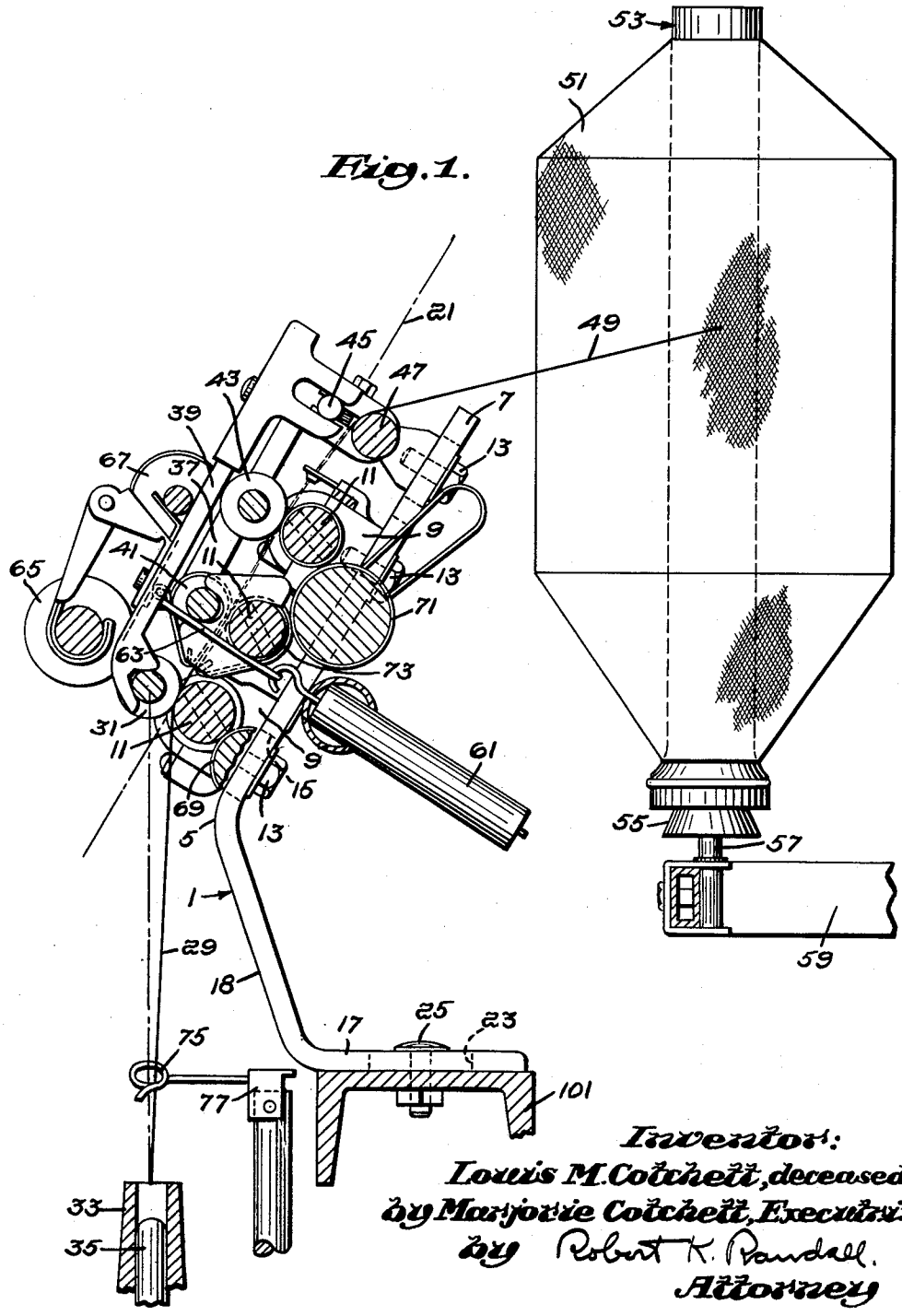
Oct. 16, 1962 L. M. COTCHETT 3,058,170

SPINNING FRAMES

Filed March 30, 1959 4 Sheets-Sheet 1

Fig. 1.



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SPINNING FRAMES

Filed March 30, 1959 4 Sheets-Sheet 2

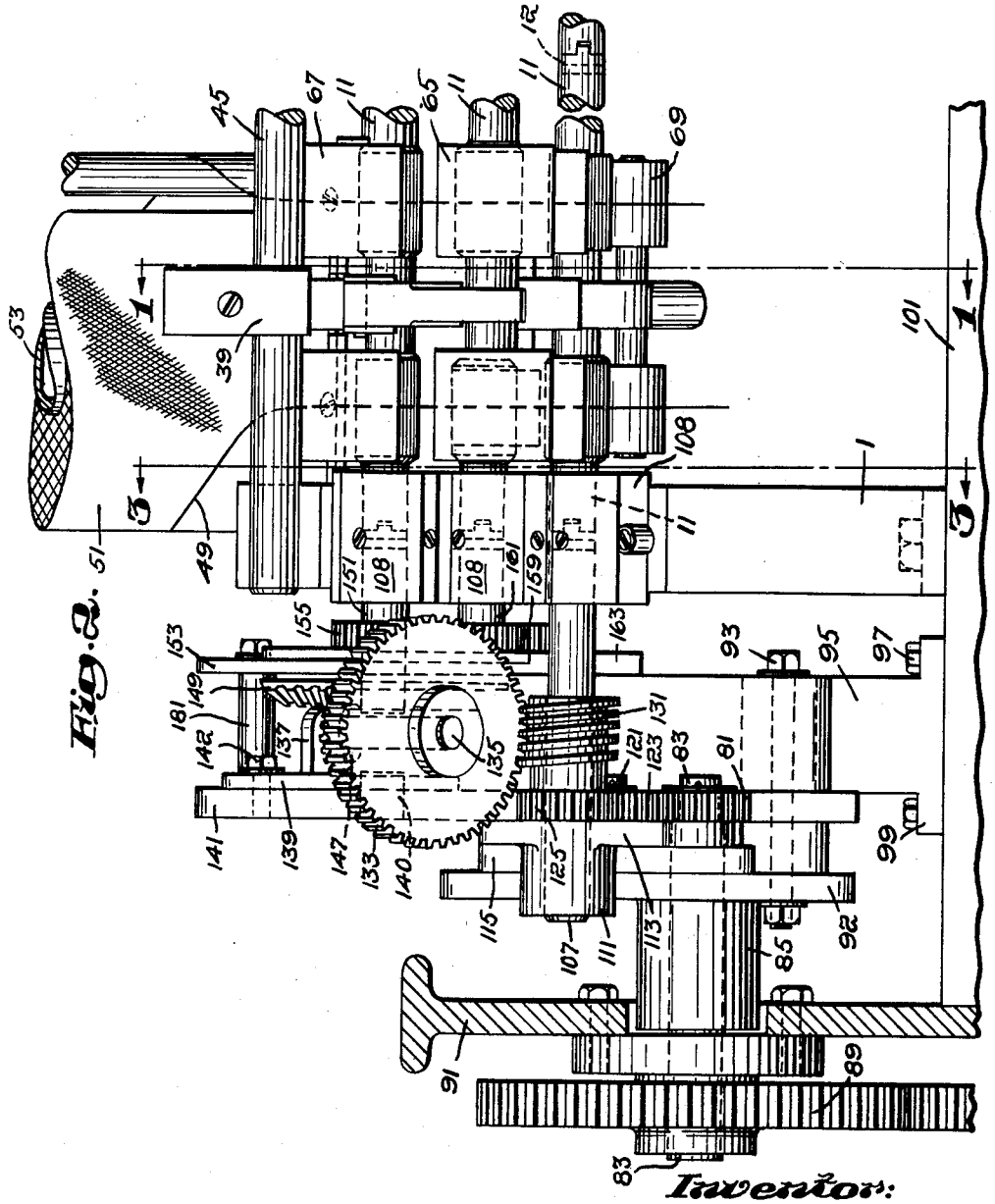


Fig. 2.

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Oct. 16, 1962 L. M. COTCHETT 3,058,170

SPINNING FRAMES

Filed March 30, 1959 4 Sheets-Sheet 3

Fig. 4.

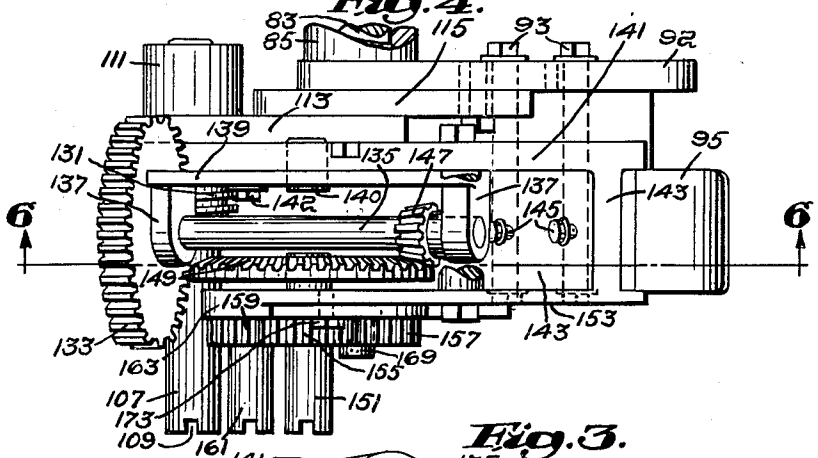
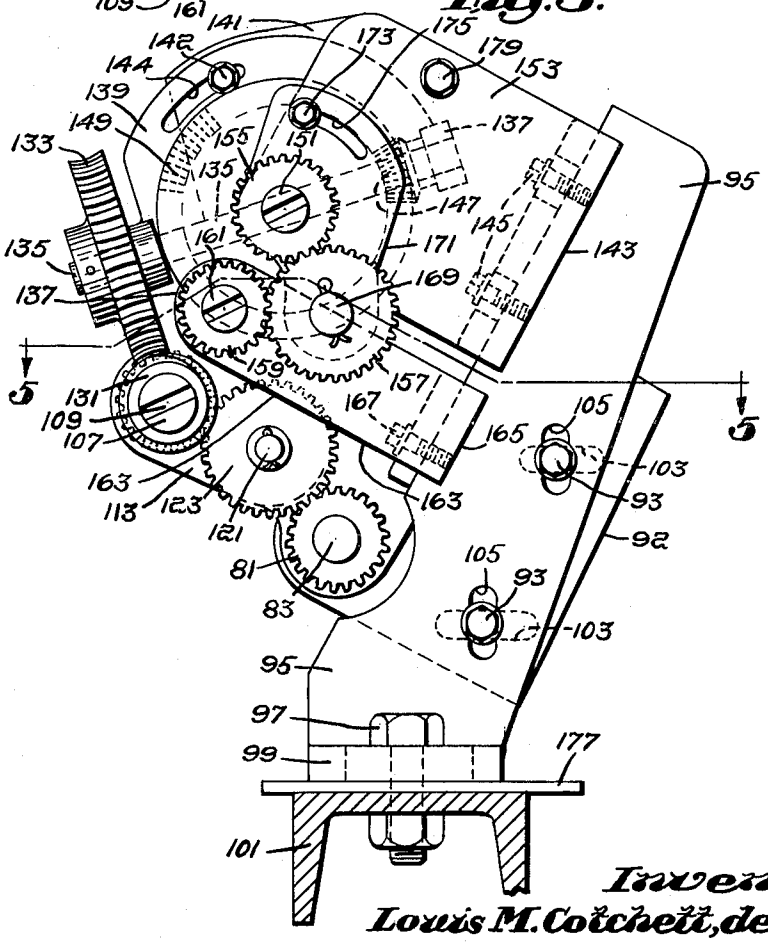


Fig. 3.



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SPINNING FRAMES

Filed March 30, 1959 4 Sheets-Sheet 4

Fig. 5.

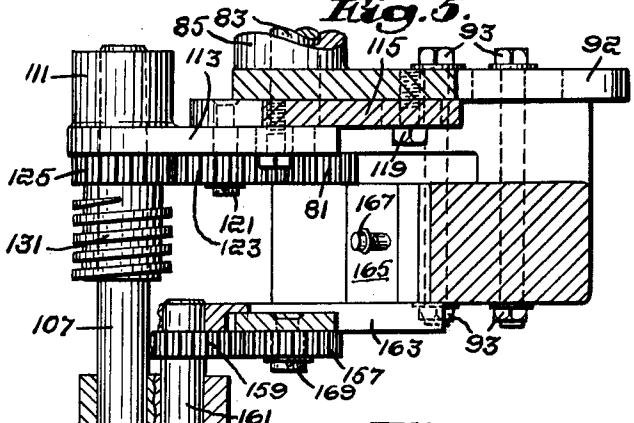
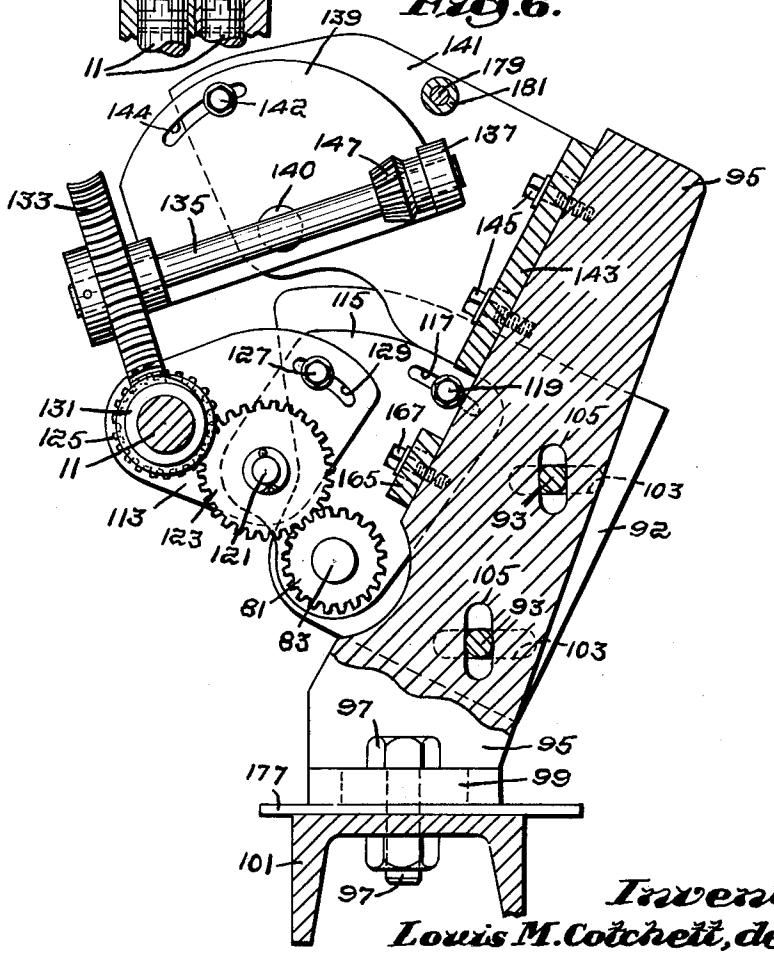


Fig. 6.



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United States Patent Office 3,058,170 Patented Oct. 16, 1962

3,058,170

SPINNING FRAMES

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Filed Mar. 30, 1959, Ser. No. 803,000
10 Claims. (Cl. 19—293)

This invention relates to spinning frames including roving frames, and relates more particularly to the location, mounting, and driving of the drawing rolls thereof. It forms a part of a reorganization of spinning frames, which is designed primarily to increase their production, improve the quality of the yarn they produce, and simplify the running of these frames. It is aimed primarily to modernize existing spinning frames of various makes, though certain of its features are equally useful and applicable in the building of new frames.

The advent of long draft spinning, through the use of aprons and other means, has made it possible to increase greatly and in many instances to triple or quadruple the amount of attenuation or draft effected in a spinning frame, with like increase in its production, over that for which many existing frames were originally designed. This of course has compelled the use of a correspondingly heavier and thicker roving for the supply, and when this coarser roving is wound on bobbins of the size originally used in the creels of these spinning frames to hold the supply, the bobbins run out too fast and require an excessive amount of time and effort from the attendant in setting up fresh supply bobbins and piecing-up their ends to the depleted supplies. Hence resort has been had to the use of bigger bobbins for the supply. But this resort has not been possible in many existing frames which are generally built for the use of 4 or 5 inch diameter roving bobbins, because with the increase of roving bobbin diameter to 6 or 7 inches there is not room to accommodate the necessary number of bobbins between the two banks of drawing rolls respectively extending along each side throughout the length of the spinning frame.

A leading aim of the present invention is to get more width and thus more creel space between the two banks of drawing rolls which limit the capacity of the creel at this level, so that roving supply bobbins of increased diameter and capacity can be used, and the economies thus attainable realized.

To this end, the drafting plane defined by the course of the strands in passing between the successive pairs of drawing rolls is tipped up at a steeper angle and moved forward (outward), by the use of a novel roll stand, so that instead of overhanging the rear edge of the roller beam as heretofore, the entire drafting mechanism of drawing rolls and all of their appurtenant and supporting structure with the exception of their widely spaced roll stands, are forward of the center line of the roller beam, and thus clear of the roving bobbins, preferably being shifted so far that the axes of all the drawing rolls are forward of the front edge of the roller beam. In this way, the space available between the two banks of drawing rolls is materially increased, thus allowing supply bobbins of much greater diameter to be used in the frame. Corresponding changes in the creel of course have to be made to hold the larger bobbins in properly spaced relation to each other. These creel changes form the subject of co-pending application Serial No. 783,902, filed December 30, 1958, now Patent No. 3,042,340.

This forward or outward shift of the drawing rolls' location compels a change in the method of driving the drawing rolls from the head end gearing which distributes the drives of many of the parts of the frame and

delivers the drive for each bank of drawing rolls to the front bottom drawing roll whence through the required speed reduction by gear train it is transmitted to the middle and back bottom rolls.

Changing the location of the two centers of rotation on which the drive from the head end gearing is delivered to each of the two front bottom rolls respectively, which extend into the gear box and are driven directly by gears fixed on their ends in existing frames, would be so complex and expensive as to be prohibitive.

The invention accordingly makes provision for transmitting the drive from the existing head end gearing to the now disaligned and offset bottom rolls, and further provides reduction gearing for the middle and back rolls, by a novel gear train which provides a much greater range of drafting ratios, has fewer parts, and occupies less space than the original gearing having direct drive to the individual bottom rolls, and additionally simplifies the means of changing the amount of the draft and the calculations involved in making such changes. These draft changes must be made every time the character of the yarn being spun is varied. Further, the novel drive inherently is adjustable to suit the different locations of the original front bottom rolls in different makes of spinning frames, so as to make possible any amount of disalignment or offset of the bottom drawing rolls from their existing driving axes that may be required or desired.

A further aim of the invention is to bring the point of delivery of the strand from the front drawing rolls as near as possible directly over and in line with the axis of the rotating bobbin on which the drawn strand is being wound. The forward shift of the roll stands which creates more creel space gives the necessary overhang of the drawing rolls in front of the roller beam, while the tilting of the drafting plane to a steep angle limits this forward extent and lets the delivery point of each strand be located where wanted above the bobbin on which this yarn is being wound and being twisted by the rotation of the bobbin.

The advantage of this new location of the delivery point is that the yarn descends in an almost vertical direction to the eye of the thread guide above the bobbin and thus with a minimum of deflection of the yarn path in passing through the eye, namely merely the angle caused by the ballooning of the yarn around the bobbin. Hence the twist is freed from the interference caused by the heretofore ever-present pressure and friction against the back portion of the eye, and can run back freely. Further, the yarn contacts a very much shorter arc of the bottom front roll after leaving the nip of the two front rolls. The valuable result of these two features is that the twist runs clear back into the nip and catches the leading ends of the fibers which have been freed from the body of the strand through relative movement produced by the drafting operation and which would otherwise be left to bristle out from the yarn or get free and be lost entirely as lint and fly. This also means that the yarn is straightened at its weakest point, namely where it is practically devoid of twist as a result of its extension, and the breakdown of the end at this usual point of failure is greatly reduced. Thus smoother and hence stronger yarn is made, with fewer interruptions, and the loss of fiber as lint and fly is significantly reduced. The economic advantage of apron drafting in conserving and consolidating straying fibers is thus extended clear to the finished yarn.

Another improved result is that the high angle of the drafting plane, preferably around 60° from the horizontal, enables late types of overhead traveling pneumatic lint clearers to circulate air around and through the apron guides and the back rolls, thus more effectively keeping them clear of lint accumulations. These traveling cleaners discharge their air blasts through ducts aimed nearly

horizontally at the drawing rolls, the bobbins being wound, and the ring rails which with their travelers wind the bobbins as the twist is being inserted. In the original arrangement of the roll stands and drawing rolls defining a drafting plane of 30° or less and reaching back of the roller beam, and using conventional revolving top roll clearers, the middle rolls with their aprons and guides and the back rolls are out of the direct range of the blasts and hence are inadequately cleared of lint.

The novel roll stands are aimed to reduce the cost of their manufacture and provide such structures adaptable to all existing types of spinning frames. New stands of course have to be provided to carry out the invention. Practically all previous types of roll stands in commercial use have been machined from iron castings with the slide for the roll bearings and the foot or pedestal in one piece. Pound for pound, steel has now come to cost only a small fraction of the cost for cast iron. In view of this economy possible in materials, a roll stand has been devised primarily designed for the purposes of the invention but additionally capable of general use in spinning frames, which can be produced by power press methods at less than half of the cost of merely machining a cast iron roll stand of conventional type. The entire roll stand is formed of a single piece of cold rolled steel stock of standard commercial dimensions and of uniform width and thickness, requiring only the punching of four longitudinal slots, the formation of one bolt hole, and the bending of the component strip of steel at two points into L-shape in profile.

To provide for easy doffing of the bobbins from their spindles when full, in spite of the overhang of the drawing rolls in front of the roller beam, the position of the front bottom drawing roll has been raised. This gives ample room to lift the bobbins off the top ends of the spindles, and equal facility in donning the empty bobbins. It further adds greatly to the ease of unweighting the top rolls, since the space between the front bottom roll and the roller beam through which the operator must reach in order to release the top roll pressure devices is increased vertically by about 3 inches.

Other aims of the invention, and the manner of their attainment are as made plain hereinafter.

An illustrative embodiment of the invention is shown in the accompanying drawings, in which:

FIG. 1 is a vertical section taken on line **1—1** of FIG. 2, of the drawing mechanism at one side of a spinning frame, showing the novel roll mounting arrangement.

FIG. 2 is a front elevation showing the novel offset drive and the reduction gear train for the three bottom rolls of the drafting mechanism, together with a portion of the head gearing and drive therefrom.

FIG. 3 is a vertical section on line **3—3** of FIG. 2, with the roll stand, bearing blocks, and back bar of FIG. 2 omitted.

FIG. 4 is a plan view of the parts of FIG. 3.

FIG. 5 is a horizontal section on line **5—5** of FIG. 3.

FIG. 6 is a section approximately on line **6—6** of FIG. 4.

The novel structure of the invention comprises an L-shaped roll stand **1** formed of a single length of heavy commercial flat steel stock providing a long straight limb **7** slotted at **15** for about ⅔ of its length and forming the slide or way on which the bearing blocks **9** for the bottom rolls **11** are fixed by cap screws **13** put through a hole for the front roll bearing screw and a slot **15** for the screws holding the other two bearings.

Two obtuse angle bends define a leg comprising a main limb portion **7** and a lower portion **18**, and also a horizontal foot **17**. The exact angles and dimensions are in no way critical except that the limb **7** constituting the slide or way carrying the bottom roll bearing blocks **9** shall be at the proper angle to horizontal foot **17** to give the drafting plane **21** the desired slant. Foot **17** is held by a bolt **25** which fixes each of the series of stands **1** to the roller beam **101** at the proper points in the length of the roller beam to support adequately the drafting mechanism mounted on their slides **7**. A slot **23** in each foot **17** provides forward and rearward adjustment of the stands and hence of the drafting mechanism mounted thereon, to locate the point of delivery of the yarn **29** issuing from the nip of front bottom roll **11** and front top roll **31** in the desired position on or close to the axis of the bobbin **33** on spindle **35**. The limb **18** is of about the length of the foot **17**, and the front bottom roll **11** is thus raised to provide ease of doffing and donning the bobbins, and easy access to the weighting devices **61**.

The bottom rolls **11** are of the type disclosed in companion Patent No. 3,035,314, made in sections reaching only from one roll stand to the next and with an Oldham clutch **12**, FIG. 2, serving as a universal joint connecting each two adjacent sections and permitting axial disalignment thereof without injury to the bearings. Being thus spared the strains caused by the prior continuous types of bottom rolls through inevitable departures from alignment of the members of the series of roll stands extending along each side of the spinning frame, and through use of spring weighting of the top rolls by the devices **61**, FIG. 1, instead of dead weighting by pendent weights, the roll stands are relieved of the heavy stresses compelling the use of rugged cast iron stands heretofore. They can thus be made of sheet metal stock in the light, simple, and far less costly form shown herein.

The particular form of drafting mechanism illustrated herein is that of Patent No. 2,865,057 and is of the so-called cap-barless type in which overlapping members **37**, **39** hold the top rolls **31**, **41** and **43** by their necks alone and serve to position, guide and weight the top rolls, these members **37**, **39**, being slotted at their rear ends and hooked over an auxiliary back bar **45** mounted on the regular back bar **47** which guides the strand **49** of roving being taken from the wound mass **51** on supply bobbin **53**, rotatably supported by member **55** on spindle **57** fixed on arm **59** of the creel structure. This creel is preferably that of companion patent application Serial No. 783,902, being devised to be expanded both widthwise and lengthwise to any desired extent to suit the size and number of supply bobbins **53** wanted, and thus adapted to utilize the increased space created by the present invention between the drafting mechanism shown in FIG. 1 and the corresponding identical drafting mechanism (not shown) at the other side of the spinning frame. The top rolls are weighted by the spring loaded means **61** containing an expanding coil spring reacting against a tubular member mounted on the back side of slide **7** and extending from stand to stand, the spring biasing a hook connected by stirrup **63** to the member **39**, the weighting being transmitted thence to member **37**. Rotary clearer rolls **65**, **67** clear the top rolls **31**, **43** while clearer rolls **69**, **71** clear the front and back bottom rolls **11** and the bottom apron **73**. The usual pigtail thread guide eyes **75** pivoted on traversing rail **77** are used.

As seen in FIG. 1, top delivery rolls **31** overhang their respective spindles **35** and bobbins **33**, and the nip of front rolls **11** and **31** is almost in the line of prolongation of the axis of bobbin **33** and spindle **35**; the yarn **29** is bent so slightly, not over 4° or 5°, out of this line in its descent to guide eye **75** that the twist runs freely through this eye to the bottom roll **11**. With the angle of the drafting plane at 60° to the horizontal, the yarn **29** makes an angle of less than 30° to the drafting plane, and thus the arc of contact of the yarn with the surface of bottom roll **11** subtends an angle of less than 30°, and is so short that the twist ascending the yarn is able to travel around this arc and reach the nip and gather in the leading ends of the fibers as fast as they emerge from the nip. Heretofore, the yarn has had to make a very much sharper bend at the eye of the thread guide, with resulting pressure and friction which prevented passage of a large part of the twist upward beyond the eye, so that what was left to

reach the bottom roll was so weak that only a small part of it was able to travel around the previous sector of 40° or so of contact with the bottom roll to reach the nip. Since it is only the presence of twist which holds the fibers together to form the strand, and since the slight amount of twist originally in the roving being drawn has been dissipated by the high draft, up to 60 times extension, in modern long draft frames, it is easily understood why this failure of the twist to reach the nip of the front rolls in ample degree has made this the weakest point in the yarn during the spinning, and why this is the location of most breakdowns of the yarn, the main cause of lost production.

The new location of the drafting rolls as noted puts each bottom front roll out of line with the established center of rotation on which it received its drive from the head end gearing of the spinning frame. Hence to drive the rolls the mechanism of FIGS. 2 to 6 is substituted for the original reduction gear train using all spur gears, which transmitted the drive from the direct-driven bottom roll shaft to the middle and back bottom rolls.

This novel transmission and drive comprises a spur gear **81**, FIGS. 2, 3 and 6, fixed on the end of a stub shaft **83** replacing the original front bottom roll and mounted in a fixed hub **85** and driven by gear **89** forming a part of the original head end roll drive gearing located within the enclosure of which frame member **91** forms one part. Hub **85** is adjustably mounted by means of its flange **92** and bolts **93** upon an inclined standard **95** fixed by bolts **97** fastening its lugs **99** to the roller beam **101**. Slots **103** in flange **92** and slots **105** in standard **95** provide full adjustment of the location of hub **85** to suit the position of stub shaft **83** in the head end gearing.

The bottom front roll in its new position forward of and above the level of the orginal front bottom roll is driven by a jackshaft **107** coaxial with the bottom roll, and connected by an Oldham coupling having splines entering the slot **109** in the part **107** and a corresponding slot at right angles thereto in the end of the bottom roll shaft **11**. This jackshaft **107** is rotatably mounted in a ball bearing provided within a hub **111** mounted by means of its integral flange **113** on a sector **115**, FIG. 6, having an aperture fitting around an extension of hub **85**. The sector **115** thus has capacity to swing about this hub as a pivot, being slotted at **117** and clamped in adjusted angular position by a cap screw **119** put through the slot and into flange **92**. The flange **113** of hub **111** carrying the jackshaft **107** is pivoted upon a stud **121** fixed in sector **115**, and upon this stud is rotatably mounted an idler gear **123** meshing with gear **81** on the driving jackshaft **83** and a spur gear **125** fixed on jackshaft **107**, thus rotating the latter to drive the bottom roll. A cap screw **127** is put through a slot **129** in flange **113** and into sector **115**, to maintain the angular relation of these two parts to each other. The adjacent ends of jackshaft **107** and front bottom roll **11** are supported in ball bearings in a bearing block **108**, as are the corresponding ends of the middle and back steel bottom rolls and their driving jackshafts, to be described.

Adjustment of this angular relationship, and of the angular position of sector **115** about the axis of stub shaft **83** makes it possible to line up the driven jackshaft **107** with the bottom roll **11** in any desired location of this bottom roll, as effected by the adjustment of the roll stands **1** to bring the nips of the front or delivery rolls **11**, **31**, over the bobbins **33** and their spindles, sector **115** affording forward and backward adjustment, and flange **113** the vertical adjustment.

To drive the back rolls, a worm **131** is fixed on driven jackshaft **107**, and a worm gear **133** meshing therewith is fixed on a shaft **135** mounted in bearings in lugs **137** on a sector **139** pivoted on a stud **140** fixed in one wing **141** of a carriage **143** and held in adjusted position by screw **142** in slot **144** in the sector. This carriage is mounted on standard or "slide" **95**, overhanging the sides of the slide and fixed thereon with capacity for adjustment up and down the slide by cap screws **145** put through slots and into slide **95**. On the other end of shaft **135** is fixed a bevel pinion **147** meshing with a bevel gear **149** fixed on a jackshaft **151** carried in a bearing in the other wing **153** of carriage **143**. This jackshaft is slotted on its end and drives the back bottom roll **11** through an Oldham coupling as with the front bottom roll. Pivot stud **140** for sector **139** is coaxial with this jackshaft and the back bottom roll aligned therewith.

To drive the middle bottom rolls, a spur gear **155** is fixed on jackshaft **151** driving each back roll, which gear drives the middle bottom roll through an idler gear **157** and a gear **159** fixed on a jackshaft **161** mounted in a bearing on the single lug or wing **163** of a second carriage **165** adjustably fixed on slide **95** by a screw **167** and slot.

In order to change the driving ratio between the middle and back rolls as required by the draft needed, gear **159** is used as the change gear, and idler gear **157** is mounted on a stud **169** fixed on a sector **171** pivoted on jackshaft **151** between the wing **153** carrying the bearing for shaft **151** and the gear **155** fixed on such shaft. Thus gear **157** can be moved toward or from jackshaft **161** as required to suit the various diameters of change gears **159**, regardless of the spacing used between the middle and back bottom rolls. A cap screw **173** extends through slot **175** to fix the sector in position and hold the idler gear in mesh with the gear **159** on the jackshaft **161** driving the middle bottom roll through an Oldham clutch, as before described. The wing **163** is recessed for a part of its thickness to let sector **171** overlap it and thus bring the idler **157** into the common plane of gears **155** and **159**.

The important advantage of the new drive is that it makes it extremely simple to change the draft, since the worm gear **133** on shaft **135** is used as the change gear which determines the overall draft effected by the three sets of rolls, and the number of teeth in this gear can exactly equal the draft ratio the bottom roll diameters being equal. Thus a 48-tooth worm gear gives a back roll speed that is the reciprocal of this figure, and thus a draft of 48 to 1. Hence to increase the draft so as to give 60 times the extension of the strand, for example, it is merely necessary to use a 60-tooth worm gear. Practically, for more leverage and smoother transmission of power, a worm having four separate threads is used, so that the reduction at this stage equals the number of teeth in the worm gear **133** divided by 4, and therefore by use of a 4–1 reduction ratio at the bevel gears **147**, **149** the desired parity between the draft and the number of teeth in worm gear **133** is attained.

For greater reductions, the number of threads on the worm can be reduced.

The swivel mounting of the worm gear shaft **135** provides for the substitution of any diameter of worm gear **133** which may be needed, without any further manipulation of the gear train except the appropriate shift of sector **139** to bring the new worm gear into mesh with worm **131**.

The new drive occupies considerably less space than the original gear train using all spur gears, cuts out two such gears, their shafts, and the bearings therefor, and gives a much greater range of gear reduction. By contrast, to convert existing low-draft spinning frames having a draft up to 16 to 1 to high drafts of around 60 to 1 as used in apron drafting by use of the original spur gearing, required compound gearing applied as an added attachment at a high price.

The entire roll drive gearing is completely enclosed in a housing of which only the floor is indicated at **177**, FIGS. 3 and 6, and having a removable cover, oil sump, and pump with ducts, so that all gears and bearings are constantly lubricated and lint is excluded. Ball bearings are used throughout, both in the gear train and for mounting the bottom rolls in their stands.

Wings **141** and **153** of carriage **143** are braced by a bolt **179**, FIGS. 3 and 6, put through a spacer **181**.

While there are illustrated and described certain forms in which the invention may be embodied, it is possible that many modifications may be made therein by any person skilled in the art, without departing from the scope of the invention as expressed in the claims. Therefore, it is not desired to be limited to the particular forms shown, or to the details of construction thereof, but

What is claimed is:

1. In a spinning frame, in combination, a fixed frame member, pairs of top and bottom drawing rolls, roll stands, head end gearing, a stub shaft driven thereby and extending through the fixed frame member, a reduction gear train driving pairs of rolls at different speeds, a roller beam, supporting means for the gear train fixed on the roller beam, a jackshaft out of line with the stub shaft and driving one bottom roll directly and also driving the reduction gear train, and means transmitting the drive from the stub shaft to the jackshaft, said means providing for variable displacement of one shaft out of line with the other.

2. The combination of claim 1 in which the roll stands are fixed on the roller beam with capacity for shift transversely of this beam.

3. The combination of claim 1 in which the jackshaft driving the reduction gear train is supported with capacity for shift of its position transversely of the roller beam.

4. In a spinning frame, in combination, pairs of top and bottom drawing rolls, roll stands, head end gearing for driving the several parts of the spinning frame including the front bottom drawing roll, and a reduction gear train driving the middle and back bottom drawing rolls from the rotation of the front bottom roll including a worm and worm gear transmitting the drive from the front to the back bottom rolls, the worm being mounted on the front bottom roll's axis, a shaft having the worm gear fixed thereon, and means mounting the shaft with capacity for variation of the spaced relation of its axis from the worm.

5. The combination according to claim 4 in which the worm gear is fixed on a shaft having its axis angularly adjustable about the axis of such back bottom roll as a center.

6. The combination according to claim 5 in which a pinion on the shaft engages and drives a gear fixed in coaxial driving relation with the back bottom roll.

7. The combination according to claim 4 in which the worm and worm gear transmit the drive from the front to the back bottom rolls at a driving ratio that is the reciprocal of the number of teeth in the worm gear.

8. The combination according to claim 4 in which the worm gear is alone changed to vary the draft.

9. In a spinning frame, in combination, pairs of top and bottom drawing rolls, roll stands, head end gearing for driving the several parts of the spinning frame including the front bottom drawing rolls, a shaft angularly disposed to the back bottom roll and angularly adjustable about such roll's axis, a bevel gear in coaxial driving connection with the back bottom roll, a bevel pinion fixed on the shaft and engaging with the bevel gear, a worm rotating with the front bottom roll, and a worm gear fixed on the shaft and driven by the worm and having a number of teeth equalling the number of revolutions made by the front bottom roll during each revolution of the back bottom roll.

10. In a spinning frame, in combination, pairs of top and bottom drawing rolls, roll stands, a roller beam, head end gearing, a stub shaft driven thereby, a standard fixed on the roller beam, jackshafts respectively aligned with and driving the several bottom rolls, driving means of gear type driving the jackshafts from the stub shafts, and bearings for the jackshafts slidably mounted on the standard.

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