Dec. 12, 1933. C. L. SCHULTE 1,938,768

MACHINE TOOL

Filed Oct. 26, 1931 4 Sheets-Sheet 1

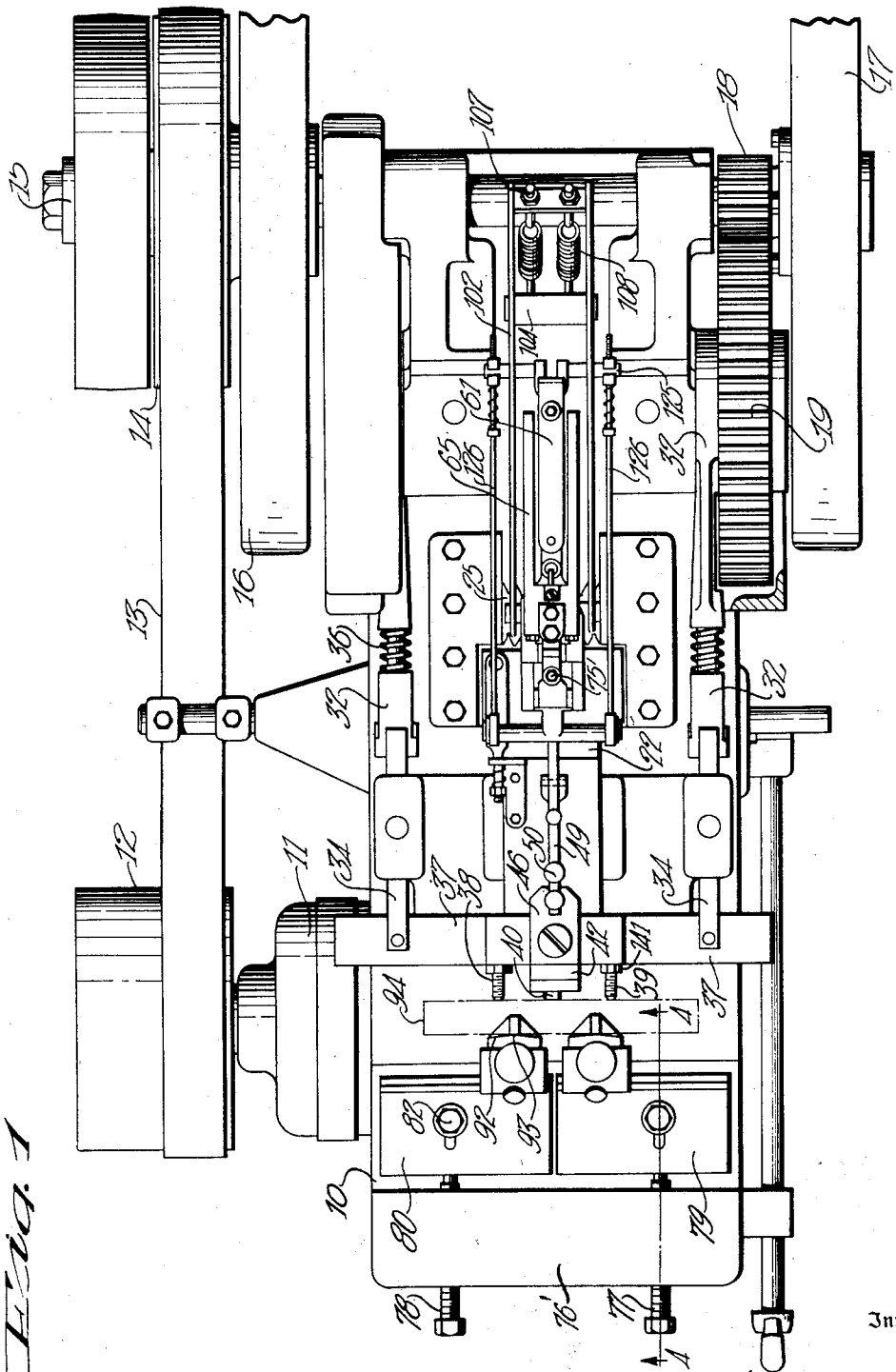


Fig. 1

Inventor

CLIFFORD L. SCHULTE

By O. K. Parsons Attorney

Dec. 12, 1933. C. L. SCHULTE 1,938,768

MACHINE TOOL

Filed Oct. 26, 1931 4 Sheets-Sheet 2

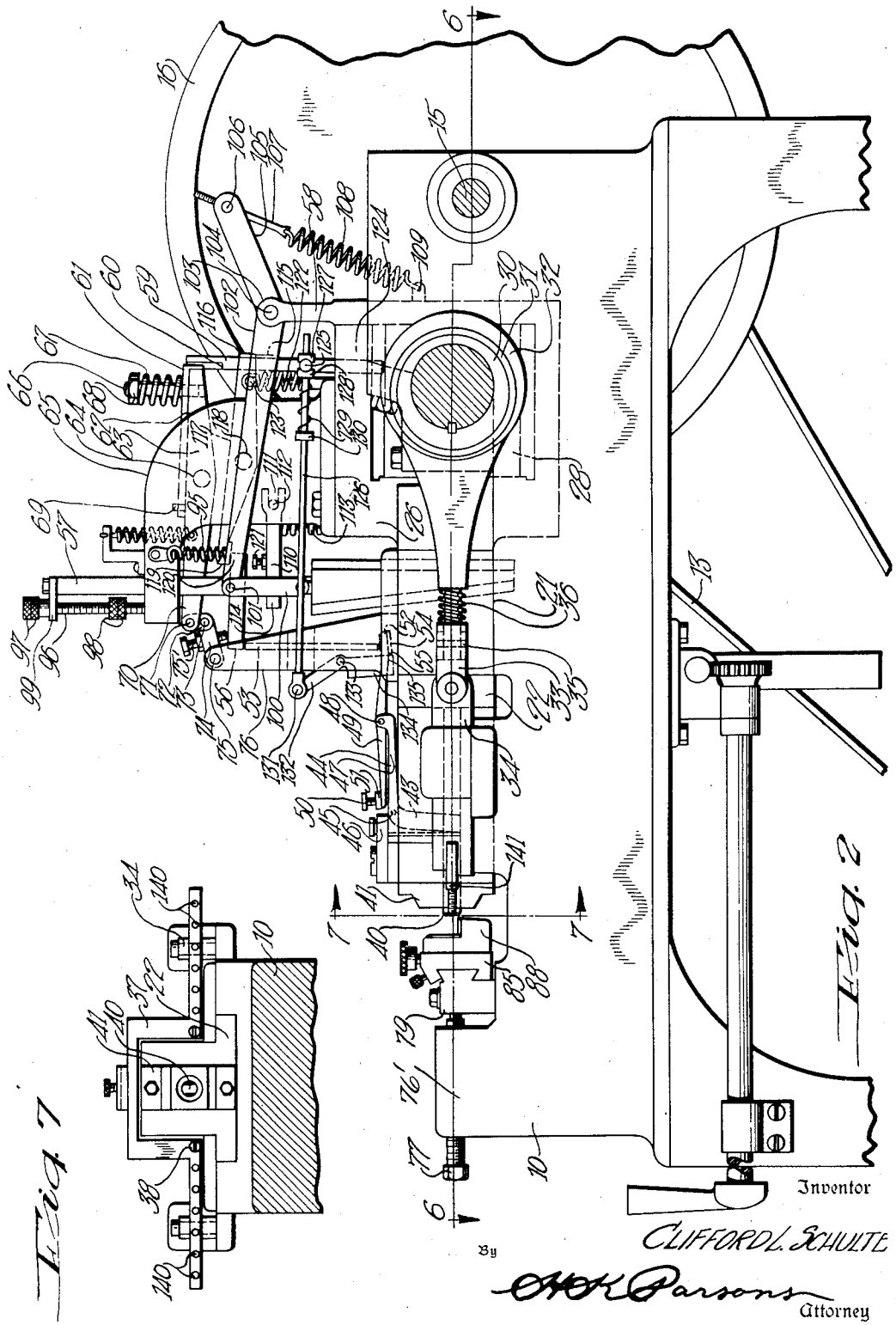


Fig. 2

Fig. 7

Inventor

CLIFFORD L. SCHULTE

By

O'K Parsons

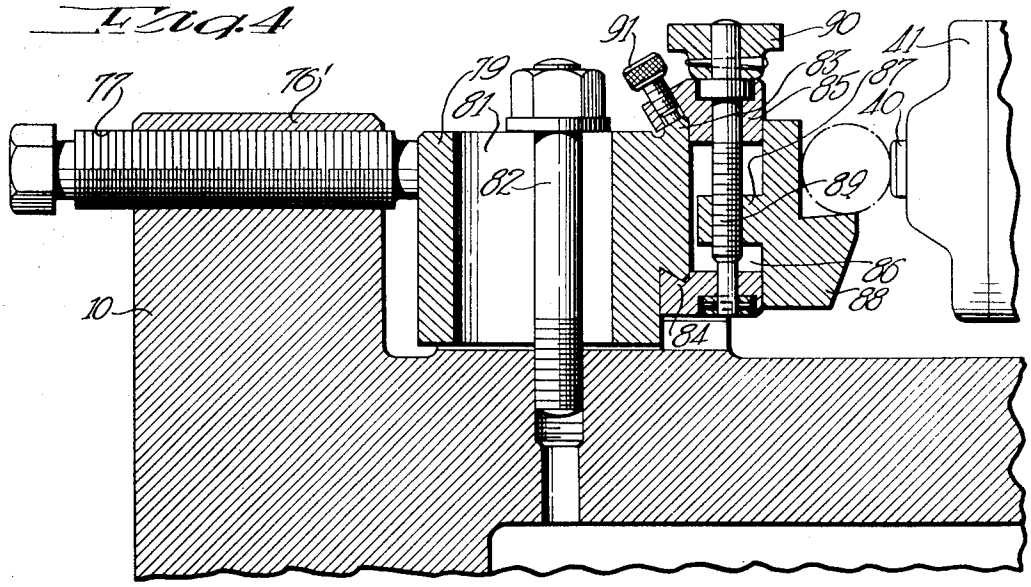
Attorney

Dec. 12, 1933. C. L. SCHULTE 1,938,768

MACHINE TOOL

Filed Oct. 26, 1931 4 Sheets-Sheet 3

Fig. 4



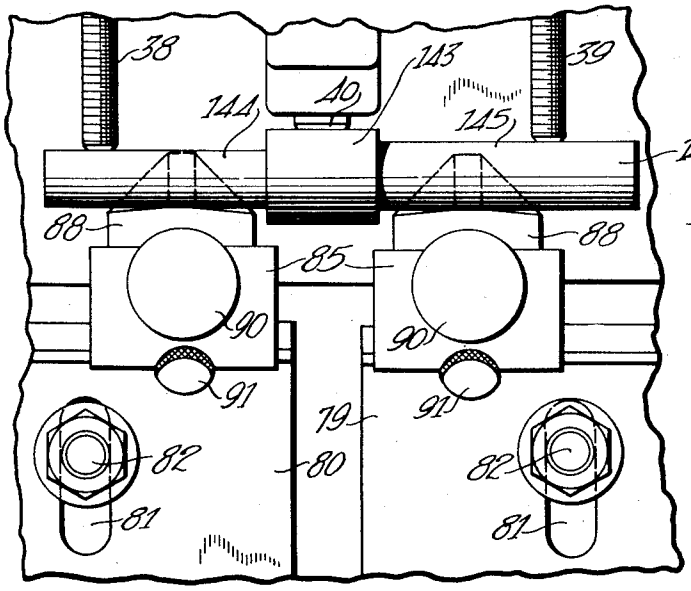
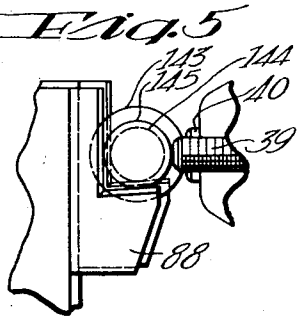


Fig. 3

Fig. 5



Inventor

CLIFFORD L. SCHULTE

By

O. K. Parsons

Attorney

Dec. 12, 1933. C. L. SCHULTE 1,938,768

MACHINE TOOL

Filed Oct. 26, 1931 4 Sheets-Sheet 4

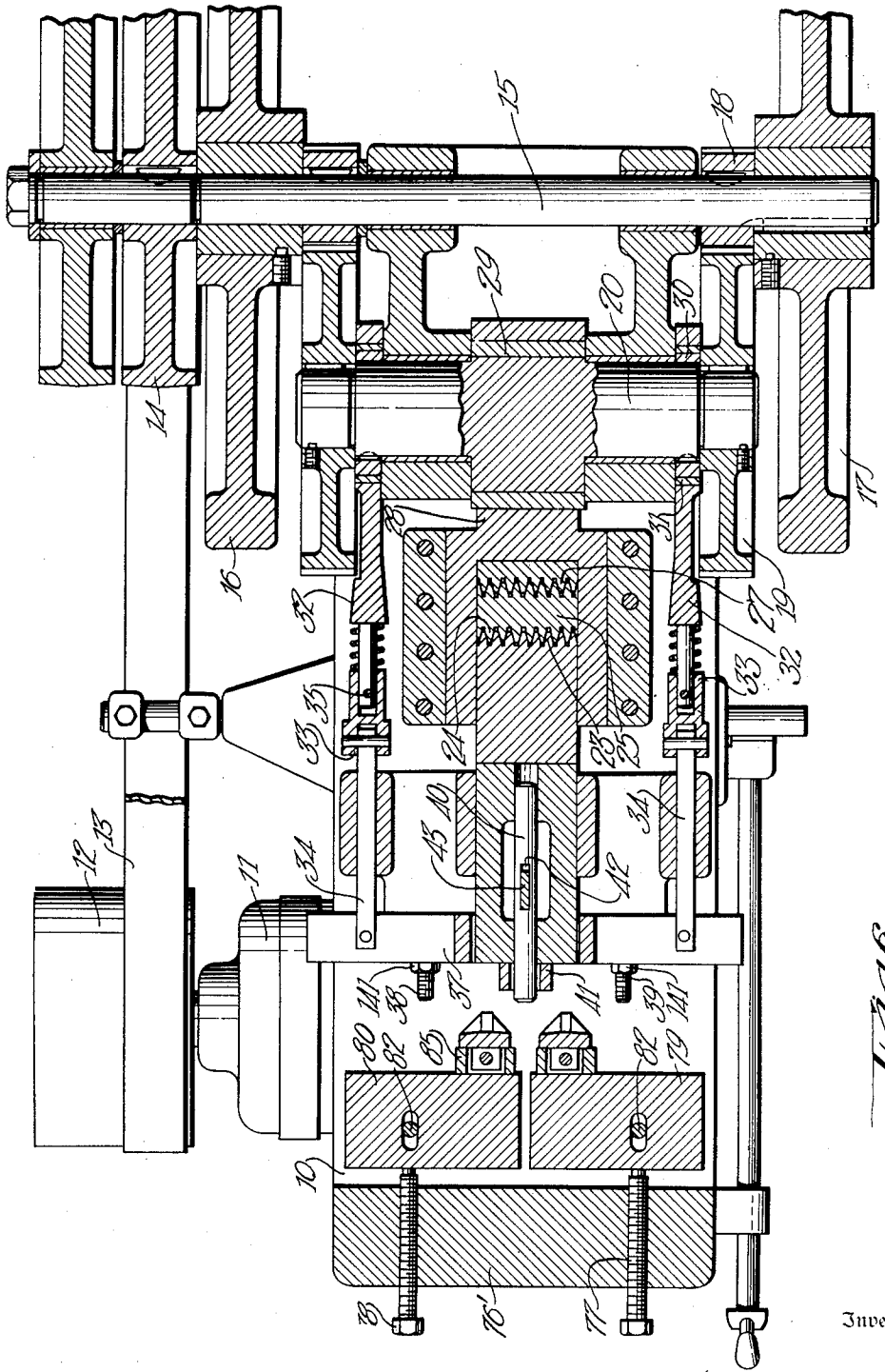


Fig. 6

Inventor

By CLIFFORD L. SCHULTE

H. K. Parsons

Attorney

Patented Dec. 12, 1933 1,938,768

UNITED STATES PATENT OFFICE

1,938,768

MACHINE TOOL

Clifford L. Schulte, Cincinnati, Ohio, assignor to Cincinnati Grinders Incorporated, Cincinnati, Ohio, a corporation of Ohio

Application October 26, 1931. Serial No. 571,011

13 Claims. (Cl. 153—48)

This invention relates to improvements in machine tools and especially to improvements in a machine for straightening metal objects, such as bars, shafting, rails, etc.

An object of the invention is the provision of an improved adjustable machine of the above indicated character for handling various sizes, classes and shapes of parts.

Another object of the invention is the provision of an improved adjustable work supporting mechanism for use with a bar or shaft straightening mechanism adapted to handle multiple diameter work, tapered work, etc.

A further object of the invention is the provision of an improved control structure for controlling and limiting the ultimate action of the straightening mechanism.

A further object of the invention is generally improving the mechanism previously known for straightening cylindrical bars and shaft stock whether of a uniform diameter, multiple diameter or conical in contour.

Other objects and advantages of the present invention should be readily apparent by reference to the accompanying drawings illustrating the invention and described in the following specification and it is to be understood that any modifications may be made in the structural details there shown and described within the scope of the appended claims without exceeding or departing from the spirit of the invention.

In the drawings:

Figure 1 is a top plan view of a machine embodying the improvements of this invention.

Figure 2 is a side elevation of the machine shown in Figure 1.

Figure 3 is an enlarged plan view of certain parts shown in Figures 1 and 2 for operating on multiple diameter stock.

Figure 4 is an enlarged sectional view taken from line 4—4 of Figure 1.

Figure 5 is an end elevation of certain parts shown in Figure 3 as seen from the right hand end thereof.

Figure 6 is a horizontal sectional view taken on line 6—6 of Figure 2.

Figure 7 is an elevational view of certain parts of the machine as seen particularly from line 7—7 of Figure 2.

Throughout the several views of the drawings similar reference characters are employed to denote the same or similar parts.

A machine embodying this invention may comprise a bed 10 having mounted therebeneath a prime mover or motor 11 supporting for rotation thereby a pulley 12. Extending about the pulley 12 is a transmission belt 13 which is also trained about a pulley 14 on the end of a driving shaft 15. The drive shaft 15 has mounted thereon for effecting stability in rotation, a pair of fly wheels 16 and 17. Secured to the shaft 15 near each end is a pinion 18 meshing with a gear 19 on a crank shaft 20. The crank shaft 20 and drive shaft 15 are mounted for rotation in suitable bearings provided by the bed 10.

The bed 10 provides on its upper surface a guideway 21 for a ram 22 which is adapted to be slidably actuated relative to the bed 10. The ram 22 terminates at its rear end in V shaped notches 23 receiving correspondingly shaped teeth 24 of a wedge block 25 fed vertically of the machine by means to be subsequently described. On the other side of the wedge block 25 is the ram head 26 which is also provided with V shaped notches 27 corresponding to the shape of the teeth projecting from the rear face of the wedge block 25. The teeth on the block 25 are formed in the manner illustrated to hold down the adhesion or possible sticking between the members which would result if flat surface wedge block and ram parts were employed. The ram head 26 encloses a cross head 28 which is mounted about the crank bearing 29 formed on shaft 20.

The crank shaft 20 has mounted near its opposite ends eccentric members 30 received in bearings 31 formed in the large ends of arms 32. The arms 32 terminate in clevises 33 having a pivotal connection with links 34. The arms 32 are each made in two sections which telescope one within the other having a pin and slot connection 35 one with the other and there is mounted between them a coiled spring 36 acting as a shock absorber in the event of an obstruction in the path of movement of the parts about to be described. The links 34 carry between their free ends a plate 37 which extends cross-wise of the bed and from which plate project adjustable feelers 38 and 39. The plate 37 also actuates a feeler or plunger 40 which is axially mounted in an enlarged opening in an anvil 41 on the end of the ram 22. The feeler 40 is provided just behind the plate 37 with a rectangular opening 42 receiving the end of arm 43 of a bell crank 44 which is pivoted at 45 to a bracket 46 carried by the plate 37. The other arm 47 of the crank 44 pivotally carries at 48 the feed control arm 49. The pivot 48 passes through the feed control arm 49 substantially midway of its ends and the said feed control arm has an adjustable screw 50 threaded in to the forward end thereof and riding on the upper surface of

crank arm 47. The screw 50 is adapted to be adjusted relative to the arm 49 for varying the operative connection between the arms 49 and 47. A lock nut 51 is mounted on the screw 50 for locking it in its adjusted position. The inner end 52 of the arm 49 is mounted beneath and contacts with the lower end of a vertically slidable feed setting rod 53. The said inner end 52 of the arm 49 is provided on its under surface with a plate 54 which forms a shoulder 55 for operating the wedge block release as will later appear. The upper end of the rod 53 contacts a pivotably mounted feed arm 56 which encircles the stem 57 of the wedge block 25.

The foregoing description deals with the setting of the feed mechanism prior to the actual feeding of the wedge block 25. This feeding mechanism is set through pressure exerted on the feeler 40 due to its contact with the work piece or stock to be operated upon.

The cross head 28, above referred to, is inclosed within the ram head 26 which has secured to it the plate or bracket 58 and which ram head partakes of the movement of the cross head in a direction longitudinally of the bed 10 but which merely guides the cross head in its vertical movement. Slidably guided by the said head 26 is a feed actuating rod 59 adapted to be vertically shifted by the cross head in its upward movement. The upper end of the rod 59 is provided with a shoulder 60 cooperating with the end 61 of a plate 62 yieldably mounted on the upper surface of a beam 63 which is pivoted at 64 to a superstructure or frame 65 carried by the cross head 26. A bolt 66 carried by the beam 63 extends upwardly through an aperture in the plate 62 and has a spring 67 surrounding it which spring abuts on its upper end with a nut 68 on the bolt and at its lower end with the plate 62. The spring 67 thereby yieldingly holds the plate and beam on one another except when an obstruction or the like prevents the downward feeding movement of the wedge block whereupon the upward feeding stroke of the rod or plunger 59 is taken by the spring 67. A pin 69 further connects the plate and beam to prevent inadvertent disassociation.

The super-structure or frame 65 further forms a guide for the wedge block stem 57 and guides the said stem in its vertical reciprocation. The forward end 70 of the beam 63 is pivoted at 71 to a short link 72 which has its other end pivoted at 73 to an actuating member 74. This actuating member 74 is in turn pivoted at 75 to the upper end of a bracket 76 projecting upwardly from the ram 22 to which it is secured. Extending through the actuating member 74 is a second feed adjusting screw 75' which cooperates with feed adjusting screw 50 for determining the increments of feed to be given the wedge block 25 as will later appear.

The forward end of the bed 10 terminates in an upwardly extending lug or bracket 76' through which project screws 77 and 78. Each of the screws abuts the adjacent face of work rest supporting blocks 79 and 80. As seen in Figure 4 each of the work supporting blocks is provided with an elongated aperture 81 through which clamp bolts 82 extend. By this means the work supporting blocks may be actuated longitudinally of the bed toward and from the anvil depending on the diameter of work to be operated upon and clamped in adjusted positions through the clamp bolts 82. The inner face of each of the blocks 79 and 80 is provided with a V shaped guide 83 received in a correspondingly contoured guideway 84 formed in work supporting members 85. Each work supporting member 85 is formed intermediate its upper and lower horizontal surfaces with an opening 86 in which is positioned a lug 87 projecting rearwardly from work rests 88. An adjusting screw 89 is rotatably journaled in the supporting member 85 and threaded through the lugs 87. An actuating handle or knob 90 is pinned or otherwise secured to the upper end of the screws 89. The work supporting members 85 are adapted to be manually adjusted along the dove-tailed guide 83 and clamped in adjusted positions by means of a clamp screw 91 which extends therethrough and contacts with the guide 83. The work rests 88 have an L shaped seat on which the work piece rests. By reference to Figure 1 it will be noted that the face 92 of the rest opposed to the feelers and plunger is arcuate in shape so that it contacts with the work at substantially a single point 93. In this way any pressure of the anvil tending to straighten the work does not encounter the resistance of a flat face extending the entire width of the rests 88 and possibly rendering the straightening operation ineffective.

From the foregoing it will be noted that the work support blocks may be adjusted relative to the bed depending upon the diameter of the work to be operated on. It will be further noted that the work rests 88 are adjustable vertically to align the center of the work with the plane through which the feelers and straightening anvil operate.

The operation of the mechanism thus far described is as follows: Rotation of the drive shaft 15 through the gears and pinions 18 and 19 rotates the crank shaft 20. Rotation of the crank shaft through the crank 29 and eccentrics 30 reciprocate longitudinally the ram 22 and the arms 32. The latter through the plate 37 carried thereby causes the plunger 40 to engage the work which limits its movement and forces same rearwardly for actuating the bell crank 44 about its pivot 45. This oscillation of the bell crank 44 raises the end 52 of arm 49 an amount depending on the adjustment of the feed screw and thereby raises the sliding rod 53 for operating the feed arm 56 into engagement with the wedge block stem 57. As the crank 29 rotates raising the cross head 28 it forces upwardly the rod 59 which through the seat 60 thereon oscillates the beam 63. The oscillation of the beam 63 effects the oscillation of the actuating member 74 which is contacting with the upper surface of the feed arm 56 thereby forcing the said arm 56 downwardly carrying with it the wedge block 25. This downward shifting of the wedge block 25 then through the further rotation of the crank 20 feeds the ram 22 forwardly causing the anvil on the end thereof to engage and forwardly bend the work piece 94. As the crank shaft continues to rotate the feeler 40 is again brought up against the adjacent surface of the work which is again held against reciprocation by the work causing the actuation of the feeding mechanism as above. This continuous incremental feeding of the wedge block downwardly continues until the lowermost limit of movement thereof is reached.

It should be noted that the feed arm 56 has an aperture therein through which the stem 57 of the wedge block passes and that the walls of the aperture flare outwardly from the center thereof. Also the inner end of the arm 56 is supported by springs 95 causing the said arm to drop in a counter-clockwise direction with the spring, con-

nected therewith, as the fulcrum point. In this position of the arm it is free from the stem and is also below the adjusting screw 75'. When, however, the arm 56 is raised by the rod 53, as above described, the said arm 56 clamps the stem 57 so that when it is moved downwardly it carries with it the stem 57 and wedge block 25, in this downward movement the arm is substantially horizontal and stretches the spring or springs 95.

The zone of reciprocation of the wedge block 25 is controlled so that it will neither be elevated beyond the work feeding mechanism nor be fed below a predetermined point by means of a screw 96 extending upwardly from the frame member 65. This screw limits the travel of the wedge block through adjustable lock nuts 97 at one end, and additional lock nuts 98 at the other end which engage a finger 99 carried by the stem 57, the finger having a groove formed therein to partially surround the screw 96. The lock nuts 98 are set at a point corresponding to the size of a straight work piece or the desired size to which the work piece is to be straightened.

The wedge block 25 has pivoted to it on opposite sides one end of links 100 which are in turn pivoted at their other ends 101 to one end of a pair of bell crank levers 102. The bell crank levers 102 are secured to a shaft 103 carried in a bearing lug 104 of plate 58 which is secured to the ram head 26 that incloses the cross head 28. The bell crank levers 102 extend beyond the pivot shaft 103 as at 105 and each has secured to it one end of a brace 106 through which passes tension adjusting members 107 for one end of coiled springs 108, the other ends of the coiled springs 108 are connected at 109 with the plate 58.

The springs 108 are under tension and tend to oscillate the bell crank 102 in a clockwise direction for raising the wedge block 25. From this it will be seen that the wedge block is incrementally fed during the operation of the machine against the yielding resistance of the spring 108. In order to prevent the springs from raising the wedge block 25 during the normal operation, a brake arm 110 is provided having one end bifurcated at 111 and receiving between the arms thereof a pivot 112 which is carried by the superstructure or frame 65. A spring 113 is provided and abuts on opposite ends with the brake arm 110 and with the base of the frame 65. The spring 113 contacts with the arm 110 at a point for raising the arm or actuating it in a clockwise direction. The arm 110 is provided in its end 114 opposite to the furcated end with an aperture through which the wedge block stem 57 passes. This aperture similar to the aperture in the feed arm 56 has the walls thereof flaring outwardly from the center thereof so that the upward shifting of this arm 56 by the spring 113 yieldingly holds the stem 57 and wedge block 25 from being raised by the springs 108.

The feed plunger 59 is provided on its rearward face with a lug 115 which cooperates with a ledge 116 on the rear end of a pivotally mounted release arm 117. This release arm 117 is pivoted intermediate its ends at 118 to the superstructure or frame 65 and has its free end 119 overlying the tail 120 of the feed arm 56. The brake arm 110 has projecting from it an adjustable abutment 121 which is beneath the tail 120 of the feed arm. From the foregoing it will be noted that the feed plunger 59 has two positions and functions, in its one position, through the shoulder 60 to operate the beam 63 for effecting the feed and in its other position, through the lug 115, to operate the brake release arm 110. A spring 122 having one end secured at 123 on the release arm 110 normally holds said arm in position to be oscillated by the lug 115 on the plunger 59.

The guiding aperture 124 through the ram head 26 is of a sufficient size to permit the oscillation of feed plunger 59 to its two operative positions. This plunger 59 has extending from its opposite sides a lug 125 through each of which extends a link 126, each link having on one end thereof a nut 127 for engagement with the lugs 125. Loosely carried by the links 126 and contacting with the studs on the other side are washers 128 yieldingly urged into contact with the studs by springs 129 which are coiled about the links 126. The springs 129 abut the washers 128 on one end and on their other ends abut collars 130 fixed to the links. The forward end of the links 126 are pivotally connected at 131 to one end of an arm 132 pivoted intermediate its ends at 133 to the frame member 76. The lower end 134 of the arm 132 has a rectangular opening therein through which the lever 49 passes. The lower wall of the rectangular opening in arm 132 forms an abutment 135 for the shoulder 55 on the arm 49.

When the work has been straightened to the desired size, no further pressure is exerted on the plunger 40 so that the bell crank 45 is not oscillated to thereby raise the arm 49. The forward shifting of the arms 32 carrying with them the plate 37 which also carries the bell crank 45 and arm 49, the latter being in its normal horizontal position, effects engagement between the shoulder 55 on the arm 49 with the abutment 135 of the arm 132 for oscillating said arm in a clockwise direction. The oscillation of the arm 132 rearwardly shifts the links 126 to align the lug 115 on the feed plunger 59 with the ledge 116 on the brake releasing arm 117 so that the next upward movement of the feed plunger 59 oscillates the brake release arm against the resistance of spring 122. This movement of the brake release arm 117 forces the feed arm 56, against the resistance of its spring 95, into contact with the abutment 121 of brake arm 110. The oscillation of the brake arm 110 against the resistance of its spring releases the holding engagement with the wedge block 25 whereupon the springs 108 operate for oscillating the cranks 102 and raising the wedge block 25.

From this it will be seen that during the idle operation of the machine or during the time that the work piece is being replaced on the work rest, the machine continues to operate the wedge block release so that unless the machine is actually feeding all of the parts are held in a position to insure the proper retraction of the wedge block 25.

The machine is adapted for operation on various lengths of work pieces in addition to the different sizes thereof. For this reason the lateral plate 37, and as seen particularly in Figure 7, is provided with a plurality of tapped apertures 140 for the adjustable positioning of feelers 38 and 39. These feelers 38 and 39 are in the nature of screws and are provided with lock nuts 141 for locking them in adjusted positions.

As shown in Figures 3 and 5 the mechanism is also adapted for straightening or operating on

work pieces of unequal size such as the work piece shown in Figure 3. The work piece 142 consists of an enlarged central portion 143 having extending from opposite sides thereof cylindrical shaft portions 144 and 145 each of a different diameter from each other and from the central portion 143. In order to properly align the axis of these several portions it is necessary only to differentially adjust the work supporting blocks 79 toward the operating ram as well as differentially vertically adjust the work rests 88. Also the feelers 38 and 39 are advanced relative to the feeler plunger 40 a distance corresponding to the difference in radii of the several portions so that when the arms 32 are actuated to the limit of their outward position the fixed feelers 38 and 39 are contacting with the portions 144 and 145 for pressing same against the work rests and the feeler plunger 40 contacts with the portion 143 and is held against forward movement by the bend in the work.

From the foregoing it will be noted that a substantially universal shaft straightening machine has been provided capable of being readily adjusted for various sizes or diameters of work pieces as well as work pieces having a plurality of different sized portions which it is desired to align relative to a single axis. It will also be noted that complete control of the feeding mechanism is provided whereby the machine may be set for reducing the idle non-operating time of the machine to a minimum as well as determining and limiting the further need of the parts after the work has been reduced to the desired form.

What is claimed is:

1. In a device of the class described, the combination of a bed, a reciprocable ram carried by the bed and movable through a given plane, adjustable means on the bed supporting a work piece in the line of reciprocation of the ram, said means comprising a bracket, a pair of blocks mounted on the bed for sliding movement relative thereto, adjustable means carried by the bracket for adjusting the blocks relative to the bed, a work rest on each block, means for adjusting the work rest longitudinally of the block, and additional means for adjusting the work rest laterally of the block.

2. In a device of the class described, the combination of a bed, a reciprocable ram carried by the bed and movable through a given plane, adjustable means on the bed supporting a work piece in the line of reciprocation of the ram, said means comprising a bracket, a pair of blocks mounted on the bed for sliding movement relative thereto, adjustable means carried by the bracket for adjusting the blocks relative to the bed, a work rest on each block, means for adjusting the work rest longitudinally of the block, additional means for adjusting the work rest laterally of the block, and means for clamping the blocks in adjusted positions relative to the bed and the work rests relative to the blocks.

3. In a device for straightening metal objects comprising a bed, work rests on the bed, a ram on the bed for movement toward and from the work rests, a feeding mechanism for incrementally advancing the ram, and adjustable means for defining one limit of the zone through which the feeding action takes place.

4. In a device for straightening metal objects comprising a bed, work rests on the bed, a ram on the bed for movement toward and from the work rests, a feeding mechanism for incrementally advancing the ram, adjustable means for defining one limit of the zone through which the feeding action takes place, said means comprising a stem associated with the feeding mechanism, a screw carried by the bed, an adjustable abutment on the screw, and means carried by the stem for co-operation with the abutment on the screw.

5. In a device for straightening metal objects comprising a bed, work rests on the bed, a ram on the bed for movement toward and from the work rests, a feeding mechanism for incrementally advancing the ram, adjustable means for defining one limit of the zone through which the feeding action takes place, said means comprising a stem associated with the feeding mechanism, a screw carried by the bed, an adjustable abutment on the screw, means carried by the stem for co-operation with the abutment on the screw, means for retracting the feeding mechanism, and an adjustable abutment on the screw for limiting the retraction of the mechanism.

6. In a device for straightening metal objects, the combination of a bed, a support on the bed for supporting the object to be straightened, a ram carried by the bed for movement relative thereto toward and from the work supports, a feeding mechanism operable by engagement with the work prior to engagement thereof by the ram, and axially adjustable feelers for engagement with the work to force same against its support prior to the engagement thereof by the feeding mechanism.

7. In a machine for straightening metal objects, the combination of a bed, a support on the bed for supporting the object to be straightened, a ram carried by the bed for movement relative thereto toward and from the work supports, a feeding mechanism operable by engagement with the work prior to engagement thereof by the ram, axially adjustable feelers for engagement with the work to force same against its support prior to the engagement thereof by the feeding mechanism, and means for adjusting the feelers relative to the feed contact mechanism so that multiple size work may be operated upon.

8. An adjustable work support for use with metal object straightening machines, the combination of a bed, a plurality of blocks caried thereby and independently adjustable relative thereto, a bracket on the bed, adjusting screws carried by the bracket and abutting the blocks for effecting their adjustment, clamp bolts extending through the blocks into the bed for securing same in adjusted positions, and work supporting members carried by each block.

9. An adjustable work support for use with metal object straightening machines, the combination of a bed, a plurality of blocks carried thereby and independently adjustable relative thereto, a bracket on the bed, adjusting screws carried by the bracket and abutting the blocks for effecting their adjustment, clamp bolts extending through the blocks into the bed for securing same in adjusted positions, work supporting members carried by each block, the work supporting members having a groove formed therein receiving a tongue formed on the blocks whereby they may be adjusted relative to the blocks, a work rest carried by each member, and means for adjusting the rests relative to the members.

10. In a machine for straightening multiple diameter shafts, the combination of a bed, a bracket carried thereby, a work supporting

mechanism on the bed adjacent the bracket, said mechanism comprising a plurality of work supporting units one unit for each diameter of work, a straightening ram actuable longitudinally of the bed in a given plane, and means for adjusting the work supporting units relative to one another an amount equal to the difference in radii between the several diameters of the work to thereby align the common axis of the work parallel with the plane of actuation of the ram.

11. In a machine for straightening multiple diameter shafts, the combination of a bed, a bracket carried thereby, a work supporting mechanism on the bed adjacent the bracket, said mechanism comprising a plurality of work supporting units one for each diameter of work, a straightening ram actuable longitudinally of the bed in a given plane, means for adjusting the work supporting units relative to one another an amount equal to the difference in radii between the several diameters of the work to thereby align the common axis of the work parallel with the plane of actuation of the ram, feeler members carried by the bed and shiftable longitudinally thereof toward the work for engagement with the work prior to the engagement thereof by the ram for holding the work on the work supports, and means for adjustably supporting the said feelers whereby they may be adjusted relative to one another an amount equal to the difference in radii of the diameters of the shaft.

12. In a shaft straightening machine, the combination of a bed, an eccentric rotatably mounted thereon, a two-part ram carried by the bed and reciprocated by the eccentric, a wedge block between the two parts of the ram for extending the operable length thereof, a feed mechanism for actuating the wedge block relative to the ram parts, and means for controlling the said feed comprising a stem on the ram, a screw on the bed, an adjustable abutment on the screw, and a coupling between the wedge block stem and abutment of the screw.

13. In a shaft straightening machine, the combination of a bed, an eccentric rotatably mounted thereon, a two-part ram carried by the bed and reciprocated by the eccentric, a wedge block between the two parts of the ram for extending the operable length thereof, a feeding mechanism for acuating the wedge block relative to the ram parts, means for controlling the said feed comprising a stem on the ram, a screw on the bed, an adjustable abutment on the screw, a coupling between the wedge block stem and abutment of the screw, a release mechanism for effecting the retraction of the wedge block, and means for limiting said retraction of the wedge block comprising a second adjustable abutment on the screw for engagement by the wedge block stem coupling.

CLIFFORD L. SCHULTE.