

No. 874,714.

PATENTED DEC. 24, 1907.

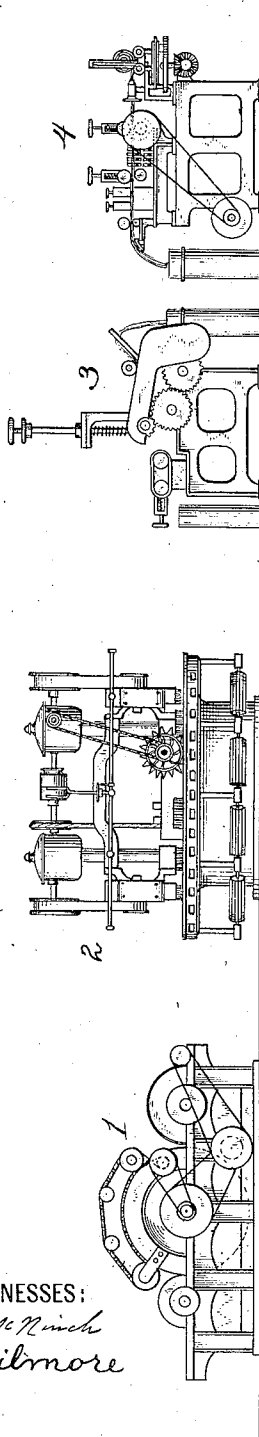
V. S. WESTCOTT & F. W. POTTER.
METHOD OF MAKING WORSTED YARNS.

APPLICATION FILED NOV. 14, 1906.

2 SHEETS—SHEET 1.

Fig. 1.

WITNESSES:
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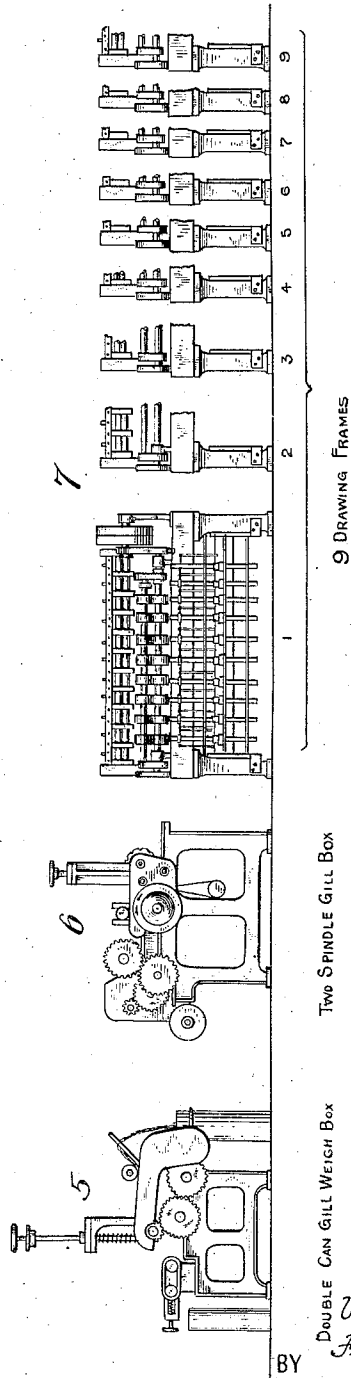


SLIVER EVENER
&
BALL GILL BOX

DOUBLE CAN GILL BOX

COMBING MACHINE

CARDING MACHINE



TWO SPINDLE GILL BOX

DOUBLE CAN GILL WEIGH BOX

9 DRAWING FRAMES

BY

INVENTORS
Valorus S. Westcott
Frank W. Potter
Master of Forges
THEIR ATTORNEYS.

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2 SHEETS—SHEET 2.

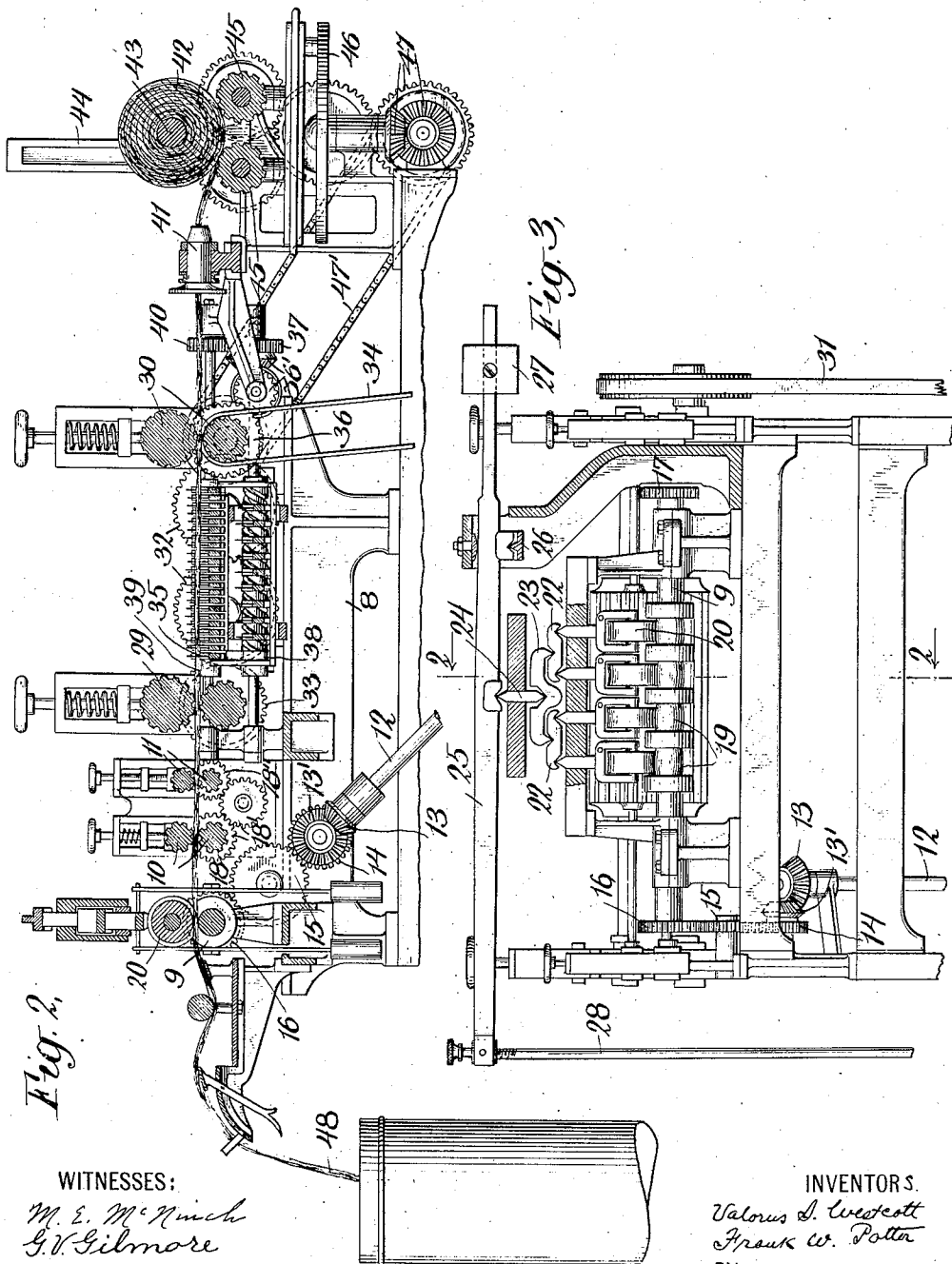


Fig. 2.

Fig. 3.

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UNITED STATES PATENT OFFICE.

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METHOD OF MAKING WORSTED YARNS.

No. 874,714.

Specification of Letters Patent.

Patented Dec. 24, 1907.

Application filed November 14 1906. Serial No. 343,410.

To all whom it may concern:

Be it known that we, VALORUS S. WESTCOTT and FRANK W. POTTER, citizens of the United States, residing at Pawtucket and Central Falls, in the county of Providence and State of Rhode Island, respectively, have invented a certain new and useful Method of Making Worsted Yarns, of which the following is a specification.

In the manufacture of worsted and kindred yarns the aim of the manufacturer is to produce a yarn of uniform weight for a given unit of length. These yarns are known to the trade by numbers, a given number meaning so many yards per pound on which basis they are sold. It is of interest, therefore, that when selling or buying upon a specified order the manufacturer supplies what is called for and the purchaser obtains that for which he pays. According to present wool processes the manufacturer falls short of accomplishing his aim with the result, from a commercial standpoint, that a loss is entailed either upon one side or the other. For example, if what is known as 36s is ordered which sells at a given price per pound, although the manufacturer ostensibly may supply that weight, the order is apt to include a lighter or heavier weight; if the former, the loss is upon the manufacturer, and, if the latter, upon the purchaser. This matter assumes additional importance from the fact that a mill manufacturing woven cloths desires that its products shall be what they purport to be in weight, and that a fabric of 36s, for example, should be of that weight of yarn and not lighter or heavier. When it is considered that a single mill may order ten thousand pounds, or more, a week, the difference in money value one way or the other aggregates a very large amount. The reason for this variation in weight of a given standard of worsted yarn is due to the fact that at present dependence is placed upon the skill of an operator to average the slivers as they pass through the gilling process. Such method followed by two different operators will not be the same within a wide range. However skilful the operator may be it is practically impossible to deliver to the drawing frames a sliver of uniform weight per unit of length, and consequently the final spun yarn will vary in weight. According to the present invention this guess work method of averaging slivers is eliminated and in place

thereof we introduce into the process a sliver-evening mechanism between the usual combing and drawing operations. So far as we are aware no attempt has heretofore been made to introduce such step in wool processes. The basis of perfect wool spinning is a perfectly uniform material upon which to work, and every step taken toward the production of such material tends to an advance in the art and is of vast commercial importance. In order to fully appreciate our invention and its relation to the manufacture of worsted yarns it will be advisable to refer briefly to the nature of the raw material and the present day processes through which wool is put preparatory to the drawing and spinning.

The wool fiber is a tube built up of layer upon layer of scales, the number of scales bearing a fairly direct relation to the fineness of the fiber. No other textile industry has to deal with a raw material so sensitive and so easily injured, wool fiber being more sensitive and much sooner injured than any of the vegetable fibers as cotton or flax, and the tendency should be to maintain its natural softness, strength and elasticity unimpaired. Wool is commonly characterized by its fine, soft, curly nature, the curliness being due to the spiral structure of the filaments and is one of its recognized and important characteristics. Another valuable characteristic of wool is its elasticity which gives it a softness to the touch which is retained in the manufactured goods. Closely related to this is the strength of the fiber, wool fiber being fully one-fourth stronger than cotton.

The three main classes of wool on the basis of the staple are (1) carding or clothing wools in which felting qualities are desired, (2) combing wools in which length of staple is required and felting qualities not desired, used for hard spun non-felting worsteds, and (3) miscellaneous, sometimes called carpet or blanket wools, long, strong, coarse wools used for carpets, blankets and coarse clothing.

The present invention primarily relates to the production of worsted yarns. The first operation in the series of processes is the sorting of the wool in which the exigencies of the manufacture determine the mode to be followed. After this comes the scouring, the purpose of which is to cleanse the

wool of its yolk, natural grease and dirt. Much depends upon this as without proper scouring of the wool it is impossible to card it properly as the wool will not open freely.

5 The wool is then passed through a drier from which it emerges in tangled masses in a more or less moist condition. It is then delivered to the carding engine, after the operations of teasing for opening up the masses

10 and the blowing out of dust and dirt, and buring to remove burs or motes of any kind.

The carding of wool to some extent differs from that for any other textile manufacture and proceeds upon somewhat different lines. Carding for every other industry aims at laying the fibers parallel. With wool the aim is to open the material fiber from fiber and to present it in a perfectly loose and thoroughly open condition

20 without leaning towards any artificial arrangement. Owing to the want of mechanism to distribute or equalize any inequality due to a fault in the carding, such operation assumed great importance in the woolen

25 industry. In fact, in no other textile industry is the carding of the same importance and required to be done so uniformly as it is in the wool, and in no other industry has any irregularity such disastrous consequences. When the carded wool is made

30 into a thick sliver there is no artificial arrangement of the fibers and the ends are loosely embedded in the bulk.

From the cards the sliver passes through

35 condensing rolls and is wound into a ball. About eight or more of these balls are then put through a washing process to remove the oil with which the wool was damped preparatory to carding, the wool after drying being passed through condensing rolls

40 and emerging in the form of a single sliver. The slivers from the back washing are in some mills run through a gill box before being balled for the combing machine. About

45 twenty of these balls are then placed on the combing machine, the flat webs passing through the combs are drawn in a single sliver which is wound into a ball or run into a can. The purpose of the combing is to remove

50 noil and dirt and is the final cleaning operation preparatory to gilling.

The preliminary operations above noted up to the combing are common to all manufacturers, but at that point the two

55 branches of wool manufacture separate. In making woolen yarns the wool is simply carded and loosely spun; in making worsted yarns the wool is combed, gilled, drawn, and twisted until it becomes very hard. In

60 making woolen yarns a short stapled wool may be used and a fiber having good felting qualities is preferred. The opposite characteristics are sought in wool to be used in the manufacture of worsted.

65 In the production of worsted yarns the

first operation after combing is that of gilling the object of which is to level the fibers and lay them parallel. The machine by which this is accomplished consists of a pair of feed rolls which catch the wool, and a pair of

70 drawing rolls which draw it forward over steel bars, called fallers, covered with projecting steel pins. These machines are generally used in sets, each successive machine having pins on the fallers finer and more

75 closely set than the preceding. In operation there is a steady and constant drawing of the wool away from the feed rolls and through the teeth of the fallers. The product from each gill box is condensed into a

80 sliver which is received in cans or rolled into a ball. After the combed material has been gilled it is put through the drawing frames, and then spun. The spun yarn is rolled, warped, beamed, sized or otherwise prepared

85 for weaving.

As compared with the foregoing, cotton processes involve merely the operation of picking, carding, drawing, slubbing, roving

90 and spinning. In wool processes wholly different conditions obtain not only in the characteristics of the fibers, but in the operations preliminary to drawing and spinning. The tangled masses of wool received "in the grease" and passing through several wash-

95 ings before combing presents conditions not met with in the treatment of cotton. In the latter the material is in practically dry, flocculent masses the fibers of which readily lend themselves to the parallelizing action of the

100 cards, the resulting slivers passing immediately to the drawing frames, or preparatory thereto through an evening mechanism. With wool, on the contrary, the manufacturer

105 has to deal with more or less moist, compact, tangled masses which are delivered to the cards and emerge therefrom in a sliver having no artificial arrangement of the fibers and must pass through several elaborate operations of combing and gilling preparatory

110 to drawing. So far as we are aware, it has not been considered feasible, at least no attempt has been made, to reduce the wool slivers between the combing and drawing operations to a uniform weight, except by

115 the guess work method before referred to of averaging by hand the slivers as they pass through one of the gill boxes. Such method is unsatisfactory and wholly unproductive of the desired result. The desirability of an

120 even mechanism in worsted processes has long been felt and we believe that by the machine herein described that want has been met as it is well adapted to the peculiar conditions obtaining in such processes.

125

We will now describe by reference to the accompanying drawings the relation of the evenner mechanism to the other parts of a mill and particularly its relation to one of the gill boxes.

In the drawings Figure 1 illustrates in a more or less diagrammatic manner several of the machines employed in a mill for the production of worsted yarns, a sufficient number of these machines being shown to explain the place occupied by the sliver evenner in the series of operations; Fig. 2 is a central vertical section partly broken away through a combined sliver evenner and gill box on the plane of the line 2—2 of Fig. 3; and Fig. 3 is an end elevation of said machine looking in the direction of the arrow of Fig. 2.

Similar reference numerals indicate similar parts in the several views.

The several machines illustrated in Fig. 1 are of known construction except the combined sliver evenner and gill box and, therefore, only the latter will be specifically described, so far as may be required, it being understood that the particular types of machines illustrated are selected solely for descriptive purposes. Referring then to Fig. 1 the numeral 1 designates a traveling flat carding engine through which the wool passes in a thin, gauze-like web which is drawn through a trumpet and condensing rolls in the form of a sliver having the fibers in no particular or artificial arrangement. This sliver is balled and after the back washing, the wool passes through a combing machine 2 to remove noil and dirt, and in some cases through a gilling and balling operation preparatory to combing. The slivers from the combing machine are then passed through several crossings and redrawings in gill boxes in order to lay the fibers parallel, and by running several ends into one to reduce as much as possible the thick and thin places to produce a level yarn. In the mill before referred to four gill boxes are employed through which the slivers are passed as follows. About thirty ends from the combing machine are drawn through a double-can gill box. Eight or ten ends from the first gill box are then drawn through a ball gill box, the resulting single sliver being rolled into a cylindrical ball about nine inches across. From eight to ten ends from this latter gill box are then run into one through what is termed a double-can gill weigh box. It is at this point that the operator by introducing a greater or less number of ends, and by close attention to the slivers with respect to thick and thin places, attempts the production of a sliver which shall approximate toward some degree of uniformity in weight. Experience is the only guide and at best it is mere guess work and wholly unsatisfactory, it being impossible by such method to produce a sliver, and consequently a yarn, of uniform weight. The results are shown by variation in a yarn of given count of anywhere between five and fifteen per cent. in weight.

The slivers from the third gill box are received in cans which are weighed and two or more ends therefrom, approximating the same weight, are run into one through a two-spindle gill-box. The slivers from this last gill box are wound on spools which supply the drawing frames, the number of drawing operations depending upon the count of yarn required. From the drawing frames the rovings go to the spinning frames for the final operation in the production of the yarn.

By the introduction of a sliver evenner mechanism into this series of operations the averaging of the slivers as they are run through one of the gill boxes by the operator is done away with. Instead of depending upon experience as a guide with its attendant unsatisfactory results we are enabled to produce a sliver for the drawing frames which is substantially uniform in weight for a unit of length. Owing to the nature of the combing and drawing operations the evening of the sliver must be effected between the two, and we have illustrated the evenner mechanism as between the first and second gill box and for convenience of operation have attached it to the latter. This, however, is not absolutely essential as the evenner mechanism may be separately mounted. It is of advantage to locate the evenner before the double-can gill weigh-box for the reason that the operator on that machine is enabled to supply it with a given number of slivers, and as each individual sliver is of substantially uniform weight the resultant sliver from the last-named machine will be of uniform weight. With this arrangement the first or double-can gill box designated by the numeral 3; the double-can gill weigh-box 5; the two-spindle gill box 6; and the drawing frames 7 remain as heretofore both as to construction and relative positions. The combined sliver evenner and ball gill box 4 which assumes the position of the ball gill box heretofore used will now be described.

In a companion application filed of even date herewith Serial No. 343,411 we have described the combined evenner mechanism and ball gill box in detail. The present application relating only to the method of making worsted yarns, we do not deem it necessary to more than illustrate a part of the said machine as it is given only for the purpose of calling attention to what has been done in practice.

Referring now more particularly to Figs. 2 and 3 the numeral 8 designates the frame of the machine. At the back thereof is an evenner roll 9 and drawing rolls 10 and 11 supported in suitable bearings. These rolls are geared together and the evenner roll connected with the driven member of any suitable form of variable speed motion through a shaft 12. Said shaft carries a bevel gear 13 meshing with a similar gear 13' on the shaft of which

is keyed a spur gear 14. The latter through an intermediate 15 is connected to a gear 16 on the shaft of the evener roll 9. On the opposite end of said shaft is keyed a spur gear 17 which through an intermediate is connected to a gear, not shown, keyed on one end of the shaft of the lower roll 10. On the opposite end of said latter shaft is a gear 18 which through the intermediate 18' is connected to the gear 18'' on the shaft of the lower roll 11.

The evener roll 9 is provided with a series of peripheral grooves 19 adapted to receive without binding upon the side walls thereof a corresponding number of detector disks 20 revolubly supported on studs carried by yokes 21. These yokes carry upwardly extending rods having a knife edge upon which saddles 22 are supported, the latter in turn supporting the upper saddle 23 which is in engagement, through an intermediate knife edge 24, with the under side of a lever 25. These parts are so constructed and adjusted that in the absence of a sliver a given disk 20 will rest upon the bottom of its groove 19 of the evener roll, and when a sliver is passing through the evener roll any variation thereof from a normal weight will be indicated by the rising and falling movements of the disks 20, such movements being communicated to lever 25 through the system just described. Lever 25 is fulcrumed on a knife edge 26 carried by a stirrup attached to a bracket of the frame, and is balanced by an adjustable weight 27. The outer end of the long arm of lever 25 is adapted to support adjustably therein a vertical rod 28 which is connected to a friction wheel, not shown, of the variable speed motion, the position of said wheel determining the speed of the driven member which in turn determines the speed of rotation of the evener roll 9 and drawing rolls 10 and 11.

The screw gill box, through which the slivers are passed as they leave the drawing rolls 10 and 11, comprises two sets of drawing rolls 29 and 30 which are driven at constant rates of speed. As shown in Figs. 1 and 3 the shaft of the lower one of the front drawing rolls 30 is connected through a belt 31 with the power shaft. On the opposite end of the shaft of said roll is a spur gear, not shown, which is connected through the intermediate gears 32 with a gear 33 keyed on the shaft of the lower one of the rolls 29, these gears being so related that the rolls 30 are driven at a speed about five times as great as that of the rolls 29. The drawing rolls 10, 11, 29 and 30 have their surfaces corrugated, and between the front rolls 30 is passed an endless apron 34 of soft leather.

The fallers 35 are of the usual type and are moved forward and backward by screws driven through a suitable train of gears. The drawings show one of two gears 36 keyed on opposite ends of the shaft of the lower roll 30 and these are connected through intermedi-

ates 36' to spur gears 37 on the shafts of the lower screws 38. The upper screws 39 are driven through gears 40 meshing with the gears 37.

The slivers as they pass through the drawing rolls are spread into a practically continuous web, and after passing through the drawing rolls 30 this web is gathered by a trumpet 41 into a sliver which is rolled into a cylindrical shaped ball 42 at the front of the machine. The issuing sliver is wound on a spindle 43 having bearings in blocks seated in guides 44. The ball rests upon corrugated rolls 45 revolubly mounted in a carriage which is reciprocated transversely of the machine through a crank disk 46, the latter being rotated through a train of gears 47 driven from the lower of the rolls 30 by a chain 47' or other connection.

When a sliver evener is used in the connection above described the evener roll 9 will be provided with four grooves each adapted to receive and unite two or more ends into one, the balled sliver being the result of the union of the eight or more ends received from the double-can gill box. The slivers from the latter, one of which, designated 48 is shown, are fed from the cans and delivered through suitable guides to the grooves of the evener roll. They pass thence through the drawing rolls 10, 11 and 29, fallers 35 and front drawing rolls 30 to the balling mechanism. As the slivers pass through the evener roll they are confined on all sides, that is between the bottom and side walls of the grooves of said roll, and the detectors. The latter bear directly upon the slivers and being yieldingly mounted in a plane transverse to the plane of fixed confinement it follows that the detectors will respond instantly to any variation in the weight of the corresponding sliver, whether that variation is in a vertical or a transverse direction. The several parts of the machine described are adjusted primarily for a sliver of normal weight so that an increase above or a decrease below the normal will effect a rising or falling movement of the corresponding detector disk, the result being to automatically lessen the speed of the rolls 9, 10 and 11 if the sliver increases in weight, thereby permitting the uniformly rotating rolls 29 to draw the sliver down to normal weight. If there is a decrease below the normal when the sliver enters the evener roll the speed of said roll and of the drawing rolls 10 and 11 will be automatically increased above that of the rolls 29, so that the amount or weight of material entering the rolls 29 is substantially uniform under all conditions. The sliver which is rolled into the ball 42 is, therefore, of substantially uniform weight for a given unit of length, and if the double-can gill weigh-box is to be retained by reason of the necessity for another gilling operation, the operator is merely called upon to

keep that machine supplied with the necessary number of ends, being relieved entirely of the work of averaging the slivers. It follows that the drawing frames will be supplied
 5 with spools from the two-spindle gill box carrying a uniform sliver, and that the rovings from the drawing frames will be of like character as to weight for a given count of yarn. The commercial importance of this
 10 has been pointed out and can hardly be overestimated.

In the foregoing description we have assumed the retention in the process of the third gill box, but in practice this may well
 15 be omitted, thus effecting a further saving of time and labor. This is because of the drawing of the slivers in the evenner mechanism by the back rolls 10 and 11, the relation of these rolls and the evenner roll to the rolls
 20 29 being such that there is "a draft of three," that is a given unit of length of sliver entering the evenner roll is drawn to three times that length upon entering the rolls 29. While we have paid special attention to the
 25 evening of the sliver this drawing by the rolls 10 and 11 is of importance although relatively secondary. As it in a manner supplements the parallelizing action of the ball gill box, the double-can gill weigh-box may
 30 be omitted and the slivers taken directly from the ball gill box to the two-spindle gill box.

The term "worsted yarn" as used herein is intended to cover not only a yarn made
 35 from the wool of the sheep, but mohair and kindred yarns requiring a like treatment preparatory to the spinning operation. Also we do not wish to be limited to any specific details of mechanism employed in evening
 40 the yarn, that illustrated being given solely for the purpose of description.

While we have described the entire operation of producing a worsted yarn and have laid stress upon the commercial importance

of producing a yarn of uniform weight for 45 a given unit of length, and have illustrated in the drawings an entire mill, or such parts of it as are essential to an understanding of the invention, it will be understood that the tops
 50 from the ball gill box constitute a regular article of manufacture and trade and that the production of a sliver of uniform weight between the combing and drawing operations is the basis of uniformity in the final product.

What we claim and desire to secure by Letters Patent is:—

1. The herein described process for the production of worsted yarns comprising the evening of the sliver preparatory to drawing 60 and spinning.

2. The method of producing a yarn of wool of substantially uniform weight for a given unit of length comprising the automatic evening of the sliver preparatory to the 65 drawing operation.

3. The herein described yarn process comprising the usual carding, combing, gilling, drawing and spinning operations, and an intermediate process connected therewith for 70 evening the sliver to a substantially uniform weight for a given unit of length.

4. The herein described yarn process comprising the usual carding, combing, gilling, drawing and spinning operations, and as a 75 step intermediate the combing and drawing automatically evening the sliver to a substantially uniform weight for a given unit of length.

In testimony whereof we have hereunto 80 signed our names in the presence of two subscribing witnesses.

VALORUS S. WESTCOTT.
 FRANK W. POTTER.

Witnesses:

CHAS. H. HYDE,
 FRANCIS H. WASHBURN.