Nov. 23, 1943. W. SIEGERIST 2,334,886

MACHINE FOR STRAIGHTENING, SIZING, AND POLISHING TUBES AND RODS

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Fig. 1.

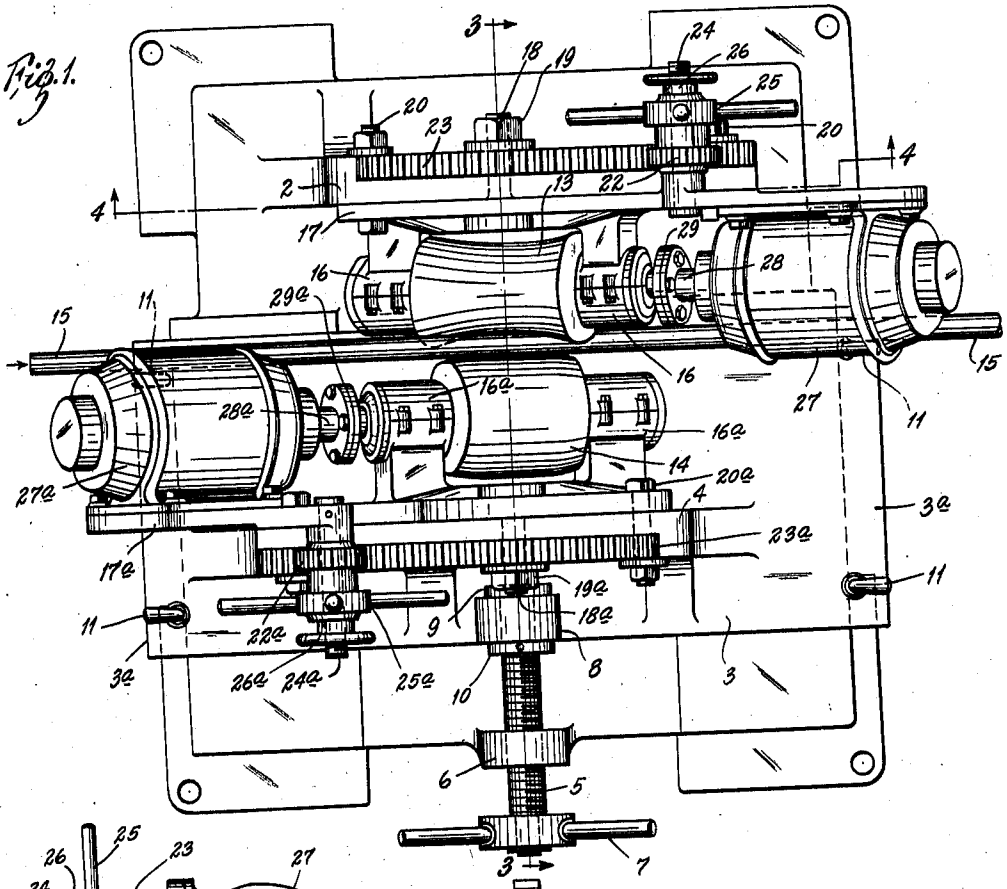
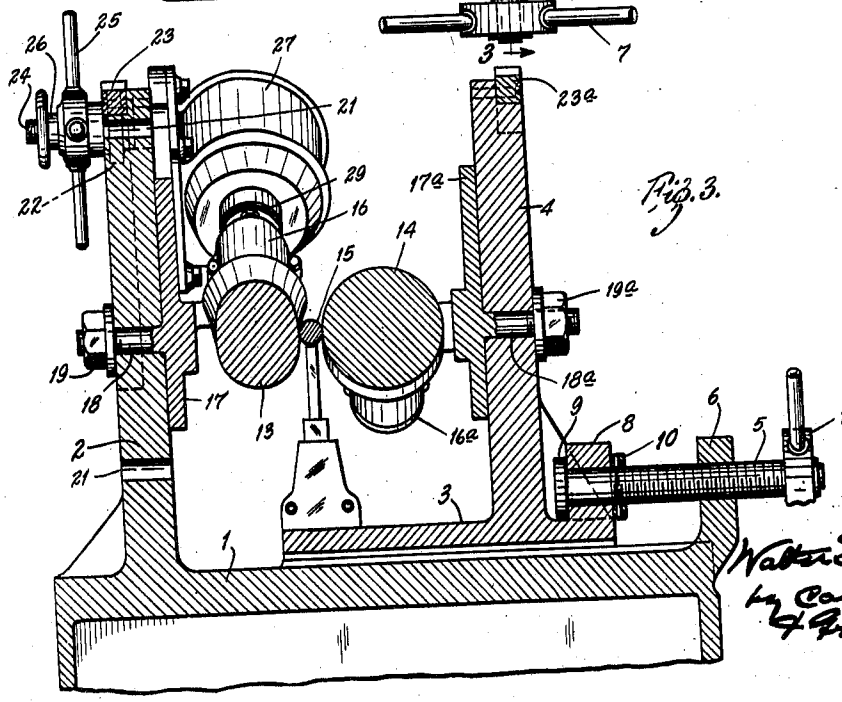


Fig. 3.



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Fig. 2.

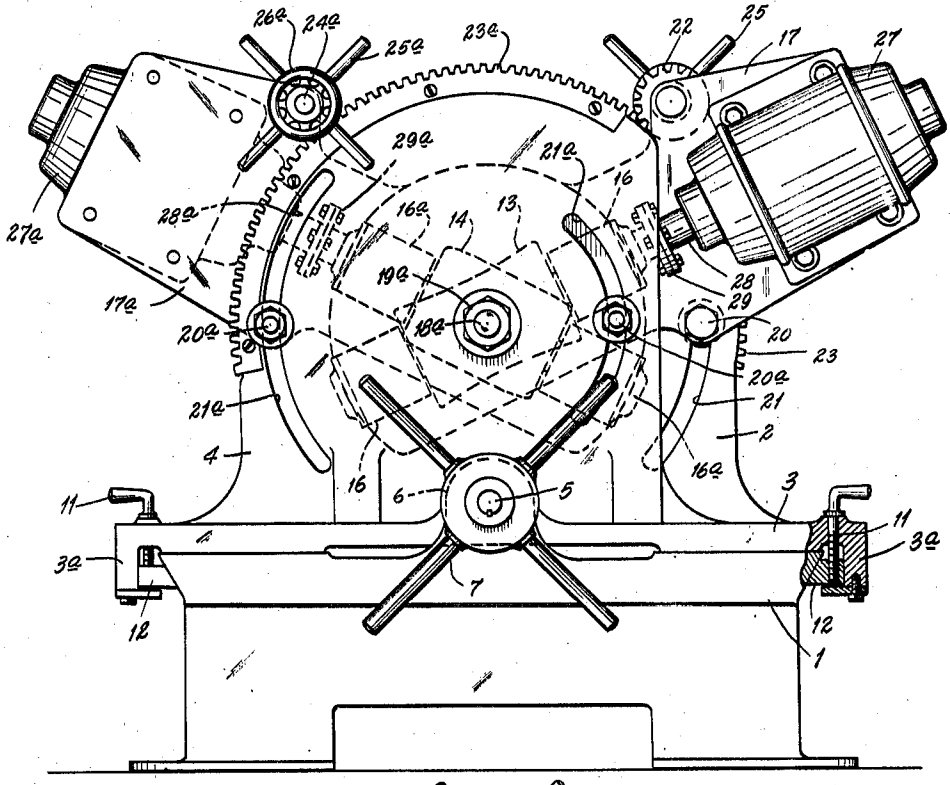
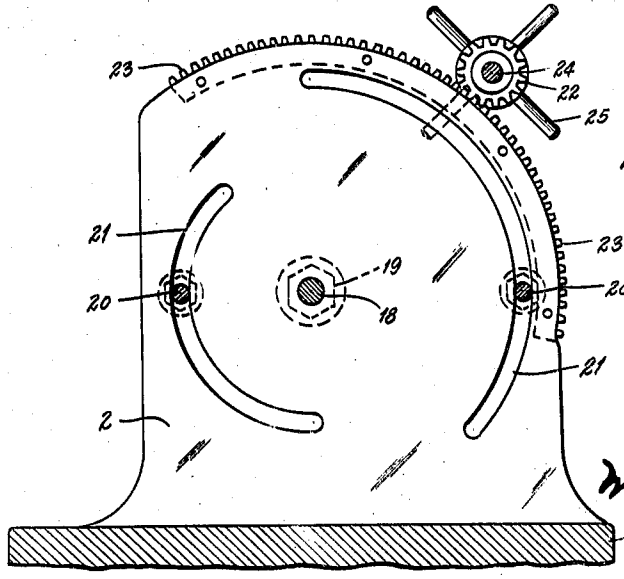


Fig. 4.



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MACHINE FOR STRAIGHTENING, SIZING, AND POLISHING TUBES AND RODS

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Fig. 5.

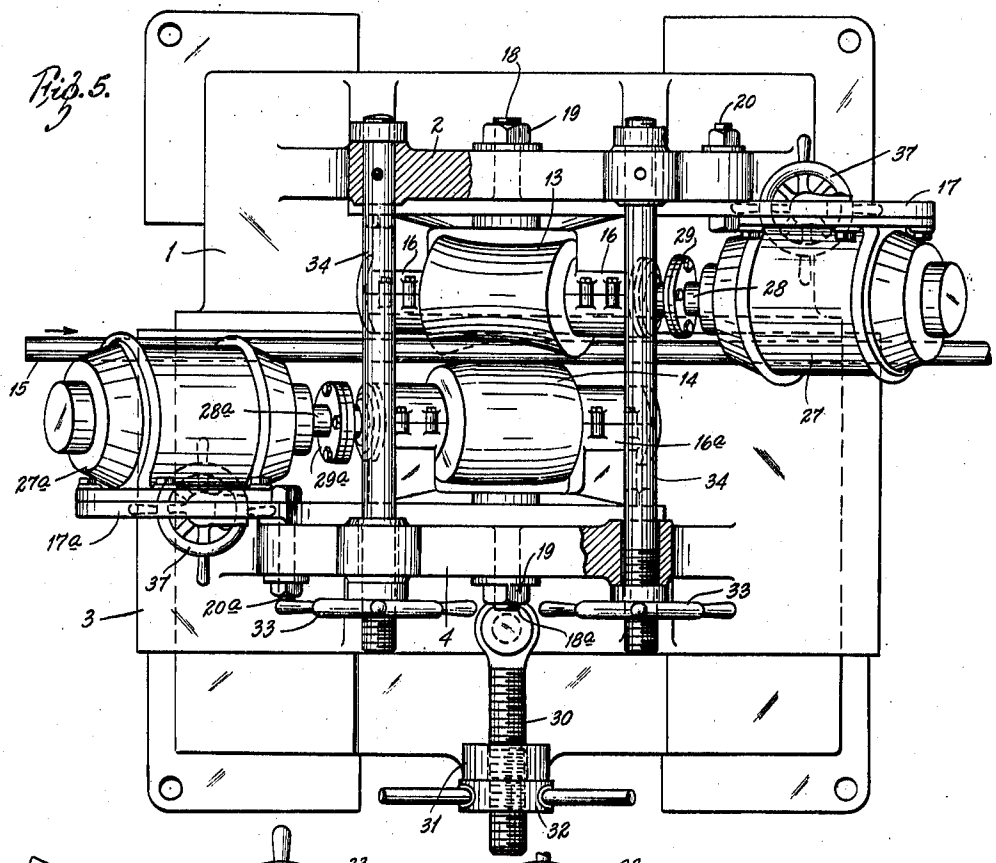
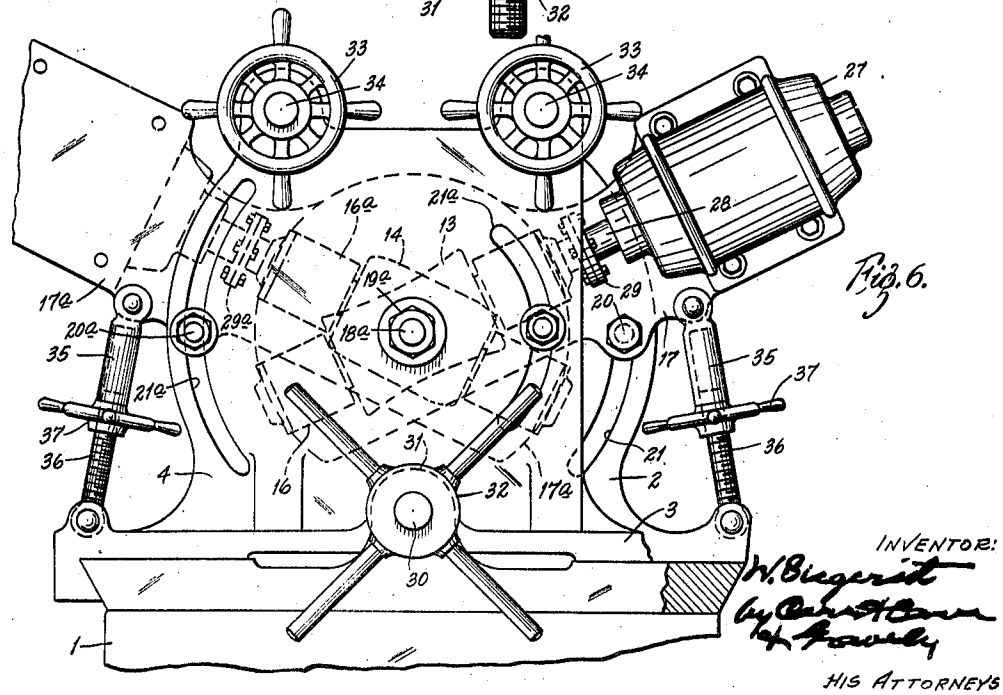


Fig. 6.



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Fig. 7.

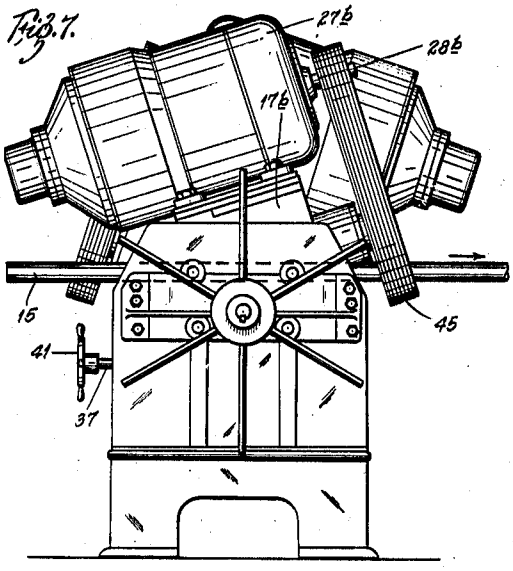


Fig. 8.

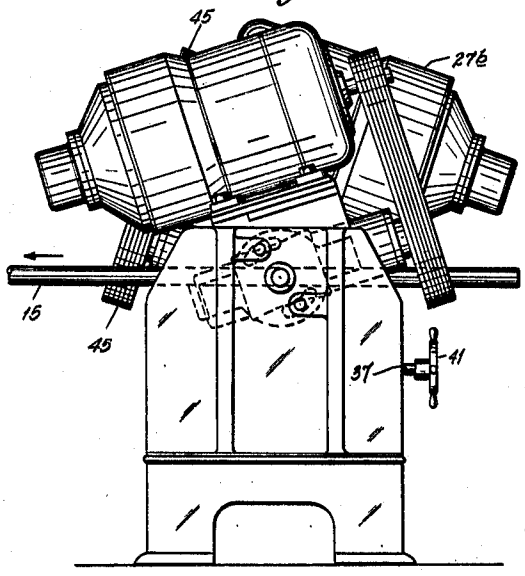
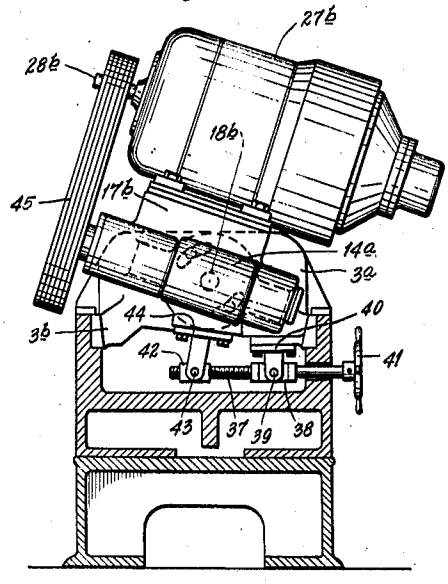


Fig. 9.



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Patented Nov. 23, 1943

2,334,886

UNITED STATES PATENT OFFICE

2,334,886

MACHINE FOR STRAIGHTENING, SIZING, AND POLISHING TUBES AND RODS

Walter Siegerist, University City, Mo.

Application March 19, 1941, Serial No. 384,068

5 Claims. (Cl. 80—13)

This invention relates to machines of the kind wherein round stock, such as tubes, rods, shafts and the like, is drawn between and straightened, sized and polished by laterally spaced, power-driven work rolls that are disposed at an angle to each other and are adjustable to vary the angularity and spacing thereof for stock of different diameters. Such adjustments have heretofore required the use of universal joint connections between the work rolls and the driving shafts therefor. Practical objections to this type of work roll drive are that it causes a variation in the angular velocity of the work roll during each single revolution thereof, which is objectionable in polishing and sizing operations; it requires the machine to be operated at a low speed and thus limits the output thereof; it limits the adjustments for changing the work angle and the spacing of the work rolls and thus requires machines of different sizes to cover a wide range of stock diameters; and it requires removal of the work rolls from the machine when the rolls require dressing or regrinding.

The principal object of the present invention is to devise a machine of the above type that will overcome all of the disadvantages herebefore referred to, that will provide for rotating the work rolls at the same speed and that will provide for simplicity and cheapness of construction and compactness of design.

The invention consists in the machine and in the construction, combinations and arrangements of parts hereinafter described and claimed.

In the accompanying drawings, which form part of this specification and wherein like symbols refer to like parts wherever they occur,

Fig. 1 is a plan view of a machine embodying my invention,

Fig. 2 is an end elevation of said machine,

Fig. 3 is a central vertical longitudinal section through said machine on the line 3—3 in Fig. 1,

Fig. 4 is a vertical transverse section through said machine on the line 4—4 of Fig. 1,

Fig. 5 is a plan view illustrating a machine of modified construction,

Fig. 6 is an end elevation of the machine shown in Fig. 5,

Fig. 7 is an end elevation of another machine of modified form,

Fig. 8 is a view looking at the opposite end of the machine shown in Fig. 7, and

Fig. 9 is a vertical transverse section through said machine between the work rolls thereof, showing one of the work rolls, the driving means therefor and the means for adjusting the angularity thereof in elevation.

The machine shown in Figs. 1 to 4, inclusive, of the accompanying drawings, comprises a bed 1 having a pedestal 2 at the rear end thereof, a carriage 3 slidable on said bed and having a pedestal 4, and a central longitudinal feed screw 5 for moving said carriage longitudinally of said bed toward and from the pedestal 2. As shown in the drawings, the carriage feed screw 5 is threaded through an upstanding lug 6 at the forward end of the bed 1. The screw 5 is manually rotated by a hand wheel 7 at the forward end thereof; and the rear end of said screw has a rotary but non-axial sliding connection with the forward end of said carriage, said connection comprising an upstanding lug 8 on the carriage 1, a hole through said lug for said screw, a head 9 on said screw disposed in abutting relation to the rear face of said lug, and a thrust collar 10 pinned on said screw in abutting relation to the front face of said lug. The carriage 3 is locked to the bed 1 in its desired position of sliding movement thereon by means of lock screws 11 on each side thereof. Each of these lock screws extends downwardly through a vertical opening provided therefor in the carriage that has its lower end threaded into a vertical opening provided therefor in a clamping block 12 that is disposed between the side of the bed 1 and the overhanging side flange 3a of said carriage and has a beveled inner side face adapted to bear against a correspondingly beveled side face of said bed.

Disposed crosswise of the machine between the pedestal 2 on the bed 1 and the pedestal 4 on the carriage 3 are two laterally spaced, oppositely inclined power-driven work rolls 13 and 14 between which the round stock or work piece 15 is straightened, sized and polished. In accordance with common practice, the work roll 13 is longitudinally concave, while the other work roll 14 is substantially cylindrical. The work roll 13 has reduced end portions that are journaled in spaced outstanding bearings 16 provided therefor on the exposed face of a vertically disposed plate 17 whose opposite face seats against the front face of the pedestal 2 of the bed 1 and has an outstanding stud 18 rotatably supported in a horizontal opening or bearing provided therefor in said pedestal. The roll supporting plate 17 is rigidly clamped flatwise to the front face of the pedestal 2 by a nut 19 on the end of the pivot stud 18 and by bolts 20, each of which extends through an arcuate slot 21 formed in said pedestal concen-

tric with said pivot stud and through a hole formed in said supporting plate in alinement with said slot.

When the nut 19 and bolts 20 are loosened, the roll supporting plate 17 may be rotatably adjusted about the axis of its pivot stud 18 to vary the angularity of the roll 13 carried by said plate. The means for turning said plate about its rotary axis preferably comprises a pinion 22 that intermeshes with an arcuate rack 23 located at the perimeter of said plate concentric with said axis. The pinion 22 is rotatably supported on a horizontal stud 24 that projects rearwardly from the roll supporting plate 17 across the top of the pedestal 2. The pinion has a hand wheel 25 rigid therewith and is held on the stud 24 by means of a nut 26 that is threaded on the outer end of said stud. The work roll 13 is driven by means of an electric motor 27 that is bolted to the roll supporting face of the rotary plate 17 with its armature shaft 28 secured to one end of said roll in axial alinement therewith by means of a suitable coupling 29.

The cylindrical work roll 14 is supported on the pedestal 4 of the carriage 3 and is driven and angularly adjusted in the same manner as the concave work roll 14. Thus, the cylindrical roll 14 has reduced end portions journaled in the bearings 16*a* provided therefor on a supporting plate 17*a* having a pivot stud 18*a* journaled in a horizontal bearing provided therefor in the pedestal 4 of the carriage 3. The plate 17*a* is held in position on the pedestal 4 by means of a nut 19*a* on the pivot stud 18*a* of said plate and by means of bolts 20*a* that pass through arcuate slots 21*a* in said pedestal. The plate 17*a* is rotated about its pivotal axis by means of a pinion 22*a* journaled on a stud 24*a* fixed to said plate; and said pinion meshes with an arcuate rack 23*a* on the pedestal 4 and has a hand wheel 25*a* rigid therewith and is held on said stud by a nut 26*a*. The work roll 14 is driven by an electric motor 27*a* that is bolted to the roll supporting plate 17*a* with its armature shaft 28*a* disposed in axial alinement with the roll axis and secured to one end of the roll by means of a suitable coupling 29*a*. As shown in the drawings, the electric motor 27 is secured to one end of the concave roll 13 while the electric motor 27*a* is secured to the other end of the cylindrical roll 14, whereby the two rolls are driven in opposite directions.

By the arrangement described, the hand wheel 7 may be operated to slide the carriage 3 along the bed 1 and thus move the cylindrical roll 14 carried by said carriage toward or from the concave roll 13 to thereby vary the spacing of said rolls for stock of different diameters. The rolls 13 and 14 are then set at the proper working angle to the stock by manipulating the hand wheels 25 and 25*a*, after which said rolls are locked in the desired position of angular adjustment by means of the nuts 19 and 19*a* and the nuts 20 and 20*a*. The arcuate slots 21 and 21*a* in the roll supporting plates 17 and 17*a*, respectively, are long enough to permit the desired angular adjustment of the rolls. The arcuate slots 21*a* also permit the straight roll 14 to be placed in a horizontal position so that it can be reground or dressed in place with a portable grinding device; and the arcuate slots 21 permit the concave roll 13 to be placed in a vertical position for regrinding or dressing with the same portable grinding device. Ample space for the grinding device is provided by adjusting the cylindrical roll 14 away from the concave roll 13. Each work roll and the driving motor therefor are mounted for joint pivotal movement as a unit about the pivotal axis of the supporting plate therefor, whereby said roll and motor are in the same relative position in all positions of angular adjustment of said roll and the roll is driven at a uniform angular velocity in all positions of such adjustment. Both work rolls may also be driven at the same constant speed by matched speed induction type alternating current motors, by direct current variable speed motors with their field windings in series for simultaneous speed regulation, by variable speed alternating current motors wherein the speed regulation is arranged to keep the two motors in synchronism, or by synchronous alternating current motors for obtaining absolute synchronism at constant speed.

Figs. 5 and 6 illustrate a modification which is similar to the construction hereinbefore described except for the arrangement for adjusting the carriage 3 and the arrangement for turning the roll supporting plates 17 and 17*a* on their pivotal axes. The modified carriage operating mechanism comprises a horizontal screw 30 that is threaded through a lug 31 on the bed 1 and has its rear end secured to the front end of the carriage 3. The front end of the screw 30 has a hand wheel 32 threaded thereon adapted to bear against the front face of the lug 31 and force said screw and the carriage 3 to move forwardly along the bed 1. The carriage 3 is moved rearwardly by two hand wheels 33, each of which is threaded on a horizontal rod 34 having one end fixed to the pedestal 2 of the bed 1 and the other end slidably supported in horizontal openings provided therefor in the pedestal 4 of the carriage 3. The hand wheels 33 bear against the front face of the pedestal 4 of the carriage 3 and, when rotated in the proper direction, force said carriage rearwardly in the direction of the pedestal 2 of the bed 1. The modified arrangement for turning each of the roll supporting plates 17 and 17*a* on its pivotal axis comprises a link having an upper section 35 pivoted at its upper end to pedestal 2 or 4 and a lower section 36 pivoted at its lower end to the bed 1 or carriage 3 with its upper end slidable in an axial socket provided therefor in the lower end of said upper section. The lower link section 36 has a hand wheel 37 threaded thereon adapted to abut endwise against the lower end of the upper link section 35. By this arrangement, the link is lengthened or shortened by turning the hand wheel 37, thereby causing the roll supporting plate controlled thereby to rotate on its pivotal axis.

In the modification shown in Figs. 7, 8 and 9, the motor and roll supporting plate 17*b* is pivotally secured to the carriage 3*b* in the manner hereinbefore described and is rotated on its axis to vary the working angle of the roll by means of a horizontal screw 37 that is disposed transversely of said axis and is threaded through a block 38 that is supported on horizontal pivots 39 in a bracket 40 fixed to the underside of said carriage. The outer end of the screw 37 has an operating handle 41 rigid therewith, and the inner end of said screw has a sleeve nut 42 threaded thereon that is connected by horizontal pivots 43 to a bracket 44 fixed to the bottom of the roll supporting plate. By this arrangement, the screw 37, when rotated, causes the sleeve 42 to travel axially thereof and thus rotate the supporting plate 17*b* on its supporting stud 18*b* to change the angular position of the work

roll 14a carried by said plate. A similar arrangement, not shown, is employed for adjusting the angular position of the other work roll of the machine. In the modification shown in Figs. 7, 8 and 9, the motor 27b for driving the roll 14a is mounted above said roll on the supporting plate 17b therefor; and the armature shaft 28b of said motor is connected to the roll by means of an endless sprocket chain 45. This arrangement reduces the overall width of the machine and thus adapts the machine for installation wherein the floor space is limited.

Obvously, modifications may be made without departing from the invention. Therefore, I do not wish to be limited to the precise construction shown and described.

What I claim is:

1. A machine of the kind described comprising two rotary work rolls inclined oppositely to each other in spaced parallel vertical planes and adapted to receive round stock therebetween, separate electric motors for driving the respective rolls, a single support for one of said rolls and the driving motor therefor, a single support for the other roll and its driving motor, said supports being mounted in said machine for independent rotary movement through a wide angle about a common horizontal axis disposed at right angles to and intersecting the rotary axes of said rolls, separate means for turning each support on its axis, the turning means for one of said supports including a shaft disposed at right angles to the pivotal axis of said support, a bearing for said shaft mounted for pivotal movement on an axis disposed transverse to said shaft, a sleeve nut threaded on said shaft and pivoted to said support on an axis crosswise of said shaft, and means for bodily adjusting said last mentioned support and the turning means therefor towards and away from the other support.

2. A machine of the kind described including a frame, comprising two rotary work rolls inclined oppositely to each other, a single support for each of said rolls, a member mounting each support on said frame, the rolls lying in spaced parallel vertical planes and adapted to receive round stock therebetween, separate electric motors for driving the respective rolls mounted on said supports, each roll and driving motor therefor being mounted on their respective supports with their axes rigidly affixed in the same plane, the rolls and motors being so coupled that each roll is driven with uniform angular velocity, said supports being mounted in said machine for independent rotary movement through a wide angle about a common horizontal axis disposed at right angles to and intersecting the rotary axes of said rolls, separate means for turning each support on its axis, the member mounting one of said supports and its turning means being mounted on said machine for bodily adjustment horizontally towards and away from the other support, and linear guide means on said machine engaging last mentioned member and extending parallel to the axis of rotation of said supports, whereby to maintain the rotary axes of said rolls in parallel planes.

3. The combination claimed in claim 2, the member mounting the other of said supports, being rigidly affixed on said machine.

4. The combination claimed in claim 2, the separate means for turning each support on its axis including a rack on the adjacent support and a pinion journaled on the adjacent member.

5. The combination claimed in claim 2, the separate means for turning said one support comprising a telescopic link having a section pivoted to said member, another section pivoted to said support, and a member threaded on one of said sections in end-wise abutting relation to the other section.

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