June 24, 1924.

1,499,100

G. H. EKSTROM

STRAIGHTENING MACHINE

Filed Feb. 27, 1922

3 Sheets-Sheet 1

Fig. 1

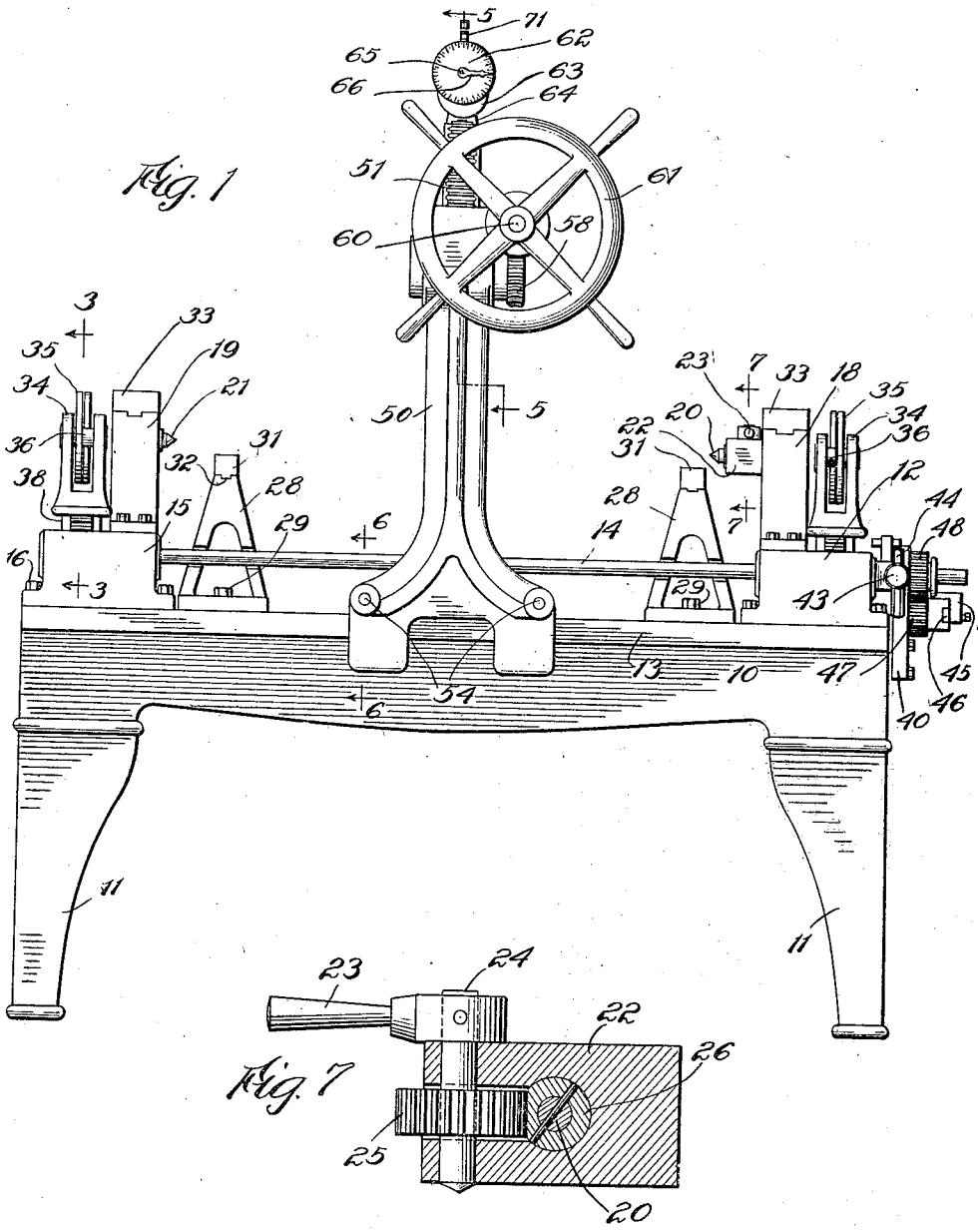

Fig. 7

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3 Sheets-Sheet 2

Fig. 2

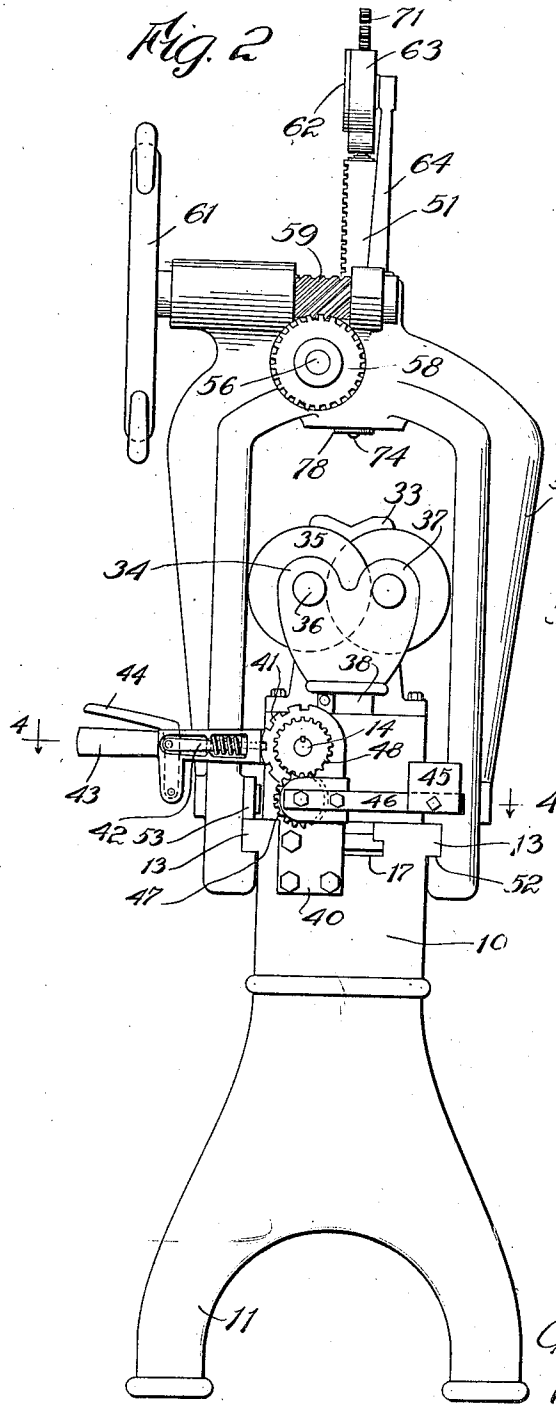
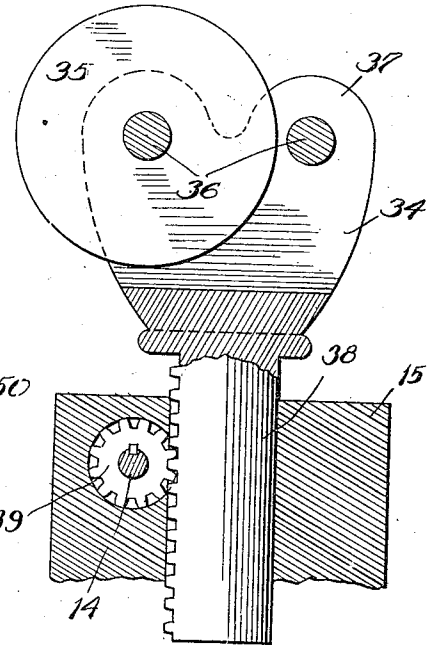


Fig. 3



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3 Sheets-Sheet 3

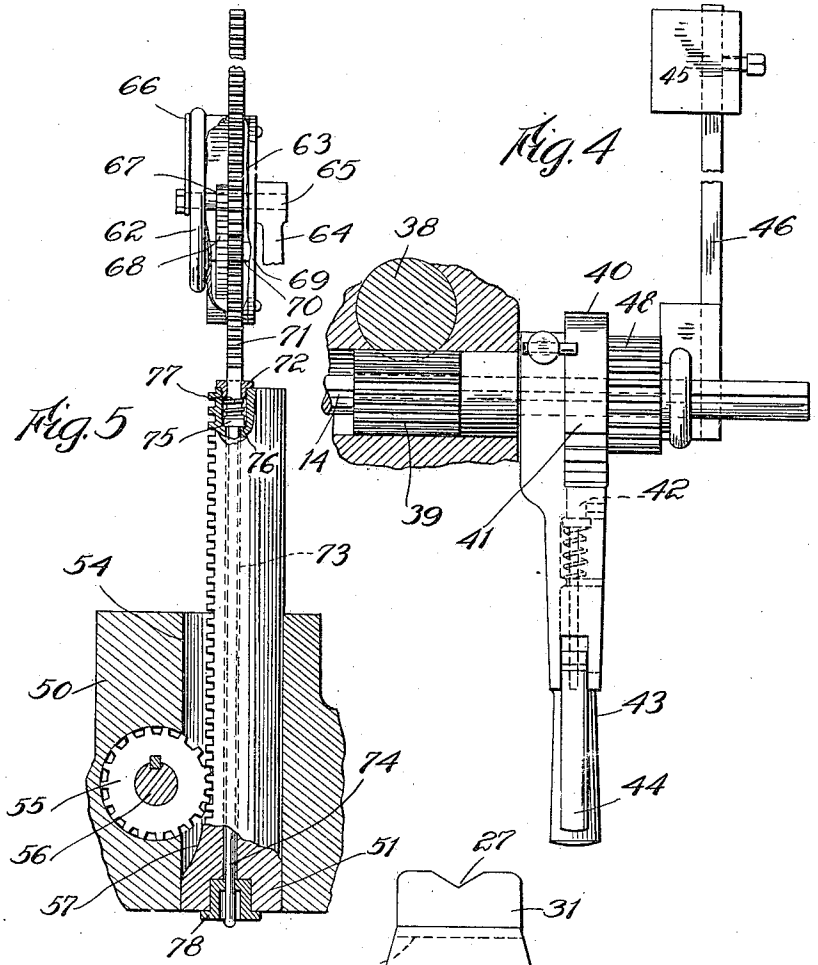

Fig. 6

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UNITED STATES PATENT OFFICE.

GUSTAF H. EKSTROM, OF ROCKFORD, ILLINOIS, ASSIGNOR TO ROCKFORD TOOL COMPANY, OF ROCKFORD, ILLINOIS, A CORPORATION OF ILLINOIS.

STRAIGHTENING MACHINE.

Application filed February 27, 1922. Serial No. 539,423.

To all whom it may concern:

Be it known that I, GUSTAF H. EKSTROM, a citizen of the United States, residing at Rockford, in the county of Winnebago and State of Illinois, have invented certain new and useful Improvements in Straightening Machines, of which the following is a specification.

This invention relates to straightening machines especially designed for removing buckles and kinks in shafting and tubing.

The principal object of this invention is to provide a machine which makes it possible to determine with facility the portion of the shaft or tube out of alinement, to then estimate accurately the extent of the disalinement, to bend the shaft or tube back into shape and thereupon finally to test the same to make certain that all portions thereof have been properly alined.

The invention provides furthermore a simple and comparatively inexpensive hand operated machine of this kind which embodies a well balanced construction and design that is economical to operate and maintain.

Other objects, advantages and uses of the invention will appear in the following detailed description.

Referring to the drawings, Figure 1 is a front elevation of the machine. Fig. 2 is an elevation of the right hand end thereof. Fig. 3 is a fragmentary enlarged vertical section of one of the vertically adjustable roller supports and is taken on line 3—3 of Fig. 1. Fig. 4 is a fragmentary enlarged horizontal section of the elevating mechanism employed in connection with the roller supports and is taken on line 4—4 of Fig. 2. Fig. 5 is a fragmentary enlarged vertical sectional detail of the indicating mechanism employed in connection with the ram of the machine and is taken on line 5—5 of Fig. 1. Fig. 6 is a fragmentary enlarged vertical transverse section taken on line 6—6 of Fig. 1 illustrating the relative positions of the work supporting anvils and the ram carriage on the bed of the machine, and Fig. 7 is an enlarged vertical sectional detail of the center releasing means provided on one of the stocks and is taken on line 7—7 of Fig. 1.

The same reference numerals designate the same parts in all views and the sectional details are all taken looking in the directions indicated by the small arrows in the various views.

The machine comprises a bed portion or base plate 10 supported on legs 11 at opposite ends. A headstock base 12 is mounted stationarily at one end of the bed 10 between the tracks 13 provided running lengthwise at the front and rear sides of the bed. A shaft 14 bears in this base and extends horizontally the length of the machine and is received in a tail stock base 15. The tail stock base is adjustable longitudinally toward and away from the headstock base and has bolts 16 by means of which it may be secured in adjusted position. Clamping plates in a T-shaped slot 17 in the bed of the machine or any other suitable means may be employed in connection with the bolts 16 to secure the base in position.

The bases 12 and 15 carry the head and tail stocks 18 and 19, respectively, in which are provided centers or spindles 20 and 21 respectively. The center 20 is longitudinally adjustable in an extension bearing 22 on the head stock and is arranged to be operated by a short hand throw lever 23 secured to a pin 24 mounted vertically in the bearing 22 in front of the center 20. A pinion 25 secured to the pin 24 meshes with rack teeth formed in the side of a collar 26 secured to the inner end of the center 20. In this way, work rotatably supported between the centers 20 and 21 may be removed without necessitating withdrawal of the tail stock 19 in the usual way. This is especially advantageous because the work after having been tested to determine the disalinement of portions thereof is removed and operated upon and replaced repeatedly in the process of straightening. The work is placed in V-

notches 27 in the anvil blocks 28 which, as illustrated in Fig. 6, are mounted between the tracks 13 and are arranged to be moved longitudinally and clamped in position by bolts 29 cooperating with plates 30 adjustable in the T-slot 17.

If desired, the notches or recesses 27 which center the work while supporting the same in the straightening operation, may be formed in removable buffer plates 31 suitably held in the transverse grooves 32 in the anvils by tongues provided on the nether sides of the plates. The plates 31 may also be provided in varying thicknesses to support the work adjacent the disalined portions without removing the same from between the centers. Shims or other expedients commonly employed for similar purposes are suitable for this purpose.

The stocks 18 and 19 each have anvil blocks or plates 33 notched similarly to the plates 31 and held in place on the stocks in a similar manner. These plates serve to support work to be straightened which is of too great length otherwise to be operated on by the machine or are used to support tubing which cannot conveniently be supported between the centers 20 and 21 without employing mandrels or the like or to support shafting such as automobile drive shafts which frequently do not have center holes or recesses in the ends thereof and so cannot conveniently be operated upon between the centers.

I prefer to employ in conjunction with the anvil plates 33 a pair of vertically adjustable roller supports 34 each of which comprises axially spaced roller disks 35 rotatable on pins 36 journaled in bearings 37 as illustrated in Fig. 3. The supports are mounted on cylindrical standards 38 which have rack teeth formed in one side thereof to mesh with pinions 39 keyed to the shaft 14. The pinion 39 which is employed in connection with the left-hand roller support shown in Fig. 1, has its key slidable in a keyway cut the length of the shaft 14 to permit adjustment of the tail stock lengthwise of the bed of the machine while at the same time maintaining a fixed relation between the roller supports so that they are elevated an equal degree simultaneously by simply rotating the shaft 14. The shaft 14 projects through the head stock base 12 and through a plate 40 fastened in a vertical position to the end of the bed of the machine as shown in Figs. 1 and 2. The plate 40 has a ratchet quadrant 41 formed thereon concentric to the shaft 14 as appears in Fig. 2. Arranged to engage in between the teeth of the ratchet is a spring pressed detent latch 42 operating in a dished portion in the side of a hand elevating lever 43. The latch 42 is adapted to be withdrawn in the usual manner by depressing a hand piece 44 when moving the lever 43. The lever 43 is secured to the shaft 14 at its inner end and so rotates the same as it is swung around the quadrant 41 as just described. A counterweight 45 is adjustable lengthwise of a lever 46 which at its inner end is fastened securely to the side of a gear 47 rotatable on a stud on the plate 40. The gear 47 is arranged to rotate a gear 48 keyed to the shaft 14. By virtue of this arrangement the roller supports 34 are simultaneously elevated an equal degree when the operator releases the latch 42 from the ratchet quadrant 41 and permits the lever 43 to swing. The weight 45 is capable of adjustment so that it overcomes the resistance of the bearings and is sufficient of itself to rotate the shaft 14 to elevate the supports 34.

When so desired, the gear 48 may be moved out away from the plate 40 so that the shaft 14 is no longer subject to operation by the weight 45 which, under these conditions, swings to a downwardly projecting position in an obvious manner.

I shall now proceed to describe the means employed for exerting a loading stress transverse to the longitudinal axis of the work to bend disalined portions thereof into alinement. A carriage 50 which is movable along the tracks 13 the length of the machine supports a ram 51 which is operable vertically to straighten out buckles and kinks in work placed beneath it on the supports. As shown in Fig. 2, the carriage straddles the bed 10 of the machine and is provided with shoulders 52 on the free ends of the parallel legs thereof which engage beneath the tracks, the lower ends of the legs of the carriage being bifurcated as shown in Fig. 1 to prevent the carriage from rocking. Being rigid the carriage can be moved endwise of the machine bed with little effort. Rollers 53 are carried on pins 54 in the legs of the carriage to roll on the tracks 13 with a minimum of friction. The rollers 53 it will be seen support the carriage as it is moved along the bed and the shoulders 52 serve as abutments to take up the upward thrust of the carriage incident to the operation of the ram 51. The ram 51 is disposed centrally in the carriage in a cylindrical bore 54. A pinion 55 keyed to a horizontal shaft 56 in the upper end of the carriage frame meshes with rack teeth cut in a flat 57 formed on one side of the cylindrical ram 51. The shaft 56 carries a worm gear 58 at its outer end which meshes with a worm 59 on a shaft 60 which is adapted to be turned by a hand wheel 61 at the front of the machine. In this way the rotation of the wheel 61 through a considerable arc causes reciprocatory movement of the ram 51 through a comparatively small space but of course with a proportionately greater force.

An indicator dial 62 is mounted to rotate

on the front of a casing 63 supported by a bracket 64 on top of the carriage 50. The dial 62 preferably rotates with respect to a dial shaft 65 which carries an index needle 66. A pinion 67 is secured to the dial shaft and meshes with a gear 68, of four times its diameter, which is rotatably mounted in the casing on the shaft 65. A pinion 70 of the same size as pinion 67 meshes with a rack 71 which projects vertically through the casing 63 and terminates at its lower end in a cylindrical portion slidable in a bushing 72 threaded in the upper end of an axial bore 73 in the ram 51. A follower rod or feeler 74 is threaded into the cylindrical end of the rack 71 just below a collar 75 secured thereto and resting on a seat 76 at the enlarged upper end of the bore 73. A coiled tension spring 77 acts between the bushing 72 and the collar 75 normally to hold the free end of the follower rod or feeler 74 yieldingly in the position shown in Fig. 5 wherein it projects from a button or bushing guide 78 on the bottom of the ram 51. It is apparent that the rod 74 may be moved downwardly to the work by lowering the ram 51 in the manner previously described. The spring 77 ensures an even pressure of the rod to the work so that the movements of the rack faithfully indicate the presence of buckles and kinks as well as the extent to which these portions are out of alinement. The dial 62 must be reset to zero each time that the ram has been lowered or raised because under each of these conditions the rack bears a different relation to the casing 63 and hence the train of gears therein interposed between it and the dial shaft 65.

The machine is designed to be used in the following manner: The work is mounted between the centers 20 and 21 or on the roller supports 34 which are at the time disposed in elevated relation. The mounting of the work will be determined largely by convenience and by the characteristics of the particular work in hand. Ordinarily, however, shafting having recesses or center holes in its ends and which does not extend beyond the limits of the machine, may be mounted between the centers 20 and 21. The anvil blocks 28 will then be utilized in the straightening operations. When operating on tubing, or shafting which has no center holes or recesses in the ends to fit the centers or spindles 20 and 21, the roller supports 34 are employed in testing. These supports, of course, will be used invariably where the work is too long to be mounted between the centers. When the roller supports are used in testing, the anvil plates on the stocks 18 and 19 are used in the straightening operation. In either instance, the work having the buckles or kinks is mounted in the machine and rotated in any convenient manner as, for example, by whirling the same by hand where this is practicable. The operator takes note of the portions out of alinement and may suitably designate these portions as, for example, by chalking the same. He then moves the carriage 50 adjacent one of these portions and lowers the ram 51 so that the follower rod or feeler 74 just engages the work. He then sets the dial 62 so that the needle 66 indicates zero deflection. The carriage is then moved so that the follower rides on the disalined portion whereupon the needle will be oscillated and will indicate a certain maximum deflection. This deflection is the significant figure of which the operator takes note. The work is then ordinarily removed from its rotatable support and placed on the anvils, one being disposed on each side preferably almost adjacent the limits of the portion out of alinement to avoid the possibility of forming a bow in the work when the ram is operated to press on the work. Also, when the work is so supported there can be little tendency for the work to rotate so that the outer side of the buckle or kink cannot move where it will be on the nether side away from the ram. The hand wheel 61 is turned to operate the ram 51 to stress the work to what the operator considers the proper degree consistent with the deflection of the needle which he previously noted. The work is then replaced in its rotatable support and the result of the straightening operation is carefully checked and any deflection of the needle carefully compared with the previous deflection before the work is subjected to a further bending stress. In this way a series of operations are repeated until all buckles and kinks in the work have been removed.

The invention is not to be considered as residing in the mere details of construction hereinbefore described. In the appended claims, it is aimed to embrace variations not involving a departure from the general trend of the invention and which would readily occur to one skilled in the art to which this invention relates.

I claim as my invention:

1. The combination of a stationary head stock, a tail stock movable toward and away from said head stock, said stocks having centers for supporting work to be rotated therebetween, anvil blocks for stationarily supporting the work taken therefrom, roller supports for the work adjacent said stocks adjustable vertically with respect thereto, and anvil plates on said stocks for stationarily supporting the work taken from said roller supports, a ram for exerting a loading stress transverse to the longitudinal axis of the work, a carriage movable between said stocks to support said ram, means on said carriage projecting from said ram to

determine the extent of disalinement in the work, and manually operated means for actuating said ram.

2. In a straightening machine, the combination with straightening means of a stationary work support, a rotatable work support, and means tending normally to move one support vertically past the other to assume the support of the work, comprising a lever, a counterweight thereon, and detent means normally holding said lever in adjusted position.

In testimony whereof, I have hereunto set my hand.

GUSTAF H. EKSTROM.