May 29, 1928. 1,671,356

P. O. DIEDERICHS

ROLLER MILL

Filed July 10, 1926 4 Sheets-Sheet 1

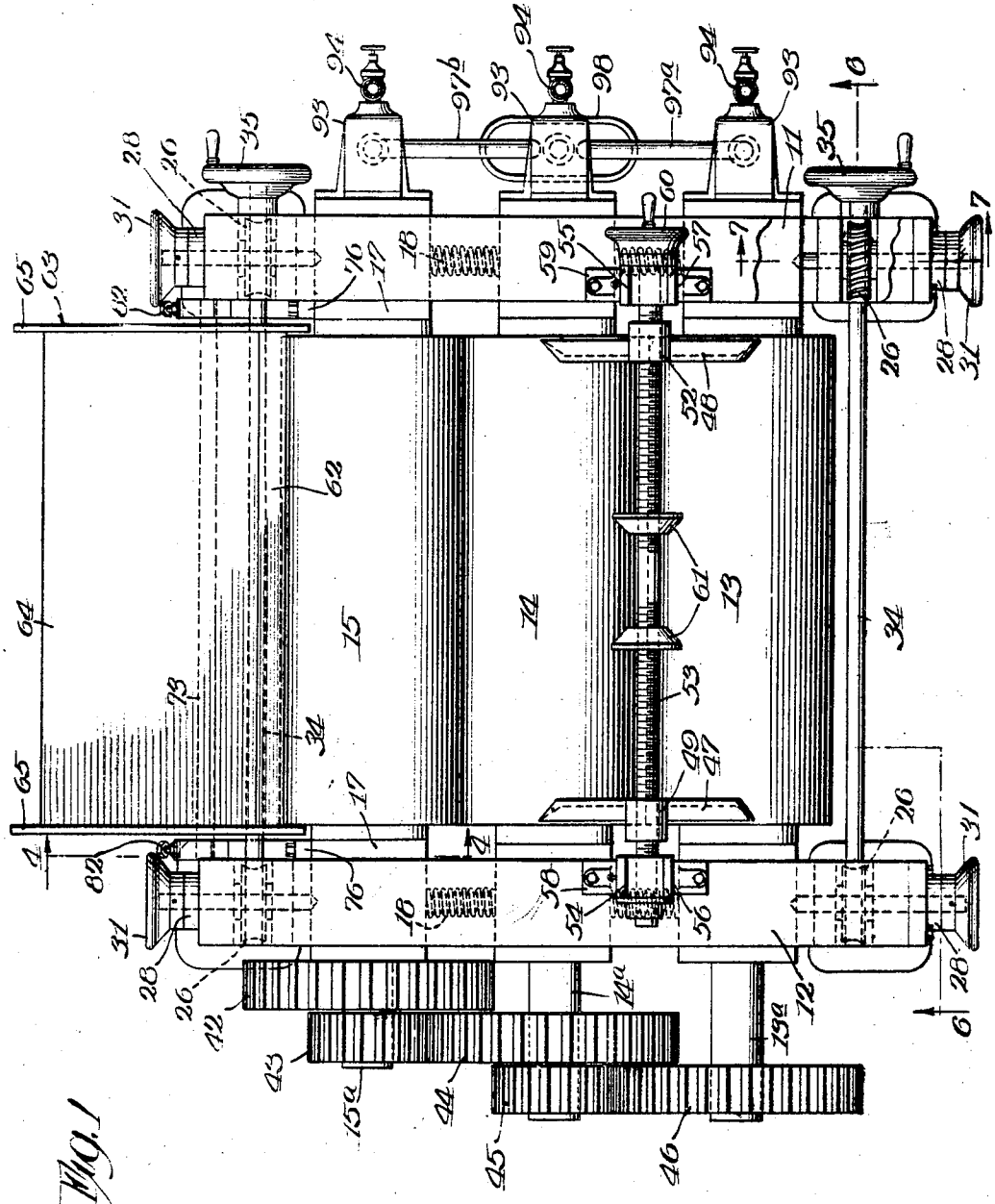


Fig. 1

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ROLLER MILL

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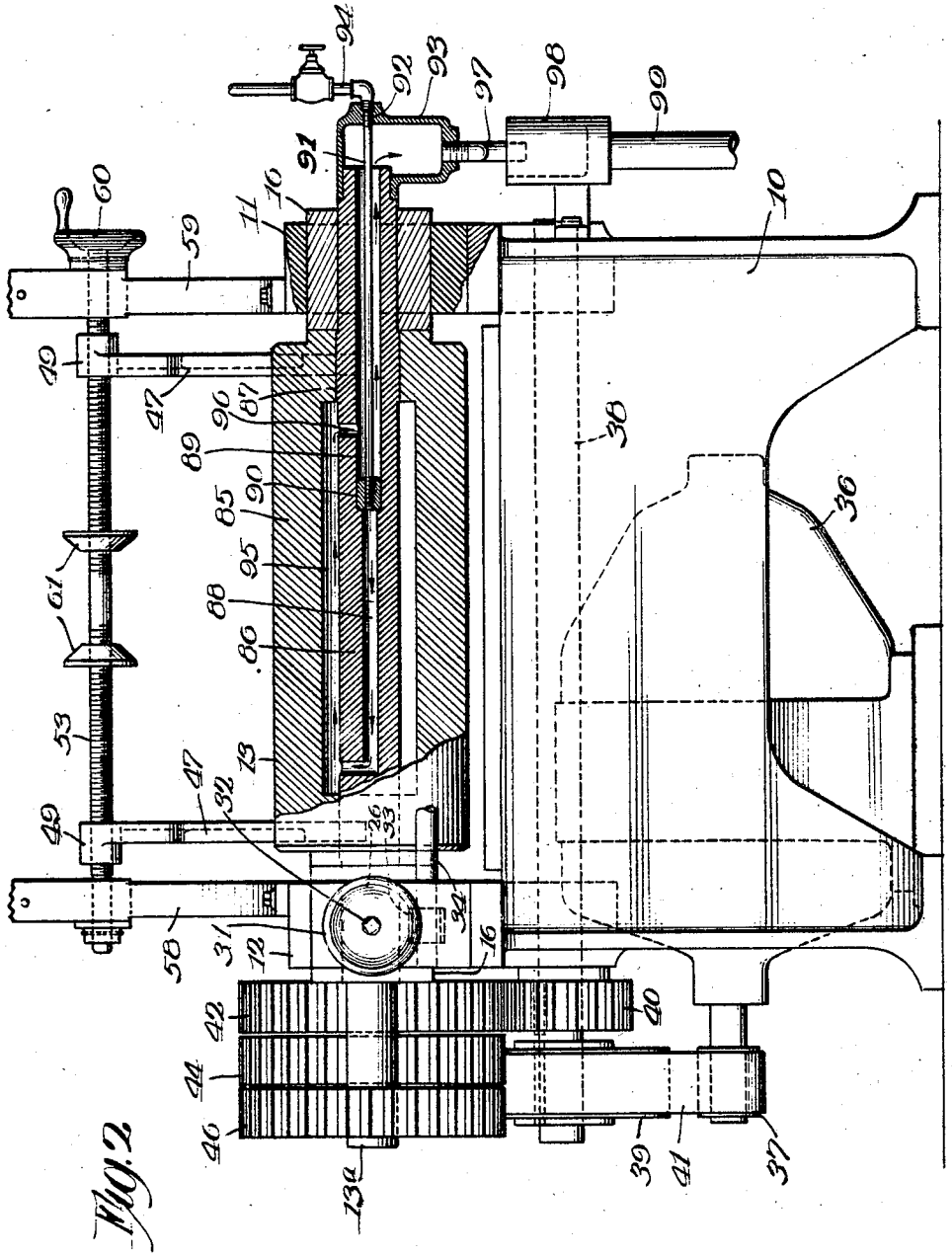


Fig. 2

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ROLLER MILL

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Fig. 3

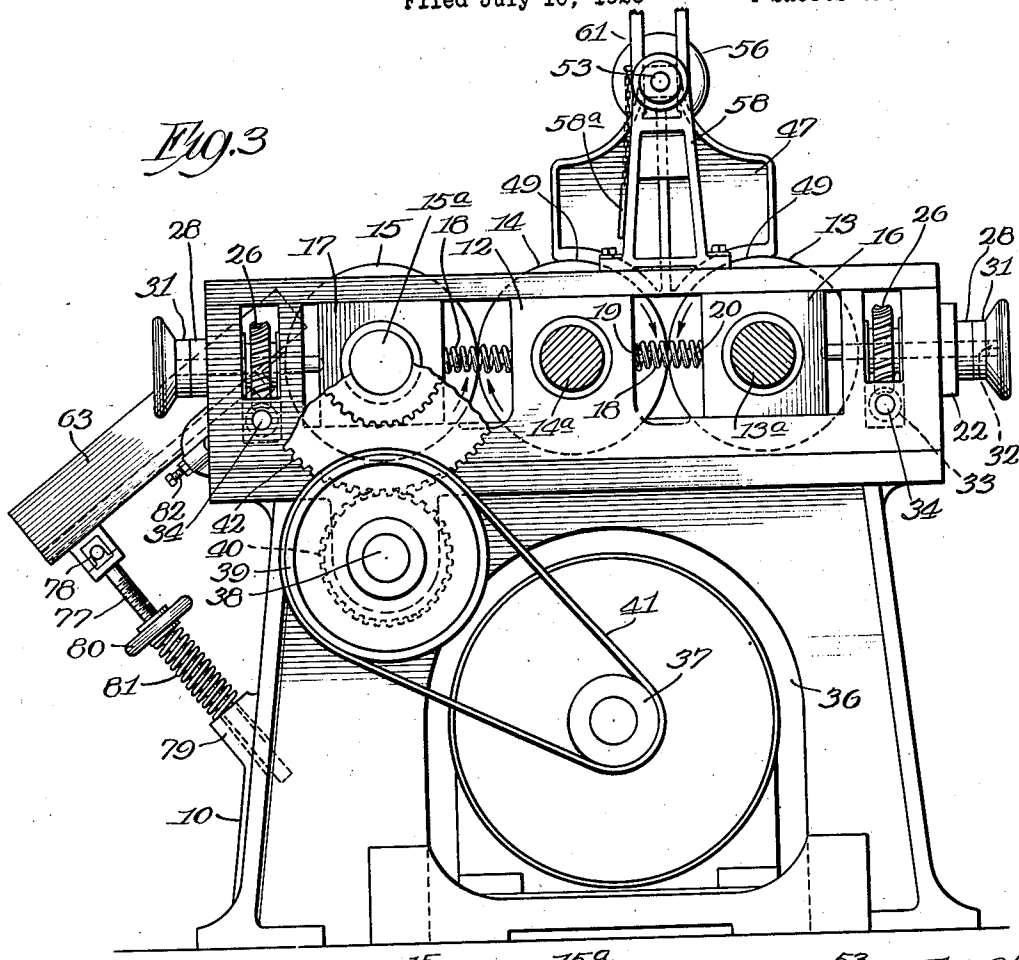


Fig. 4

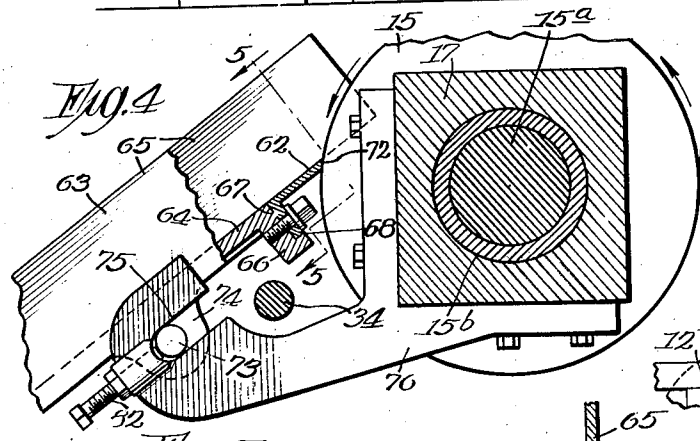


Fig. 3A

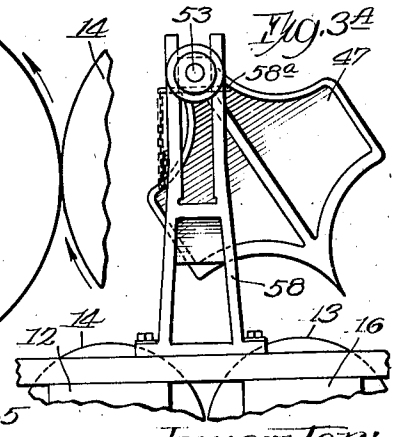
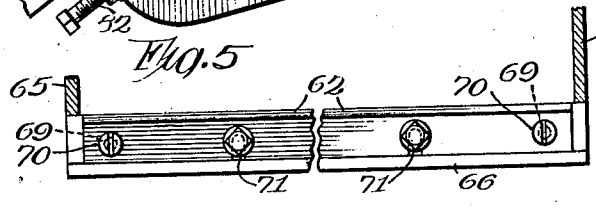


Fig. 5



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ROLLER MILL

Filed July 10, 1926 4 Sheets-Sheet 4

Fig. 6

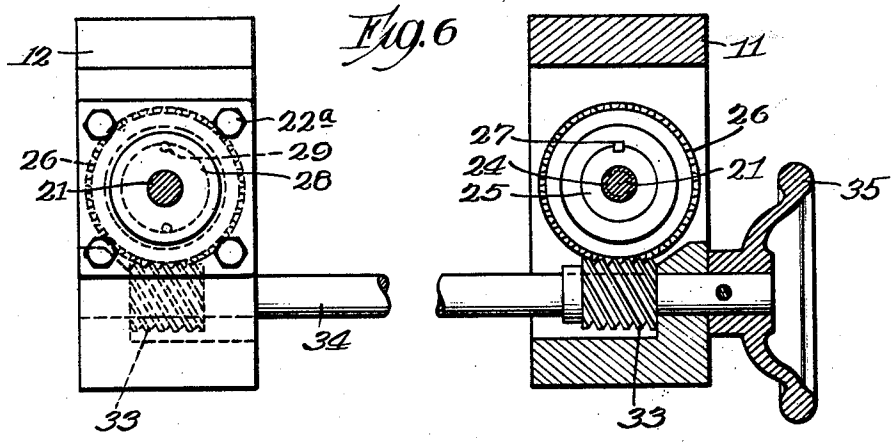
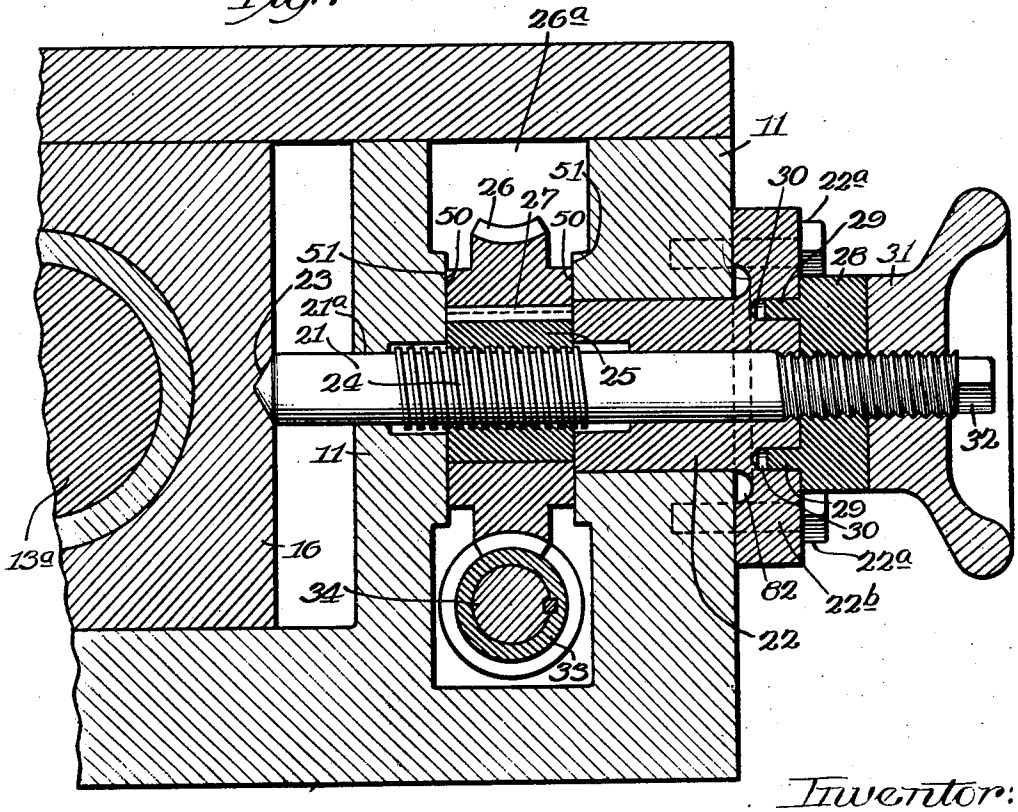


Fig. 7



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Patented May 29, 1928. 1,671,356

UNITED STATES PATENT OFFICE.

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ROLLER MILL.

Application filed July 10, 1926. Serial No. 121,539.

This invention relates to roller mills and more particularly to mills of the type adapted to grinding ink, paint, chocolate, etc., in which there are a series of rolls mounted to cooperate with each other for grinding the ink or other material therebetween. In mills of this type it is important that means be provided for accurately adjusting the rolls into proper relationship for the grinding action. It is also desirable that means be provided whereby adjustment of the cooperating rolls towards or from each other may be accurately made by a single operation. To facilitate cleaning of the rolls after a grinding operation has been completed or when a change in the kind or color of material is to be made, which also necessitates such cleaning, it is desirable that the adjusting means be capable of separating the rolls so that they will not contact at any point.

It is therefore a principal object of this invention to provide means for quickly, yet accurately adjusting the relative positions of the cooperating rolls whereby the operative position may be very accurately adjusted, and whereby the rolls may be separated to prevent contacting of the respective surfaces for facilitating the cleaning thereof. It is also an important object of this invention to provide a single adjusting means which will move both ends of the roller simultaneously from the roller with which it co-operates and then be effective to return the roller to its operative position with a high degree of accuracy.

Other objects of this invention are to provide means for preventing damage to the cooperating rolls or other expensive parts of the machine in case foreign matter should be fed between the rolls; to provide improved means for adjusting the ink guides to accommodate the machine to efficient operation with various quantities of ink; to provide means for facilitating cleaning of the guides; to provide an improved knife structure for scraping the ink from the final roll and conveying it to a suitable receptacle; to provide such a knife structure in which the knife element may be quickly and easily removed for sharpening or replacement, and to provide improved means for cooling the rolls.

Other objects and advantages of this invention will become apparent when the following specification is considered in connection with the accompanying drawings wherein I have illustrated a selected embodiment of the invention and in which—

Fig. 1 is a plan.

Fig. 2 is an end elevation, certain parts being shown in section to more thoroughly illustrate the structure.

Fig. 3 is a side elevation, certain gearing being omitted to facilitate illustration of the present invention.

Fig. 3ª is an elevation showing a portion of Fig. 3, the part being shown in another position.

Fig. 4 is a section on the line 4—4 of Fig. 1.

Fig. 5 is a section on the line 5—5 of Fig. 4 and

Figs. 6 and 7 are sections on the lines 6—6 and 7—7 respectively of Fig. 1.

Referring now to the drawings, my improved machine comprises a main frame 10 having upstanding side frame portions 11 and 12. A plurality of rolls, in this instance, three, indicated at 13, 14 and 15, are journaled and supported in the side frames 11 and 12.

The middle roll 14 is preferably journaled in suitable bearings which are fixed or stationary in their position in the side frames. The rolls 13 and 15 are each journaled in suitable bearing blocks as 16 and 17 respectively, which are slidably mounted in suitable guides as clearly shown in Fig. 3. These rolls are therefore capable of being adjusted to or from the center roll 14.

Means for adjusting the roll 13 relative to the roll 14 will now be described. As above mentioned, the roll 13 is journaled in sliding bearing blocks 16 at its ends, which are slidable in suitable guideways in the side frames 11 and 12. As best shown in Fig. 3, a compression spring 18 is interposed between the fixed bearing block for the center roll 14 and the sliding block 16, and is prevented from dropping from its position by suitable means such as pins 19 and 20 projecting from the respective bearing blocks into the center of the spring. The spring 18 normally tends to force the roll 13 away from the stationary roll 14. It is, of course, to be understood that both ends of each of the rolls are similarly journaled and the above described spring mechanism is likewise provided at both ends.

Referring now more particularly to Figs,

6 and 7, it will be seen that screw mechanism is provided for forcing the journal blocks 16 and consequently the roll 13 towards the stationary roll 14. This screw mechanism comprises a shaft 21 which is slidably and rotatably mounted at its inner end in a suitable bearing 21a in the frame member 11 and at its outer end in a bushing 22 which is secured in position in the end of said side frame by means of bolts 22a. The inner end of the shaft 21 abuts the edge of the bearing block 16 and is preferably seated therein in a recess as indicated at 23, which is preferably shaped to correspond to the end of the said shaft. The shaft 21 is provided intermediate its ends with screw threading 24 which threadedly engages a bushing 25, which in turn is mounted within a worm wheel 26 and keyed to rotate therewith by means of a key 27. The worm wheel 26 is thus rotatably mounted, but is confined against axial movement in a slot 26a in the side frame 11 by engagement of the faces 50—50 of the hub of the worm wheel with the faces 51—51 of the slot 26a. The outer end of the shaft 21 is also provided with screw threading of the same pitch as the threading intermediate its ends, and which is adapted to receive a nut 28 provided with lugs or fingers 29—29 which enter suitable apertures 30—30 in the bushing 22 to prevent its rotation. A lock nut 31 also threadedly engages the outer end of the shaft 21 and is adapted to lock the nut 28 in the desired position on the shaft 21 in a well known manner.

It will be noted that when the nut 28 is locked in position on the shaft 21, that the lugs 29 entering the apertures 30 in the bushing 22 will prevent rotation of the said shaft 21, the bushing 22 being held in fixed position by the bolts 22a. The extreme outer end of the shaft 21 is preferably squared as indicated at 32 to receive a suitable wrench whereby the screw may be turned through the nut 28 and through the threaded bushing 25, for purposes of vernier adjustment of the corresponding end of the roll 13.

A worm 33 meshing with the worm wheel 26 is keyed to a transverse shaft 34 so as to rotate therewith, and the shaft 34 extends across the end of the machine, as clearly show in Fig. 1, is journaled in suitable bearings in the side frames 11 and 12, and is provided at one side of the machine with a hand wheel 35 as is most clearly illustrated in Figs. 1 and 6. Screw mechanism such as above described in connection with side frame 11 is also provided in connection with side frame 12 to adjust the other end of the roll 13, and being of similar construction need not be specifically described.

It will be observed that by turning the hand wheel 35 in one direction, the worm wheels 26 at both sides of the machine will be rotated, and through the threaded bushing 25 which rotates therewith in engagement with the threading on the shaft 21 will cause the shaft 21 to slide inwardly or outwardly to force the roll 13 towards the stationary roll 14 or to permit the springs 18 to spread the rolls apart. When the rolls are spread or separated, the lugs 29 on the nut 28, which is locked in position on the shaft, slide outwardly from the holes 30 but do not become disengaged therefrom since the separation required is only enough to prevent contact between the surfaces of the two rolls. On readjustment to operative position, the wheel 35 is turned in the proper direction to advance the roll until the roll is again brought to proper position to co-operate with the middle roll. It will be noted that the use of a worm and worm wheel for transmitting motion from the transverse shaft 34 to the shafts 21, renders unnecessary any further provision for maintaining the roll 13 in its operative position, since such gearing is not adapted to being driven in the reverse direction.

Similar adjusting means may also be provided at the opposite end of the machine for adjusting the roll 15 towards or from the roll 14. This mechanism may be of the same type as above described in connection with roll 13 and therefore need not be again described.

When the rolls are to be cleaned after a batch of ink or other material has been ground, it is a comparatively simple matter to turn the wheel 35 to spread the rolls 13 and 14 a sufficient distance to prevent any contact between their respective surfaces. When the rolls are spread, the roll 13 for instance, may be cleaned and it will not pick up material from the uncleaned roll 14. The roll 15 may be similarly separated from the roll 14 which will permit the roll 14 to be cleaned without danger of picking up ink or other material from the uncleaned roll 15, and it is of course obvious that the roll 15 may be then cleaned. To place the mill in condition for grinding the next batch, it is only necessary to turn the hand wheel 35 at each end of the machine to readjust the end rolls 13 and 15 into proper co-operative position with the center roll 14.

Due to wear, uneven expansion, and other causes, it is sometimes necessary to make additional adjustments at either or both ends of the roll in order that accurate relationship of the surfaces of the co-operating rolls may be effected across their entire length. To accomplish this adjustment the lock nut 31 is unscrewed and a suitable wrench applied to the squared end 32 of the shaft 21. The shaft 21 may then be turned inwardly or outwardly as desired, the threading in the nut 28 and bushing 25 being of the same pitch. When the desired adjustment is ob-

tained, the lock nut 31 is again tightened to maintain this adjustment.

The rolls 13 and 14 are rotated in opposite directions as are also the rolls 14 and 15, the respective directions of rotation being indicated by arrows in Fig. 3. These rolls are rotated by suitable means such as an electric motor indicated at 36 which is provided with a pulley 37. A shaft preferably extends across the mill being journaled in the side frames thereof and is provided at one end with a pulley 39 and a spur gear 40. The motor 36 rotates the shaft 38 by means of a belt 41 which is threaded over the respective pulleys. It is obvious, of course, that a silent chain drive or other means might be substituted for the belt drive above described.

The roll 15 is provided with a shaft 15^a at one end extending outwardly through its bearing block and a spur gear 42 is keyed thereto and meshed with the aforementioned spur gear 40. It will be apparent that the roll 15 is thereby rotated and that the speed of rotation is governed by the ratio of the pitch diameters of the respective gears. A smaller gear 43 is also keyed to the shaft 15^a and is meshed with another gear 44 which is of larger diameter and which is keyed to the shaft 14^a of the roll 14, and another gear 45 keyed to the shaft 14^a is meshed with a gear 46 on the shaft 13^a of the roll 13. It will now be apparent that the respective rolls are rotated through the gear train just described and that the speed of rotation of the respective rolls is dependent upon the pitch diameters of the respective driving gears. In the present instance, it may be assumed that the roll 13 is driven at the rate of 30, the roll 14 at 60, and the roll 15 at 120 revolutions per minute.

Ink or other material which is to be ground is poured between the rolls 13 and 14 and is gradually fed between these two rolls whereby its originally coarse texture is made finer. Due to the greater speed of the roll 14 as compared with the roll 13, the ink is picked off the roll 13 and carried on the surface of the faster moving roll until it passes between this roll and the next adjacent roll 15 where it is again subjected to a guiding pressure. Due to the greater speed of the roll 15, the ink is picked off the surface of the roll 14 and is carried around to a scraper knife mechanism which will hereinafter be described.

It sometimes happens that foreign matter finds its way into the unground ink mixture which is apt to do great damage to the rolls or other parts of the machine if it passes between the rolls. As a practical matter, it is almost impossible to prevent such occurrences, and I therefore provide the following structure to prevent damage to the rolls or other expensive parts of the machine.

Referring particularly to Fig. 7, it will be seen that a groove 82 is provided in the end plate 22^b of the bushing 22. The groove extends around the bushing and is of a depth which will weaken the bond between the end plate and bushing portion.

Pressure on the roll 13 to hold it against the roll 14 is, as hereinbefore explained, applied by means of the shaft 21. It will be noted that the load is carried through the threading 24 on the shaft 21, and the threaded bushing 25 which in turn bears against the inner end of the bearing bushing 22. When excessive pressure is exerted against the bushing 22, due to hard foreign matter passing between the rolls, the threaded bushing 25 will be forced outwardly from the worm wheel 26 and the bushing 22 will be broken out of the end plate 22^b around the weakened portion at the groove 82. The end plate 22^b thus acts as a safety plate which, if broken, may be easily replaced at comparatively small cost.

It should be observed that, since the rolls 14 and 15 at the other end of the mill, rotate in a direction which would tend to throw a foreign object therefrom rather than draw it downwardly therebetween, the above described safety plate structure and threaded bushing within the worm wheel may safely be dispensed with at this end. At this end of the mill, the shaft 21 may have its outer end journaled directly in a bearing aperture in the frame and the worm wheel 26 may be provided with an aperture threaded to correspond to the threaded aperture in the bushing 25.

When a quantity of ink to be ground is poured on the rolls 13 and 14, it naturally tends to spread out between the rolls. To limit this spreading, suitable guides 47 and 48 are provided which are shaped at their lower ends as indicated at 49—49 to closely fit the upper adjacent surface portions of the said rolls 13 and 14. These guides are effective to prevent leakage of the ink beyond the edges of the rolls and in connection with the adjacent surfaces of the rolls form a reservoir in which the supply of ink is held. Because of the consistency of the ink mixture, and the rotation of the rolls, the supply of ink gathers into the form of a cylinder and rolls between the two adjacent rolls 13 and 14 and is thereby agitated to more thoroughly mix the ink.

The guides 47 and 48 are provided with bosses 49 and 52 respectively at their upper ends which bosses are apertured and threaded to receive a threaded supporting and adjusting rod 53. The rod 53 is mounted in bearing blocks 54 and 55 which are vertically slidable in the forked upper end 56 and 57 respectively of upstanding brackets 58 and 59 which are secured on the upper edges of the side frames 12 and 11 respec-

tively. It will be apparent that as the lower edges of the guides 47 and 48 are worn, the slidable mounting of the supporting member 53 will permit the weight of the guides to continually maintain them in close engagement with the rolls. The bosses 49 and 52 are preferably of considerable width so that the respective guides 47 and 48 will be rigidly supported by the said rod 53. By means of a suitable hand wheel as 60 (Fig. 1) the rod 53 may be rotated to cause the guide plates 47 and 48 to be moved inwardly towards the center of the rolls 13 and 14, the rod being provided with right and left hand threads at its opposite ends and the respective bosses on the guides correspondingly threaded. The hand wheel 60 and a suitable collar on the opposite end of the rod, which engage the corresponding brackets, prevent axial movement of the rod. By this means the ink mill is adapted for use with various quantities of ink. I also prefer to provide suitable blocks 61—61 on the rod 53 near the center of the machine which are adapted to position the can or other receptacle on the rod 53, from which the ink is poured on the rolls 13 and 14. It is of course obvious that these blocks may be threaded to engage the threads on the rod 53 and thereon adjusted to receive various sizes of cans, or that a single block of suitable size and shape may be secured in fixed position on the rod.

To facilitate cleaning the guides, I elongate the forked upper ends of the brackets 58 and 59, as clearly shown in Fig. 3ª, so that the rod 53 and its bearing blocks may be manually elevated to the position there shown. In order to maintain this elevated position, I provide suitable means such as a pin 58ª which is adapted to be inserted through suitable apertures in the forked ends of the brackets under the respective bearing blocks 54 and 55. The pins 58ª may conveniently be secured to the brackets by means of a chain so that they will not be lost and will always be handy for use. When the guides are thus elevated, they may be swung outwardly on the rod 53 as shown, so that the bottoms of the guides as well as the faces thereof my easily be cleaned.

As above explained, the ink after its final grinding, is carried on the surface of the roll 15 until it is scraped therefrom by a knife 62 which forms a part of a trough 63 whereby the ink is conveyed to a suitable receptacle. The trough 63 includes a bottom 64 and side members 65—65 and is provided with a depending flange 66 at its front end. This flange is recessed as indicated at 67 to receive the mounting flange 68 of the knife 62 which is L-shaped in cross section. As best shown in Fig. 5, the mounting flange 68 of the knife is provided at its ends with apertures 69 through which screws 70 are passed and threaded into suitable apertures in the depending flange 66. Intermediate the apertures 69 in the mounting flange of the knife, the said flange is provided with a plurality of slots 71—71 which are adapted to be passed over suitable cap screws or bolts which are also threaded into the said depending flange 66. By this means, removal of the knife for sharpening or for changing becomes a very simple operation since it is only necessary to loosen the intermediate bolts which pass through the slots 71 and to remove only the end bolts 70. The mounting is also very rigid since the knife blade itself is stiffened because of the mounting flange 68 extending the full length of the knife and because of the large area of contact between the knife and flange 66. The forward edge of the knife is beveled as indicated at 72 to closely fit the roll 15 and it will be obvious that when the trough 63 and knife 62 thereon are properly positioned relative to the roll 15 that any ink on the surface will be cleanly removed from the roll surface.

The trough 63 may conveniently be mounted by means of stud shafts 73 projecting from lugs 74 depending from the bottom of the trough which shafts are seated in slots 75 of arms 76 which in turn are mounted on the corresponding bearing blocks 17 of the roll 15, as best shown in Fig. 4. The trough therefore moves inwardly and outwardly with the roll 15. The outer end of the trough 63 is adjustably supported by means of a screw-threaded rod 77 which is detachably connected at 78 with the said outer end of the trough. The rod 77 extends downwardly and loosely through an aperture in a boss 79 on the frame 10 and is provided intermediate the boss and its upper end with a hand wheel 80 which is apertured and threaded to engage the threaded portion of the rod. A spring 81 interposed between the boss 79 and the lower side of the hand wheel 80 normally tends to force the outer end of the trough 63 upwardly about the stud shafts 73 and thereby normally maintains the knife 62 in tight but yielding engagement with the surface of the roll 15.

The rolls in mills of this type ordinarily become heated due to friction. In order to prevent such heating, I provide the following water-cooling system. As best shown in Fig. 2, the rolls comprise a hollow cylinder 85 and a core 86 on which the cylinder is mounted, as indicated at 87. The joint between the cylinder and core is preferably a drive fit so that a substantially water-tight joint is insured as is also rotation of the cylinders with the core. The core is centrally bored out as shown at 88 and with a larger bore as at 89. A bushing 90 is disposed in larger bore 89 and against the

shoulder which defines the two bores and is rotatable therein. An inlet pipe 91 is threaded into the bushing at one end, and at 92 into a suitably threaded aperture in a closed discharge or drain box 93. A connection, as 94, to a water supply pipe is provided. Water enters through the pipe 94, the pipe 91 passes through the core 88 to the chamber 95 in the cylinder around the core. From the chamber 95 it passes through an aperture 96 in the core to the large bore 89 around the pipe 91 and thence outwardly to the discharge box 93. The provision of the closed discharge box 93 is a very convenient feature, since it prevents splashing of the water as it leaves the rolls and it also provides room for variation in the quantities of water discharged from the rolls due to variation in the pressure on the water, which might otherwise tend to overflow the usual receiving trough. An outlet 97 from the box 93 drains the water into the drain box 98 which is provided with an outlet 99.

The drain box 98 is elongated as best shown in Fig. 1 to receive outlets 97^a and 97^b from rolls 13 and 15 respectively, and to permit necessary movement of drain outlets with the rolls when the latter are moved away from the center roll 14.

I have thus provided an improved grinding mill structure having certain advantages not present in the usual grinding mill, and while I have described the improved structure with reference to ink grinding, it is to be understood that the improvements as hereinafter claimed, are also applicable to mills for other purposes.

I am aware that various changes in the form, construction and proportion of parts may be made without departing from the essence of the invention and I therefore reserve the right to make such changes as fall within the scope of the following claims.

I claim as my invention:

1. In a machine of the class described, a supporting frame, a pair of co-operating grinding rolls rotatably mounted on said frame, means for mounting one of said rolls so as to permit adjustment thereof, towards or from the other, said means including bearing members for said adjustable roll and adjustably mounted in said frame, a pair of shafts adjustably mounted in said frame and each abutting one of said bearing members, screw threading on said shafts intermediate their ends, a collar on each of said shafts and threadedly engaging said screw threading, means for rotating said collars to cause said shafts to move inwardly, means on said frame for preventing outward movement of said collar under normal operating conditions but permitting said collar to move outwardly when subjected to abnormal pressure as an incident to an overload of material passing between said rolls, thereby permitting said rolls to separate, to permit such overload to pass between the rolls without damaging the same.

2. In a machine of the class described, a supporting frame, a roll journaled in said frame, another roll and bearing members therefor adjustably mounted in said frame, means for normally holding said rolls in engagement with each other and for adjusting said adjustably mounted roll towards or from the first mentioned roll comprising a shaft adjustably mounted in said frame and effective to force said adjustably mounted roll towards said first mentioned roll, screw threading on said shaft, a bushing threadedly engaging said screw threading, a gear wheel embracing said bushing and keyed thereto so as to rotate therewith and so as to permit relative axial movement between said bushing and gear, means for preventing axial movement of said gear, means for normally preventing outward axial movement of said bushing and said shaft, said last mentioned means being capable of yielding to permit said outward axial movement when said shaft is subjected to abnormal pressure in an outward direction as an incident to the passage of an overload of material between said rolls, thereby permitting said rolls to separate to permit passage therebetween of such overload without damaging the rolls, and means for rotating said gear for effecting said adjustment.

3. In a machine of the class described, a supporting frame, a pair of axially parallel rolls, guide plates resting on the adjacent upper portions of said rolls adjacent the respective ends of the rolls, means for simultaneously adjusting said guide plates towards and from each other, comprising a transverse shaft adjustably mounted in a vertical direction and having right and left hand threads on its respective ends engaging correspondingly threaded apertures in the respective guide plates, and means for preventing axial movement of said shaft.

4. In a machine of the class described, a supporting frame, a roll journaled in said frame, means for rotating said roll, means for scraping material off the surface of said roll comprising a trough member having a rigid bottom portion and a flange depending therefrom, a plurality of clamping members on said flange, a scraper knife also having a flange depending therefrom and adapted to be seated on said first mentioned flange and clamped thereto by means of said clamping members.

5. In a machine of the class described, a supporting frame, a roll journaled in said frame, means for rotating said roll, means for scraping material off the surface of said roll comprising a trough member having a substantially rigid bottom portion, a flange depending from said rigid bottom portion,

clamping means projecting from said depending flange, a scraper knife of angular cross section and having one of its legs seated on said depending flange, and its other leg substantially flush with and forming a continuation of said trough bottom and having its outer edge adapted to engage the surface of the roll, and means for maintaining said knife in engagement with said roll.

6. In a machine of the class described, a supporting frame, a roll journaled in said frame, means for rotating said roll, means for scraping material from the surface of said roll comprising a trough member having a substantially rigid bottom portion, a flange depending from said bottom portion, and having a recess therein, a plurality of clamping members projecting from the recessed portion of said flange, a scraper knife of angular cross section, one leg of said scraper knife being seated in said recess and having a plurality of notches for receiving said projecting clamping members, whereby said clamping members are effective to firmly clamp the knife in position on said flange, the other leg of said knife forming a continuation of the bottom of said trough and being substantially flush therewith and having its outer edge adapted to engage said roll for the purpose set forth.

7. In a machine of the class described, a supporting frame, a roll journaled in said frame, means for rotating said roll, means for scraping material from the surface of said roll comprising a trough member having a substantially rigid bottom portion, a flange depending from said bottom portion and having a recess therein, a scraper knife of angular cross section, one leg of which is adapted to be seated in said recess and having an aperture therethrough adjacent each end and a plurality of notches therein intermediate said apertures, said apertures and said notches being each adapted to receive a clamping bolt, and a plurality of clamping bolts threadedly engaging correspondingly threaded apertures in said depending flange and projecting through said apertures and notches.

8. In a roller mill, the combination of a supporting frame, a pair of axially parallel rolls journaled in said frame, a pair of vertically adjustable guide plates resting on the adjacent upper surface portions of said rolls, mounting means for said guide plates permitting said guide plates to be elevated above said rolls to a position where the bottoms thereof are accessible for cleaning purposes without dismounting the plates from the mill, and means for maintaining said guide plates in said elevated position.

9. In a roller mill, the combination of a supporting frame, a pair of axially parallel rolls journaled in said frame, a pair of guide plates resting on the adjacent upper surface portions of said rolls and pivotally mounted at their upper edges so as to be capable of being swung on their respective pivots, means permitting upward adjustment of said guide plates and their pivotal mounting, and means for maintaining the guides in a position elevated above said rolls whereby they will clear the rolls when they are swung on their pivots substantially as and for the purpose described.

10. In a roller mill, the combination of a supporting frame, a pair of axially parallel rolls journaled in said frame, a pivot block, a guide plate resting on the adjacent upper surface portions of said rolls and pivotally connected to said block, mounting means for said block permitting vertical adjustment thereof in an upward direction to a position where said guide plate will clear said rolls when swung on its pivot to permit access to the bottom edges thereof and releasable means for maintaining said block in said upwardly adjusted position.

11. In a mill of the class described, the combination of a supporting frame, a roll journaled in said frame, means for rotating said roll, a scraper for scraping material off the surface of said roll as the roll is rotated, said scraper comprising a trough member having a substantially rigid bottom portion, a flange depending from said bottom portion and provided with a recess, a scraper knife of angular cross section having one leg thereof fitting and seated in said recess whereby the knife is accurately positioned relative to said trough bottom, the other leg of said knife forming a continuation of the bottom of said trough member and having its top surface substantially flush with the surface of the trough bottom, and means for releasably locking said knife in said position.

12. In a mill of the class described, a supporting frame, a roll journaled in said frame, a second roll axially parallel to said first mentioned roll, bearing blocks for said second roll adjustably mounted in said frame, and means for adjusting said second roll laterally relative to said first mentioned roll comprising a shaft axially slidably mounted in a portion of said frame, disposed at an angle to the axis of said roll and engaging one of said bearing blocks, screw threading on said shaft, a collar threadedly engaging said screw threading, means non-rotatable but axially slidably mounted on said collar for rotating the collar, means for preventing axial movement of said collar whereby rotation thereof is effective to adjust said shaft in an axial direction, said last mentioned means comprising means for preventing axial movement of said collar towards said second roll and yieldable means for preventing axial movement of said collar in the opposite direction, said yieldable means being

adapted to yield when an excessive amount of pressure is exerted thereagainst.

13. In a roller mill, the combination of a supporting frame, a roll mounted on said frame so as to be rotatable and relatively horizontally adjustable, said roll being provided with a chamber extending lengthwise of the roll, means for introducing a cooling medium into said chamber for cooling the roll, and means for draining the medium from the chamber including a reduced extension connected to the roll at one end and apertured so as to communicate with the chamber, means mounted on said reduced extension for receiving the cooling medium as it is drained from the chamber through the aperture in the extension, said means comprising a drain box provided with an outlet and mounted on said extension so that the extension may rotate therein and whereby the box is adapted to move with the roll through its various positions of horizontal adjustment, and stationary means effective in the various positions of adjustment of said roll and box for receiving said cooling medium as it empties from said drain box through said outlet.

14. In a mill of the class described, the combination of a supporting frame, a rotatable roll mounted on said frame, provided with a core extending therethrough and having an annular chamber around the core intermediate the ends of the roll, said core being provided with a substantially axial bore communicating with one end of the core and apertures connecting said bore with the opposite end portions of said chamber, an axially apertured bushing rotatably mounted in said bore intermediate the apertures connecting the bore with said opposite ends of the chamber, a relatively stationary pipe extending through the outer end portion of said bore and rigidly connected to said bushing so as to communicate through the aperture therein with the inner end portion of the bore, thereby to be effective to supply a cooling medium to said chamber through said inner end bore portion, said pipe being of smaller outside diameter than the diameter of the outer end portion of the bore, thereby forming an annular passageway around said pipe, communicating with said chamber and serving as an outlet for the cooling medium.

15. In a mill of the class described, the combination of a supporting frame, a rotatable roll mounted on said frame, provided with a core extending therethrough and having an annular chamber around the core intermediate the ends of the roll, said core being provided with a substantially axial bore communicating with one end of the core and apertures connecting said bore with the opposite end portions of said chamber, an annular outwardly facing shoulder in said bore, intermediate the apertures connecting the bore with the opposite ends of said chamber, an axially apertured bushing rotatably mounted in said bore and seated against said shoulder, a relatively stationary pipe extending through the outer end portion of said bore and rigidly connected to said bushing so as to communicate through the aperture therein with the inner end portion of the bore, thereby to be effective to supply a cooling medium to said chamber through said inner end bore portion, said pipe being of smaller outside diameter than the diameter of the outer end portion of the bore, thereby forming an annular passageway around said pipe, communicating with said chamber and serving as an outlet for the cooling medium.

16. In a mill of the class described, the combination of a supporting frame, a rotatable roll mounted on said frame, provided with a core extending therethrough and having an annular chamber around the core intermediate the ends of the roll, said core being provided with a substantially axial bore communicating with one end of the core and apertures connecting said bore with the opposite end portions of said chamber, an axially apertured bushing rotatably mounted in said bore intermediate the apertures connecting the bore with said opposite ends of the chamber, a relatively stationary pipe extending through the outer end portion of said bore and rigidly connected to said bushing so as to communicate through the aperture therein with the inner end portion of the bore, thereby to be effective to supply a cooling medium to said chamber through said inner end bore portion, said pipe being of smaller outside diameter than the diameter of the bore, thereby forming an annular passageway around said pipe, communicating with said chamber and serving as an outlet for the cooling medium, and a drain box mounted on the outer end of said core for receiving the cooling medium from said outlet, said inlet pipe extending through said drain box to the outside thereof and being connected with a supply of the cooling medium.

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