L. R. HEIM.

ROLL GRINDING MACHINE.

APPLICATION FILED MAR. 6, 1915.

1,210,937.

Patented Jan. 2, 1917.

4 SHEETS—SHEET 1.

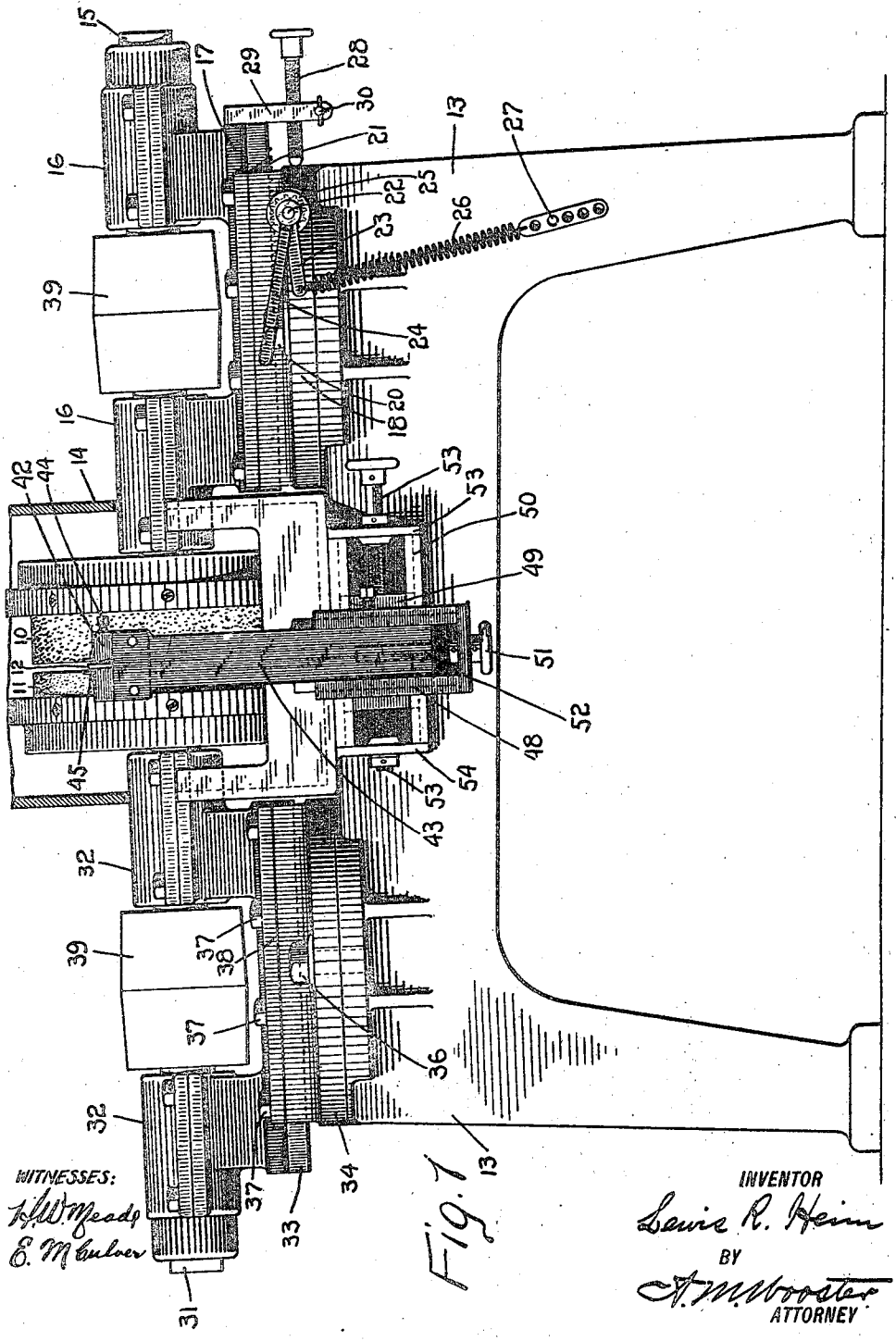


Fig. 1.

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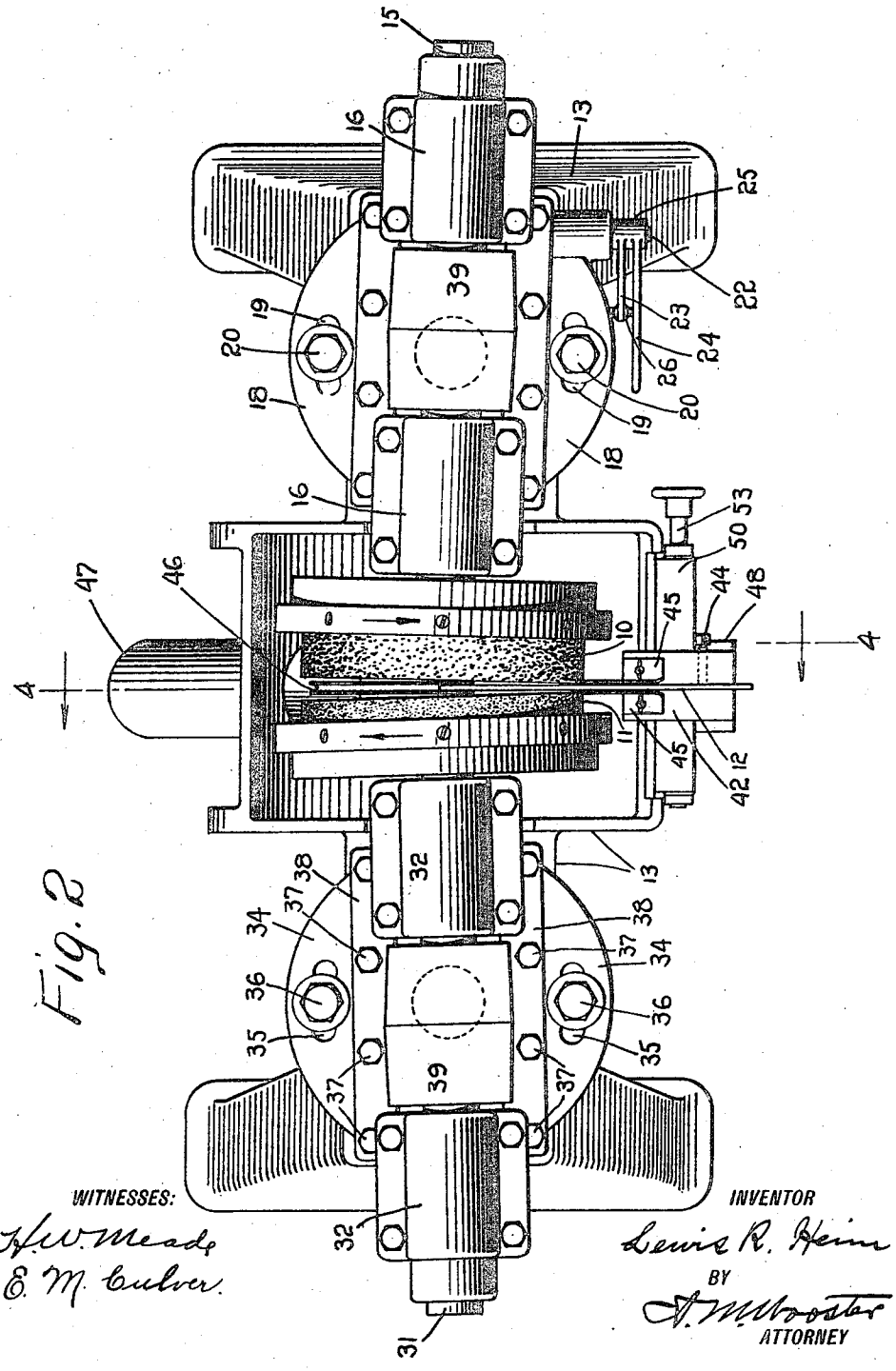


Fig. 2

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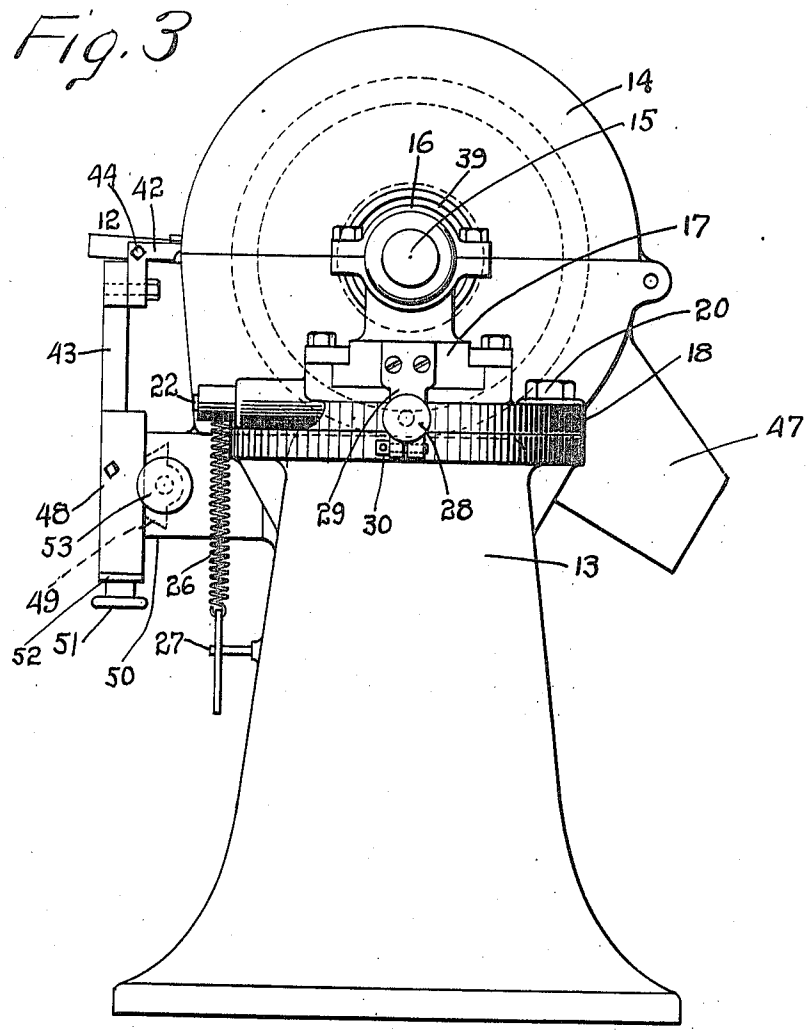
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4 SHEETS—SHEET 3.

Fig. 3



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4 SHEETS—SHEET 4.

Fig. 4

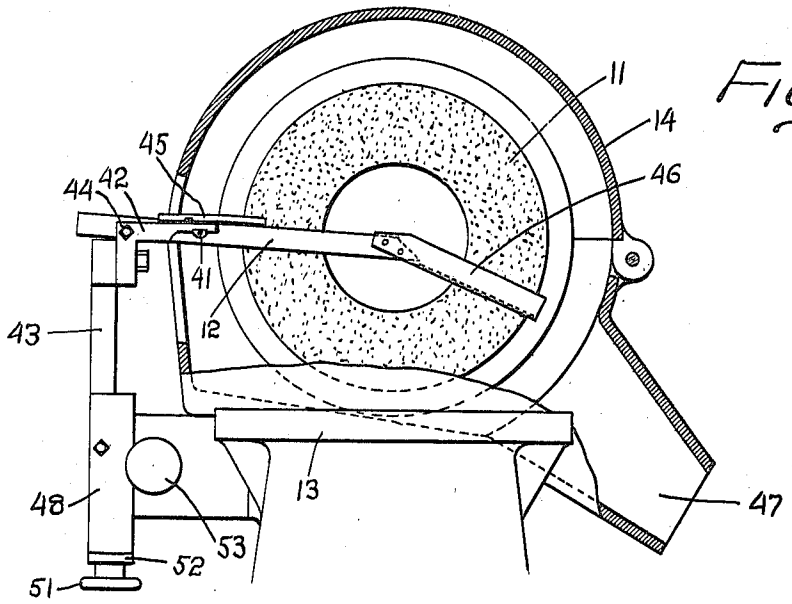


Fig. 5

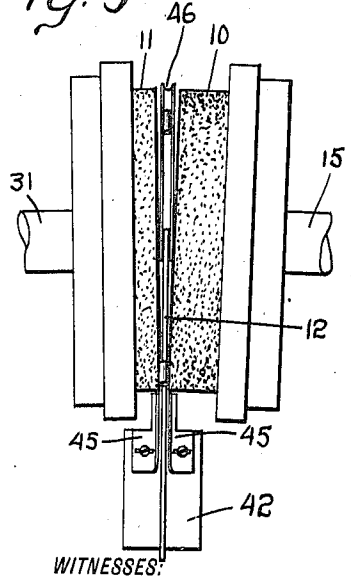
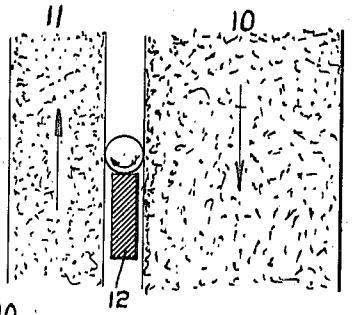


Fig. 6



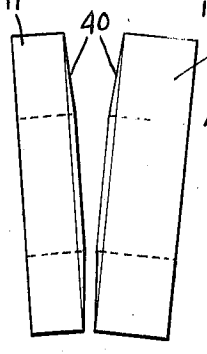


Fig. 7

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UNITED STATES PATENT OFFICE.

LEWIS R. HEIM, OF DANBURY, CONNECTICUT, ASSIGNOR TO THE BALL AND ROLLER BEARING COMPANY, OF DANBURY, CONNECTICUT, A CORPORATION OF CONNECTICUT.

ROLL-GRINDING MACHINE.

1,210,937. Specification of Letters Patent. Patented Jan. 2, 1917.

Application filed March 6, 1915. Serial No. 12,524. REISSUED

To all whom it may concern:

Be it known that I, LEWIS R. HEIM, a citizen of the United States, residing at Danbury, county of Fairfield, State of Connecticut, have invented an Improvement in Roll-Grinding Machines, of which the following is a specification.

This invention has for its object the production of a novel method of grinding rolls and of a machine for carrying my novel method into effect. With these objects in view I have devised the novel method and machine which I will now describe, referring to the accompanying drawings forming a part of this specification and using reference characters to indicate the several parts.

Figure 1 is a front elevation of the machine complete; Fig. 2 a plan view; Fig. 3 an end elevation as seen from the right in Figs. 1 and 2; Fig. 4 a view partly in elevation and partly in section on the line 4—4 in Fig. 2, looking in the direction of the arrows; Fig. 5 a detail plan view illustrating the operation of grinding rolls; Fig. 6 a detail elevation on an enlarged scale, as seen from the left in Fig. 4, also illustrating the grinding operation, and Fig. 7 is a diagrammatic view illustrating operative wheels having their contiguous faces formed with a slight bevel.

The essentials are a grinding wheel having a relatively high surface speed, a carrier for the rolls to be operated upon and a wheel moving in the opposite direction and having a relatively low surface speed, the action of which is to cause constant and uniform rotation of the rolls while being operated upon, at a much lower surface speed than the grinding wheel. This wheel I term the regulating wheel for the reason that it regulates the speed at which the rolls rotate while being operated upon.

10 denotes the grinding wheel, 11 the regulating wheel having a suitable holding surface, 12 the carrier, 13 the framework of the machine and 14 a hood which incloses the grinding and regulating wheels which for convenience I will term the operative wheels. The grinding wheel is carried by a shaft 15 journaled in boxes 16 on a slide 17 adjustable longitudinally on a circular plate 18 which rests upon the frame-work and has oscillatory adjustment in a plane that is approximately horizontal. Plate 18 is provided with curved slots 19, and bolts 20 passing through these slots and engaging the frame-work, lock the plate, slide, shaft and grinding wheel at any required adjustment in a plane that is approximately horizontal. The slide is adapted to reciprocate in ways upon plate 18 and is provided on its under side with a rack 21. This rack is engaged by a pinion, see dotted lines in Fig. 1, on a transverse shaft 22 journaled in plate 18. An arm 23 and a lever 24 extend from a hub 25 on shaft 22. A spring 26 connected to the arm and detachably connected to a pin 27 extending from the frame-work acts to move the slide, shaft and grinding wheel inward. The tip of an adjusting screw 28 in a bracket 29 depending from the slide bears against the edge of the plate and limits the inward movement of the slide and parts carried thereby. The lever is used to rotate the transverse shaft and move the slide and parts carried thereby outward against the power of the spring, or if preferred the spring may be disconnected from the pin. The lower end of the bracket is split and the parts thereof are drawn together to lock the adjusting screw against rotation, after the adjustment of the slide and parts carried thereby has been determined, by a clamping screw 30.

The regulating wheel is carried by a shaft 31 journaled in boxes 32 on a slide 33 adjustable longitudinally on a circular plate 34 which rests upon the frame-work and has oscillatory adjustment in a plane that is approximately horizontal. Plate 34 is provided with curved slots 35 and bolts 36 passing through these slots and engaging the frame-work lock the plate, slide, shaft 31 and the regulating wheel at any required adjustment, in a plane that is approximately horizontal. Up to this point the means for for carrying and adjusting the regulating wheel is identical with the means for carrying and adjusting the grinding wheel. The slide is adapted to reciprocate in the ways upon plate 34, but the rack and pinion for reciprocating it is omitted. This ad-

justment will seldom have to be made so in practice the slide and parts carried thereby may be locked in place in any convenient manner, as by causing bolts 37 to clamp cap plate 38 forming part of plate 34 down tightly upon the base of the slide. In practice plates 18 and 34 are preferably provided with trunnions, indicated by dotted lines in Fig. 2, which engage holes in the frame-work and provide a fixed center of oscillation for the plates. The shafts 15 and 31 are rotated at different speeds, the grinding wheel shaft being rotated at a relatively high speed and the regulating wheel shaft at a relatively low speed, by means of belts, not shown, passing over pulleys 39 shown as lying between the boxes in which the respective shafts are journaled.

It will be noted in Fig. 2 that shafts 15 and 31 are set slightly obliquely to each other so that the contiguous faces of the operative wheels lie closer together upon one side than upon the other and it will be noted in Fig. 1 that the right end of the machine is appreciably higher than the other, so as to place the operative faces of the wheels slightly obliquely to the vertical plane, the regulating wheel being on the relatively low side.

The object in setting the axes of the operative wheels obliquely to each other is to provide space between the wheels for the removal of the rolls after they have been ground. As shown in Fig. 2, both shafts are set slightly obliquely to the central longitudinal line of the machine. This requires that the faces of both the grinding wheel and the regulating wheel be beveled, as at 40, see Fig. 7, so as to provide parallel operative surfaces. The same result would be accomplished, however, by setting one of the shafts, for example the grinding wheel shaft, longitudinally of the machine, and setting the other shaft obliquely. This would require beveling the face of the regulating wheel only. Briefly then, either or both of the shafts may be set obliquely and either or both of the operative wheels must be beveled to correspond with the adjustment of the shafts, which is simply a matter of loosening bolts 20 and 36 and turning plates 18 and 34 to the required position and then tightening up the bolts again. The distance between the operative wheels may be regulated to provide for the grinding of different sized rolls by longitudinal adjustment of slides 17 and 33, more especially slide 17, as already explained.

The object in making one end of what may be termed the bed of the machine higher than the other so as to slightly tilt the operative surfaces of the wheels relatively to the vertical plane, is to utilize gravity to throw the weight of the rolls while being operated upon against the regulating wheel, the grinding wheel being always placed upon the relatively high side and the regulating wheel upon the relatively low side. This feature of construction is of importance in that partly throwing the weight of the rolls against the regulating wheel insures constant and uniform rotation of the rolls thereby and is an aid in securing perfect and uniform grinding of the rolls, scratching of the rolls and the grinding of flats thereon being wholly prevented. The rolls to be operated upon may be fed to the machine in any ordinary or preferred manner. In the present instance I have shown carrier 12 pivoted, as at 41, in a slot in a block or body 42 (shown as substantially in the form of an inverted L) which is bolted or otherwise secured to a standard 43 having both vertical and lateral adjustment. The carrier is locked at the most convenient degree of inclination for feeding the rolls by means of a set screw 44.

45 denotes guides for the rolls which are ordinarily made of sheet metal and are secured to the body on opposite sides of the carrier. After passing the operative faces of the wheels, the finished rolls drop into a trough 46, secured to the inner end of the carrier, by which they are conducted outward between the faces of the wheels on the opposite side of the center (which on that side lie at a greater distance apart). The rolls drop from the trough into a chute 47 which delivers them into a suitable receptacle.

The standard is vertically adjustable in ways 48 carried by a slide 49 which is itself laterally adjustable in ways 50 upon the frame-work. The vertical adjustment of the standard is effected by means of a screw 51 which is held against longitudinal movement in a cross-piece 52 and engages the slide. The lateral adjustment of the standard is effected by means of a screw 53 which passes longitudinally through the slide, has unthreaded engagement with cross pieces 54 and is retained against longitudinal movement. The lateral adjustment of the standard by means of the slide enables the operator to correctly position the carrier with relation to the operative wheels and to provide for different sizes of rolls and for changes in thickness of either the grinding or regulating wheel or both. It is of course necessary that the top of the carrier should be placed slightly above a horizontal line intersecting the axial line of the wheels, and it is obvious that by raising the carrier the amount of grinding action to which each roll will be subjected will be lessened, as the rolls will be drawn forward more rapidly. In connection with the vertical adjustment of the standard, the tilting adjustment of the carrier comes into use. As the conditions in grinding different rolls will vary it

is impossible to arbitrarily determine any fixed height for the standard or inclination of the carrier that will produce the best results under all the varying conditions of use. In practice, I have found approximately the adjustment as to height of standard and inclination of the carrier indicated in Fig. 4 to produce perfectly satisfactory results.

The operation is as follows:—As soon as a roll is picked up by the operative wheels the action is to draw the roll forward and pass it through between the operative faces. It will be noted (see Figs. 2 and 6) that the operative face of the grinding wheel is traveling downward and the operative face of the regulating wheel is traveling upward. As the surface speed of the grinding wheel is much greater than that of the regulating wheel it follows that the rolls being operated upon will be held down upon the carrier, will be rotated and will also be drawn forward. The tendency of the regulating wheel to hold the rolls backward is wholly overcome by the greater surface speed and greater hold upon the rolls of the grinding wheel. The regulating wheel however has this very important function, in that it insures constant and uniform rotation of the rolls so that I am enabled to produce with my novel machine, much more rapidly and economically than has heretofore been possible, rolls of the very highest grade.

Having thus described my invention I claim:—

1. A machine of the character described comprising a grinding wheel adapted to be rotated at a relatively high speed, a regulating wheel adapted to be rotated in the opposite direction at a relatively low speed and a carrier between said wheels upon which the rolls rest while being operated upon.

2. A machine of the character described comprising a carrier for rolls, a grinding wheel having an operative surface adapted to rotate in the direction of the carrier at a relatively high speed and a regulating wheel coöperating therewith and having an operative surface adapted to rotate in the opposite direction at a relatively low speed, whereby constant and uniform rotation, at a lower surface speed than that of the grinding wheel, is imparted to the rolls while being operated upon.

3. A machine of the character described comprising a carrier for rolls, a grinding wheel adapted to be rotated at a relatively high speed, and a regulating wheel adapted to be rotated in the opposite direction at a relatively low speed, the operative surfaces of said wheels lying in a plane oblique to the vertical plane, so as to throw rolls being operated upon toward the regulating wheel.

4. A machine of the character described comprising a carrier for rolls, a grinding wheel having an operative surface adapted to rotate in the direction of the carrier at a relatively high speed and a regulating wheel coöperating therewith and having an operative surface adapted to rotate in the opposite direction at a relatively low speed, the operative surfaces of said wheels lying in a plane oblique to the vertical plane, so as to throw rolls being operated upon toward the regulating wheel.

5. A machine of the character described comprising a carrier for rolls, a grinding wheel adapted to be rotated at a relatively high speed, and a regulating wheel adapted to be rotated in the opposite direction at a relatively low speed, the axes of said wheels lying obliquely to each other for the purpose set forth and said wheels being provided with parallel operative surfaces.

6. A machine of the character described comprising a carrier for rolls, a grinding wheel having an operative surface adapted to rotate in the direction of the carrier at a relatively high speed and a regulating wheel coöperating therewith and having an operative surface adapted to rotate in the opposite direction at a relatively low speed, the axes of said wheels lying obliquely to each other for the purpose set forth and said wheels being provided with parallel operative surfaces.

7. A machine of the character described comprising a carrier for rolls, a grinding wheel adapted to be rotated at a relatively high speed and a regulating wheel adapted to be rotated in the opposite direction at a relatively low speed, the axes of said wheels lying obliquely to each other and said wheels being provided with parallel operative surfaces oblique to the vertical plane.

8. A machine of the character described comprising a carrier for rolls, a grinding wheel having an operative surface adapted to rotate in the direction of the carrier at a relatively high speed and a regulating wheel coöperating therewith and having an operative surface adapted to rotate in the opposite direction at a relatively low speed, the axes of said wheels lying obliquely to each other and their operative surfaces being parallel and oblique to the vertical plane.

9. A machine of the character described comprising a grinding wheel adapted to be rotated at a relatively high speed, a regulating wheel adapted to be rotated in the opposite direction at a relatively low speed, and an adjustable carrier for rolls, between said wheels, pivoted to swing in the vertical plane.

10. A machine of the character described comprising a grinding wheel adapted to be rotated at a relatively high speed, a regulating wheel adapted to be rotated in the opposite direction at a relatively low speed, and means for adjusting the axes of said

wheels relatively to each other in substantially the horizontal plane.

11. A machine of the character described comprising a grinding wheel adapted to be rotated at a relatively high speed, a regulating wheel adapted to be rotated in the opposite direction at a relatively low speed, and means for adjusting the faces of said wheels toward and from each other.

12. A machine of the character described comprising a grinding wheel adapted to be rotated at a relatively high speed, a regulating wheel adapted to be rotated in the opposite direction at a relatively low speed, means for adjusting the axes of said wheels relatively to each other in substantially the horizontal plane and means for adjusting the faces of said wheels toward or from each other.

13. A machine of the character described comprising a carrier for rolls, a grinding wheel having an operative surface adapted to rotate in the direction of the carrier at a relatively high speed and a regulating wheel coöperating therewith and having an operative surface adapted to rotate in the opposite direction at a relatively low speed, means for adjusting the axes of said wheels relatively to each other in substantially the horizontal plane and means for adjusting the faces of said wheels toward or from each other.

14. A machine of the character described comprising a grinding wheel adapted to be rotated at a relatively high speed, a regulating wheel adapted to be rotated in the opposite direction at a relatively low speed, slides in which said wheels are journaled, oscillatable plates by which the slides are carried, means for locking the slide and means for locking the plates at any required adjustment.

15. A machine of the character described comprising a grinding wheel adapted to be rotated at a relatively high speed, a regulating wheel adapted to be rotated in the opposite direction at a relatively low speed, a slide upon which the grinding wheel is journaled, means for moving the slide and parts carried thereby inward and means for limiting the inward movement of the slide.

16. A machine of the character described comprising a grinding wheel adapted to be rotated at a relatively high speed, a regulating wheel adapted to be rotated in the opposite direction at a relatively low speed, a slide upon which the grinding wheel is journaled and which is provided with a rack, a pinion engaging the rack, a shaft carrying the pinion and also a hub, an arm extending from the hub and means engaging the arm and acting to move the grinding wheel into operative position.

17. A machine of the character described comprising a grinding wheel adapted to be rotated at a relatively high speed, a regulating wheel adapted to be rotated in the opposite direction at a relatively low speed and a carrier for rolls between said wheels.

18. A machine of the character described comprising a grinding wheel adapted to be rotated at a relatively high speed, a regulating wheel adapted to be rotated in the opposite direction at a relatively low speed, a carrier for rolls between said wheels, and means for imparting vertical adjustment to said carrier.

19. A machine of the character described comprising a grinding wheel adapted to be rotated at a relatively high speed, a regulating wheel adapted to be rotated in the opposite direction at a relatively low speed, a carrier for rolls between said wheels, and means for imparting lateral adjustment to said carrier.

20. A machine of the character described comprising a grinding wheel adapted to be rotated at a relatively high speed, a regulating wheel adapted to be rotated in the opposite direction at a relatively low speed, a carrier for rolls between said wheels, and a standard to which said carrier is pivoted to swing in the vertical plane, means for adjusting the standard vertically and means for adjusting it laterally.

21. A machine of the character described comprising a grinding wheel adapted to be rotated at a relatively high speed, a regulating wheel adapted to be rotated in the opposite direction at a relatively low speed, a carrier for rolls between said wheels, a standard to which said carrier is pivoted to swing in the vertical plane, a longitudinal slide in which said standard is vertically adjustable and means for adjusting the slide.

22. A machine of the character described comprising a grinding wheel adapted to be rotated at a relatively high speed, a regulating wheel adapted to be rotated in the opposite direction at a relatively low speed, a carrier for rolls between said wheels, a standard to which said carrier is pivoted to swing in the vertical plane, a longitudinal slide by which the standard is carried, a screw for adjusting the standard vertically, a set screw for locking it and a screw for adjusting the slide.

23. A machine of the character described comprising a grinding wheel adapted to be rotated at a relatively high speed, a regulating wheel adapted to be rotated in the opposite direction at a relatively low speed, the axes of said wheels lying obliquely to each other and the operative faces of said wheels being beveled, a carrier for rolls between the operative faces of said wheels and a trough secured to the inner end of the carrier by which ground rolls are conducted outward between the faces of the wheels on the opposite side of the center.

24. The combination with grinding and

regulating wheels mounted to rotate in opposite directions, of a carrier for rolls while being operated upon and a trough which receives the rolls after they have passed the operative faces of the wheels.

25. The combination with grinding and regulating wheels mounted to rotate in opposite directions, the axes of said wheels being set obliquely, of a carrier for rolls between the operative faces of the rolls and a trough attached to the carrier and extending outward between the wheels.

In testimony whereof I affix my signature in presence of two witnesses.

LEWIS R. HEIM.

Witnesses:
H. W. MEADE,
E. M. CULVER.