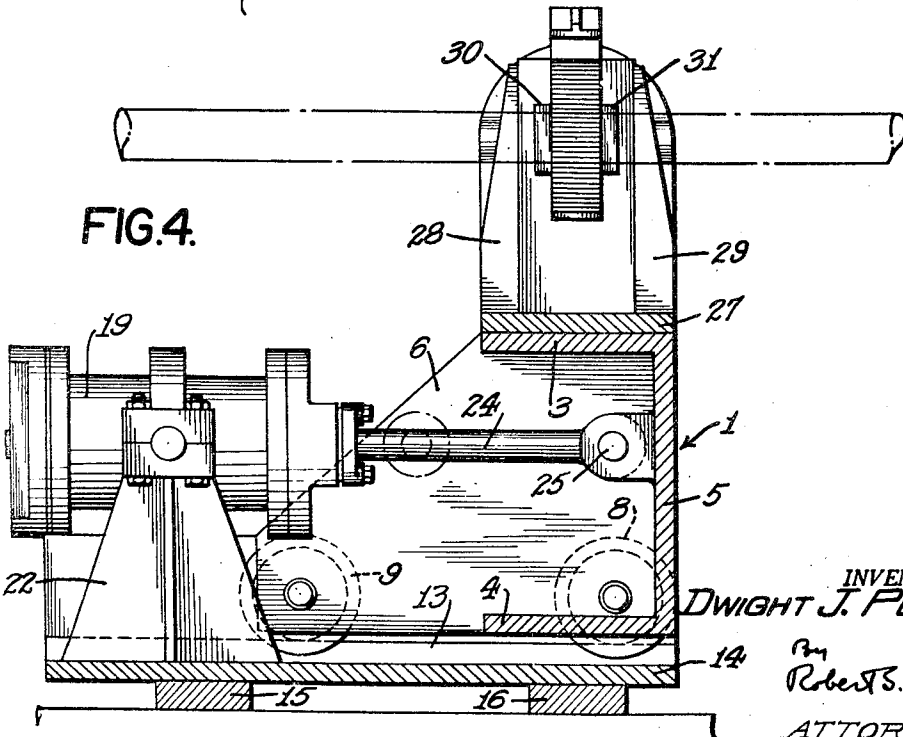


FIG.4.



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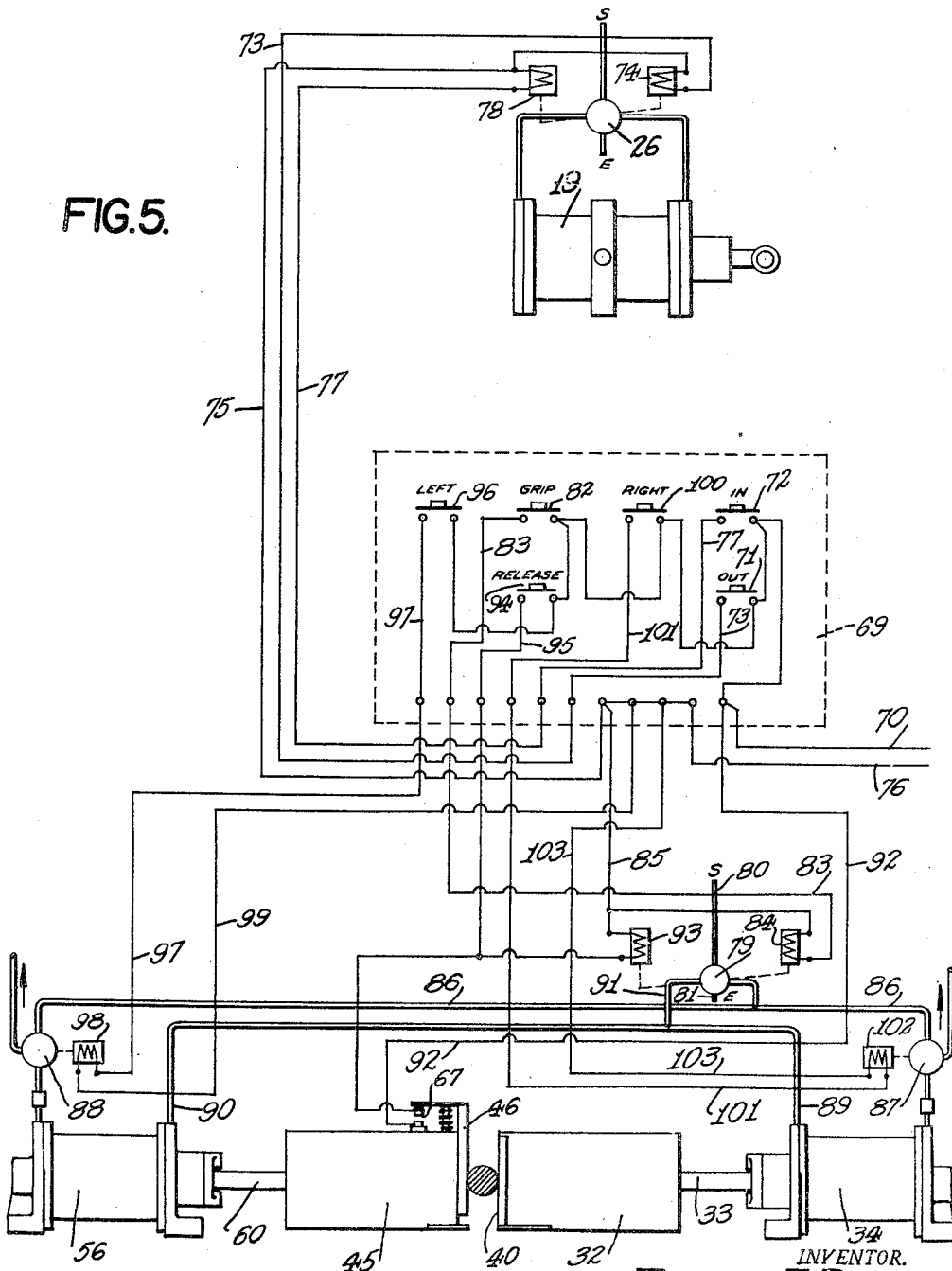
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FEEDING APPARATUS FOR STRAIGHTENING MACHINES

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4 Sheets-Sheet 4

FIG. 5.



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FEEDING APPARATUS FOR STRAIGHTENING MACHINES

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Application January 24, 1947, Serial No. 724,143

14 Claims. (Cl. 153—60)

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This invention relates to the art of manufacturing pipes, tubes, rods, bars or other similar work pieces, and particularly to feeding apparatus for feeding or advancing such work pieces to a straightening machine. In the manufacture of elongated cylindrical work pieces it is customary to straighten all bent or crooked work pieces by passing them through a straightening machine. The work pieces requiring straightening are placed upon a serving or entry table and advanced either under power or by hand to the straightening machine. The straightening machine includes pairs of rolls, some of which are power-driven. Each work piece is seized and advanced through the machine as it is being straightened. Immediately upon seizure the work piece is rotated, with the result that a crooked or bent bar is given a whipping or lashing action. If an operator has advanced the work piece into the throat of the straightening machine, he must remove his hands from the work piece very quickly upon seizure of the work piece by the straightening machine so as to avoid injury to himself.

It is among the objects of the present invention to provide apparatus for feeding elongated cylindrical work pieces to a straightening machine which obviates the necessity of an operator using his hands to accomplish this operation.

Another object of the invention is to provide a feeding apparatus capable of gripping a work piece upon a serving table and advancing it to the throat of the straightening machine under remote control.

Another object of the invention is to provide a feeding apparatus having means automatically initiated by a straightening machine for releasing the grip of the feeding apparatus on the work piece and for retracting the gripping mechanism from engagement with the work piece so as to avoid damage to the feeding apparatus by the whipping or lashing about of a crooked work piece being rotated by the straightening machine.

Another object of the invention is to provide a feeding apparatus having fluid operated means for reciprocating a carriage between a serving table and a straightening machine, and fluid operated grips or jaws for seizing a work piece and for releasing the same when the work piece has been engaged in the throat of a straightening machine, in conjunction with an electrically-operated system for controlling the operations of all of such fluid-operated means.

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A further object is to provide in an electrically-controlled system as aforesaid, means for automatically effecting the release of a work piece which is being fed by the feeding apparatus immediately upon rotation being imparted to the work piece by its seizure in the throat of a straightening machine or other machine having rolls for imparting rotation to the work piece.

Another object is to provide in a system of the character described fluid operated gripping means which may be translated laterally under the control of an operator for bringing the leading end of the work piece into registry with the axis of the throat of a straightening machine.

Other objects of the present invention will hereinafter appear in the accompanying specification and claims and are demonstrated by the drawings which show by way of illustration a preferred embodiment of the principle of the invention and the best mode in which I have contemplated applying that principle.

In the drawings, Fig. 1 is a plan of the feeding apparatus of the present invention with its operative parts in work-gripping position just prior to engagement of the work by the rolls of the straightening machine which is schematically illustrated;

Fig. 2 is an elevation of the forward end of the feeding apparatus;

Fig. 3 is a side elevation of the feeding apparatus showing the carriage in its forward position;

Fig. 4 is a vertical section on line 4—4 of Fig. 1; and

Fig. 5 is a diagrammatic view showing the fluid operating mechanism and controlling circuits.

Referring to the drawings, 1 is a mobile mount or carriage which travels between a feeding or serving table and a straightening machine 2. The carriage includes a box frame having horizontal upper and lower walls 3 and 4, respectively, and a vertical forward wall 5 connecting between vertical side walls 6 and 7. The frame is carried by wheels 8, 9, 10 and 11 which bear upon a pair of rails 12 and 13. The rails are secured to a bed plate 14, which in turn is secured to end rests upon a pair of laterally extending sleepers 15 and 16. These sleepers may be fastened to a concrete foundation or flooring by lag screws, such as 17 and 18.

The carriage is moved over its rails under the action of a fluid pressure cylinder 19 having trunnions 20 and 21 extending from opposite

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sides and supported by brackets 22 and 23. These brackets are rigidly fastened on the bed plate 14. A piston rod 24, extending from the piston within the fluid pressure cylinder, is attached to the carriage frame by means of a pin 25. The operation of the fluid pressure cylinder for moving the carriage forward and backward is controlled by a 4-way valve 26, Fig. 5, which is in turn controlled by an electrical system which will hereinafter be described more fully. The fluid pressure system herein embodied employs air cylinders, but it is to be understood that the cylinders may be operated by liquid, if desired.

The work gripping mechanism is mounted on the box frame of the carriage. For accomplishing such support a beam or plate 27 is bolted to the box frame. As well shown in Figs. 1 and 4, this beam supports vertically extending brackets 28 and 29 which are welded to the beam. Brackets 28 and 29 flank a channelled member having parallel grooves 30 and 31 within which the rails of a sliding block or slide 32 of the work gripping device are guided for movement laterally to the direction of movement of the carriage 1. Sliding block 32 is attached to a piston rod 33 which is actuated by the piston of a fluid operated cylinder 34.

The cylinder 34 is mounted on brackets 35 and 36 which are bolted to a plate 37. This plate is supported upon beam 27 by means of upstanding webs 38 and 39 which are welded to the plate and the beam.

The sliding block 32 has slidably mounted at its inner end a jaw 40 constituting a work gripping member. The jaw has a gripping surface 41, which may be milled or otherwise roughened for assuring frictional engagement with the work. Jaw 40 is mounted in a guiding slot 42 and is normally supported at its lower end by a ledge 43 extending horizontally from the lower surface of sliding block 32. The relationship of the jaw to the sliding block 32 is such that the jaw can be displaced in a direction perpendicular to the direction of movement of the sliding block in a plane parallel to the axis of the work. The jaw moves upwardly within this slot under the action of a rotating work piece when it is seized in the throat of a straightening machine, as will be evident from the following description. A stop 44 is provided to prevent complete ejection of the jaw from within its guiding slot.

Directly opposite from the sliding block 32 and gripping member 40, there is a second slide or sliding block 45 carrying a complementary gripping member in the form of a jaw 46, also having a milled gripping surface for engaging an opposite side of the work. The jaw 46 is mounted for movement in a plane parallel to the plane of movement of jaw 40, and is guided by a groove 47 disposed at the inner end of the sliding block 45. The jaw is normally held in a raised position by means of a spring 48 whose upper end is engaged by a washer 49 fastened at the end of a rod 50 which is attached to the jaw. The lower end of the spring rests upon a bracket 51. A ledge 52 extending horizontally from the lower surface of sliding block 45 serves to limit excessive downward travel of the jaw. Pairs of brackets 53 and 54, fastened to beam 27, are welded to a second channelled member 55 which is provided with horizontal grooves for guiding the sliding block or slide 45. A fluid pressure cylinder 56, by which slide 45 is actuated, is bolted to a plate 57 which is in turn supported on beam 27 by

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means of vertically disposed webs 58 and 59. The piston rod 60 of the air cylinder is attached to slide 45.

As explained hereinabove, the carriage travels between the serving or entry table and the straightening machine. This travel is controlled through the operation of cylinder 19. Work pieces which are to be straightened or otherwise rolled, are usually individually delivered on skids to the entry or serving table. The entry table may be in the form of a stationary trough or may be of a type of table which is provided with rollers normally located below the tops of the skids and arranged to be elevated to a position above the skids. If the table is of the latter type, after a piece of work is placed above the rollers, the table rollers are raised and the work is then advanced on the rollers into a position where it can be seized or gripped by the gripping members of the feeding apparatus. In this position the work is held at the level of and in line with the throat of the rollers of the straightening machine.

In Fig. 1 there is diagrammatically illustrated the last or discharge roller 61 of a feed or entry table. A suitable entry table is shown and described, for example, in United States Patent No. 1,738,340, granted December 3, 1929.

For receiving work from the entry or serving table the carriage is moved to its most rearward position along rails 12 and 13 under the action of cylinder 19. In this position cylinders 34 and 56 are operated to retract the slides 32 and 45, if not already retracted. The leading end of the work is then gripped by jaws 40 and 46 as slides 32 and 45 are operated by fluid pressure in cylinders 34 and 56. The operator then lowers the serving table and the work rests upon the skids with its leading end supported by the jaws. With the work held between the jaws, the carriage is advanced from its most rearward position towards the straightening machine 2 under the action of cylinder 19. The leading end of the work is thereby thrust into the throat of the rolls of the straightening machine, as illustrated in Fig. 1. Should the lead end of the work be to one side or the other of the center line of the throat, the operator can move the work laterally by controlling the pressure in cylinders 34 and 56 in accordance with the amount and direction of movement required to make the correction desired.

The straightening machine 2 may be of any ordinary construction and include driven rolls 62 and 63, respectively associated with idler rolls 64 and 65. These pairs of rolls, together with a pressure roll 66, straighten the work pieces as they are successively drawn through the straightening machine by the combined action of the rolls. Straightening machines of this general character are well known and in common use.

When the leading end of the work enters the throat between rolls 62 and 64 of the straightening machine, the work is immediately given a rotary motion, with the result that the jaws 40 and 46 are caused to slide with respect to their supporting slide blocks 32 and 45, respectively. As shown in Fig. 2, the rotation of the work is counterclockwise and under this motion jaw 40 rises and jaw 46 descends. As jaw 46 descends, it closes contacts 67, which immediately activate an electrical circuit controlling cylinders 34 and 56. The cylinder pistons move in opposite directions and withdraw the sliding blocks and jaws from the whipping zone of the rotating work. The circuits controlling the retraction of the slid-

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ing blocks are provided with means for enabling the operator to effect their withdrawal at will, and also in case of failure of the automatic release. The work continues on through the straightening machine and the carriage may then be caused to move rearward towards the entry table and into position for gripping a succeeding piece of work.

The electrical circuits and piping arrangement by which the various cylinders are controlled are illustrated in Fig. 5.

The operation of the feeding apparatus is electrically controlled and a push button panel 69 is provided whereby an operator may control the various operations. All of the push buttons are connected at one side to a bus 70. Buttons 71 and 72 are employed to control the movement of the carriage. For moving the carriage rearwardly button 71 is pressed to close a circuit from bus 70, through line 73, solenoid 74, line 75 to bus 76. The solenoid 74 actuates the 4-way valve 26 and introduces pressure to the forward end of cylinder 19, while at the same time exhausting the rearward end of the cylinder. After the leading end of the work piece has been gripped, the carriage is moved forwardly by reversing the position of valve 26 and thereby applying pressure to the rearward end of the cylinder 19 while exhausting its forward end. This is accomplished by pressing button 72 which closes a circuit from bus 70 through line 77, solenoid 78, line 75 and bus 76.

The movements of the slides 32 and 45 for gripping and releasing a work piece are controlled by a solenoid-operated 4-way valve 79 having connection with a source of pressure supply 80 and an exhaust 81. For actuating the valve to cause the slides to move inwardly or towards each other, button 82 is depressed, thereby closing a circuit from bus 70, through line 83, solenoid 84, line 85 to bus 76. This causes valve 79 to be positioned to admit fluid pressure to conduit 86 which has connection with the outer ends of cylinders 34 and 56 through 3-way valves 87 and 88, respectively, which are normally spring-held in open positions. At the same time the inner ends of cylinders 34 and 56, respectively, are exhausted through conduits 89 and 90, both connecting with conduit 91 and valve 79, which is disposed to connect conduit 91 with exhaust 81. The cylinders cause the work to be gripped with sufficient force to drag the work forward into the straightening machine, but not strong enough to hold the work from turning in the jaws in case of failure of the automatic release. Each of the valves 26 and 79 is such that upon momentary energization of either solenoid it is moved to the corresponding position, where it remains until the other solenoid is energized.

When the work starts to rotate under the action of the straightening machine, the sliding movement of jaw 46 on sliding block 45 causes contacts 67 to close. This completes a circuit from bus 70, through line 92, contacts 67, solenoid 93, line 85, to bus 76. The energization of solenoid 93 reverses the position of valve 79 and causes the release of pressure at the outer ends of cylinders 34 and 56 through conduit 86, valve 79 and exhaust 81, while at the same time subjecting the inner ends of the cylinders to pressure from supply 80, through valve 79, conduit 91 and conduits 89 and 90. The ensuing action of the cylinders causes immediate withdrawal of the slides 32 and 45 away from the rotating work. Push button 94 is provided to enable the operator

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to cause the release of the work whenever he might desire. The pressing of button 94 closes a circuit from bus 70, through line 95, solenoid 93, line 85 to bus 76.

As has been explained hereinabove, it sometimes is desirable to move the gripped work to the left or to the right to center its leading end with respect to the throat of the straightening machine. For moving to the left (Fig. 5), push button 96 is depressed to close a circuit from bus 70, through line 97, solenoid 98, line 99, to bus 76. The solenoid actuates the normally open 3-way valve 88 against the action of a spring and while the button is depressed, positions the valve to close the conduit 86 to the cylinder 56, and to bleed pressure from the outer end of cylinder 56. Piston rod 60 is thereby permitted to move outwardly under the action of the counter pressure in the outer end of cylinder 34.

A similar control is provided for moving the gripped work to the right. A button 100 is provided for this purpose and when this button is pressed it closes a circuit from bus 70 through line 101, solenoid 102, line 103 to bus 76. While the button is depressed, the action of the solenoid operates the normally open 3-way valve 87 against its spring, to close the conduit 86 to the cylinder 34, and to bleed pressure from the outer end of cylinder 34, with the result that the slides 32 and 45 and gripped work are moved to the right. The amount of movement of the gripped work to the left or to the right is dependent upon the selection and duration of closure of the respective press buttons 96 and 100.

While the form of apparatus herein shown and described is admirably adapted to fulfill the objects primarily stated, it is to be understood that it is not intended to confine the invention to the one form of embodiment herein disclosed, for it is susceptible of embodiment in various forms all coming within the scope of the claims which follow.

What is claim is:

1. Apparatus for feeding elongated cylindrical work pieces to a straightening machine, comprising a carriage mounted for movement in the direction of travel of a work piece through a straightening machine, means for controlling reciprocation of said carriage, means for gripping a work-piece mounted on said carriage and including jaws and jaw-supporting members, said supporting members being movable toward and away from each other laterally of the direction of movement of said carriage for causing the jaws to engage the work-piece, and said jaws being displaceable transversely with respect to the jaw-supporting members and the axis of the work-piece, means for operating said gripping means to cause said jaws to grip a work piece therebetween, and means for controlling said operating means for releasing said gripping means and jaws from work piece gripping position.

2. Apparatus for feeding elongated cylindrical work pieces to a straightening machine, comprising a carriage mounted for movement in the direction of travel of a work piece through a straightening machine, means for controlling reciprocation of said carriage, means for gripping a work-piece mounted on said carriage and including jaws and jaw-supporting members, said supporting members being movable toward and away from each other laterally of the direction of movement of said carriage for causing the jaws to engage the work-piece, and said jaws being displaceable transversely with respect to the jaw-

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supporting members and the axis of the work-piece, means for operating said gripping means to cause said jaws to grip a work piece therebetween, and means controlled by one of said jaws for releasing said gripping means from work piece engaging position upon displacement of the jaw under the action of a rotating work piece.

3. Apparatus for feeding elongated cylindrical work pieces to a straightening machine, comprising a carriage mounted for movement in the direction of travel of a work piece through a straightening machine, means for controlling reciprocation of said carriage, a pair of slides mounted on said carriage and movable towards and away from each other laterally of the direction of movement of said carriage, means for gripping a work piece, said gripping means including a jaw carried by each of said slides and mounted for movement relative to said slides under the action of a rotating work piece held therebetween, means for operating said slides to cause said jaws to grip a work piece therebetween, and means controlled by one of said jaws for effecting actuation of said slides away from each other to release said jaws from work piece engaging position upon rotation of the work piece.

4. Apparatus for feeding elongated cylindrical work pieces to a straightening machine, comprising a carriage mounted for movement in the direction of travel of a work piece through a straightening machine, means for controlling reciprocation of said carriage, a pair of slides mounted on said carriage and movable towards and away from each other laterally of the direction of movement of said carriage, means for gripping a work piece, said gripping means including a jaw carried by each of said slides and mounted for displacement relative to said slides under the action of a rotating work piece gripped therebetween, fluid pressure operated means for advancing said slides and gripping means into work piece gripping position, and means for controlling the operation of said fluid pressure means to effect retraction of said slides and gripping means from work piece gripping position upon seizure and rotation of the work piece gripped thereby by a straightening machine.

5. Apparatus for feeding elongated cylindrical work pieces to a straightening machine, comprising a carriage mounted for movement in the direction of travel of a work piece through a straightening machine, means for controlling reciprocation of said carriage, a pair of slides mounted on said carriage and movable towards and away from each other laterally of the direction of movement of said carriage, means for gripping a work piece, said gripping means including a jaw carried by each of said slides and mounted for displacement relatively to said slides under the action of a rotating work piece gripped therebetween, fluid pressure operated means for actuating said slides and gripping means into work piece gripping position, means for controlling the operation of said fluid pressure means automatically to effect retraction of said slides and gripping means from work piece gripping position upon seizure and rotation of the work piece gripped thereby by a straightening machine, and means operable at the will of an operator for controlling the operation of said fluid pressure means to retract said slides and gripping means from work gripping position.

6. Apparatus for feeding elongated cylindrical work pieces to a straightening machine, comprising a carriage mounted for movement in the di-

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rection of travel of a work piece through a straightening machine, means for controlling reciprocation of said carriage, a pair of slides mounted on said carriage and movable towards and away from each other laterally of the direction of movement of said carriage, work piece gripping means carried by said slides, fluid pressure operated means for advancing said slides and gripping means into work piece gripping position, and means for controlling the operation of said fluid pressure operated means to change the lateral position of said slides and gripping means to center the lead end of a work piece held thereby in respect to the throat of a straightening machine.

7. Apparatus for feeding elongated cylindrical work pieces to a straightening machine, comprising a carriage mounted for movement in the direction of travel of a work piece through a straightening machine, fluid pressure operated means for controlling the travel of said carriage, a pair of slides mounted on said carriage for movement towards and away from each other laterally of the direction of movement of said carriage, fluid pressure operated means for controlling the positions of said slides with respect to each other, means for gripping a work piece, said gripping means including a jaw carried by each of said slides and mounted for displacement under the action of a rotating work piece gripped therebetween, and means for controlling the operation of said last-named fluid pressure means to move said slides away from each other to release said gripping means from work piece engaging position.

8. Apparatus for feeding elongated cylindrical work pieces to a straightening machine, comprising a carriage mounted for movement in the direction of travel of a work piece through a straightening machine, fluid pressure operated means for controlling the travel of said carriage, a pair of slides mounted on said carriage for movement towards and away from each other laterally of the direction of movement of said carriage, fluid pressure operated means for controlling the positions of said slides with respect to each other, means for gripping a work piece, said gripping means comprising a jaw carried by each of said slides and mounted thereon for displacement under the action of a rotating work piece gripped therebetween, and means operated by one of said jaws for causing the operation of said last-named fluid pressure means to move said slides and jaws away from each other to release said gripping means from work piece engaging position upon rotation of a work piece held by said jaws.

9. Apparatus for feeding elongated cylindrical work pieces to a straightening machine, comprising a carriage mounted for movement in the direction of travel of a work piece through a straightening machine, fluid pressure operated means for controlling the travel of said carriage, means for gripping a work piece, said means being mounted on said carriage for movement towards and away from each other laterally of the direction of movement of said carriage, jaws mounted on said gripping means for engaging a work piece, said jaws being displaceable transversely the axis of a work piece therebetween, fluid pressure operated means for controlling the positions of said gripping means with respect to each other, and means operated by one of said jaws for causing the operation of said last-named fluid pressure means to release said gripping means and jaws from

work piece gripping position upon movement of said jaws under the action of a rotating work piece.

10. Apparatus for feeding elongated cylindrical work pieces to a straightening machine, comprising a carriage mounted for movement in the direction of travel of a work piece through a straightening machine, means for operating said carriage, electrically controlled means for controlling the operation of said carriage operating means, members mounted on said carriage and movable towards and away from each other laterally of the direction of travel of said carriage, jaws for gripping a work piece, said jaws being slidably mounted on said members for movement in planes parallel to the axis of a work piece between the jaws, fluid pressure operated means for moving said members and jaws into and out of work piece gripping positions, electrically controlled means for effecting operation of said fluid pressure operated means, and means controlled by one of said jaws to effect operation of said fluid pressure operated means and retract said members and jaws from work piece gripping position upon initiation of rotation of a work piece gripped by said jaws.

11. Apparatus for feeding elongated cylindrical work pieces to a straightening machine, comprising a carriage mounted for movement in the direction of travel of a work piece through a straightening machine, fluid pressure operated means for controlling the movement of said carriage, electrically controlled means for controlling the fluid pressure in said last-named means, members mounted on said carriage and movable towards and away from each other laterally of the direction of travel of said carriage, gripping means for gripping a work piece, said gripping means being carried by said members and adapted to seize a work piece, fluid pressure operated means for moving said members and gripping means into and out of work piece gripping positions, electrically controlled means for effecting operation of said last-named fluid pressure operated means, and means automatically to effect retraction of said gripping means from work piece gripping position upon initiation of rotation of a work piece gripped by said gripping means.

12. Apparatus for feeding elongated cylindrical work pieces to a straightening machine, comprising a carriage mounted for movement in the direction of travel of a work piece through a straightening machine, fluid pressure operated means for controlling the movement of said carriage, electrically controlled means for controlling the fluid pressure in said last-named means, members mounted on said carriage and movable towards and away from each other

laterally of the direction of movement of said carriage, gripping means for gripping a work piece, said gripping means being carried by said members and adapted to seize a work piece, fluid pressure operated means for moving said members and gripping means into and out of work piece gripping position, and electrically controlled means for effecting operation of said last-named fluid pressure operated means to displace a work piece gripped by said gripping means in a direction laterally to the axis of said work piece.

13. Apparatus for feeding an elongated cylindrical work piece to the throat of rotating rolls of a straightening machine, the combination comprising gripping members for seizing a work piece, means permitting relative movement between a seized work piece and said gripping members to release said gripping members from seizing relationship with said work piece, means for advancing said gripping members and a seized work piece in the direction of travel of a work piece through a straightening machine, and means initiated into action by the rotation of the seized work piece upon entrance of the same to the throat of the rotating rolls of a straightening machine to relieve said gripping members from seizing relationship with the work piece.

14. Apparatus for feeding elongated cylindrical work pieces to the rolls of a straightening machine, which, upon gripping a work piece, act to rotate it substantially about its longitudinal axis, comprising means for gripping a work piece, means permitting relative movement between a seized work piece and said gripping means to release said gripping means from seizing relationship with said work piece, means for advancing said gripping means and a work piece forwardly into said straightening machine, and means actuated by the rotation of a work piece after it has been engaged by the rolls of the straightening machine for automatically releasing the gripping engagement of the first-named means, whereby said work piece is thereafter drawn through said straightening machine by the rolls thereof engaging said work piece.

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