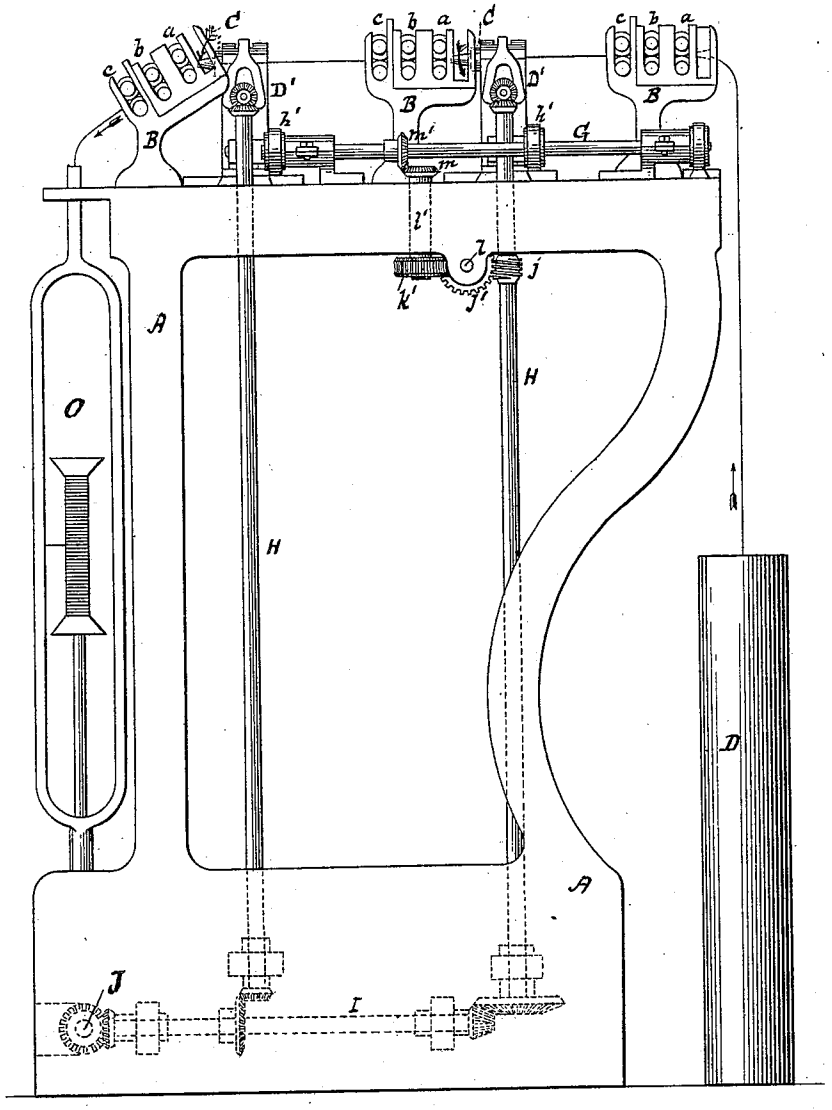
(No Model.) 4 Sheets—Sheet 1.

E. W. KELLEY.

MACHINERY FOR THE MANUFACTURE OF ROVING.

No. 250,043. Patented Nov. 22, 1881.

Fig. 1.



WITNESSES

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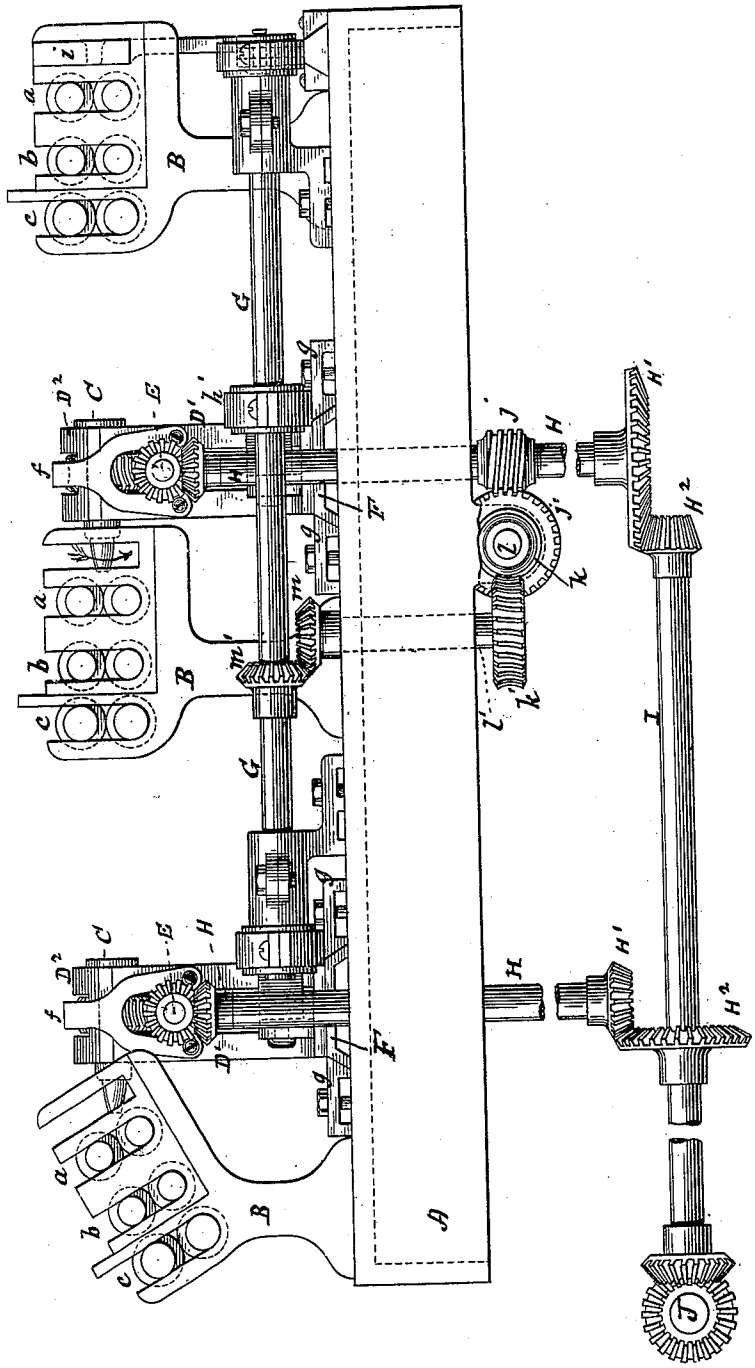

Fig. 2.

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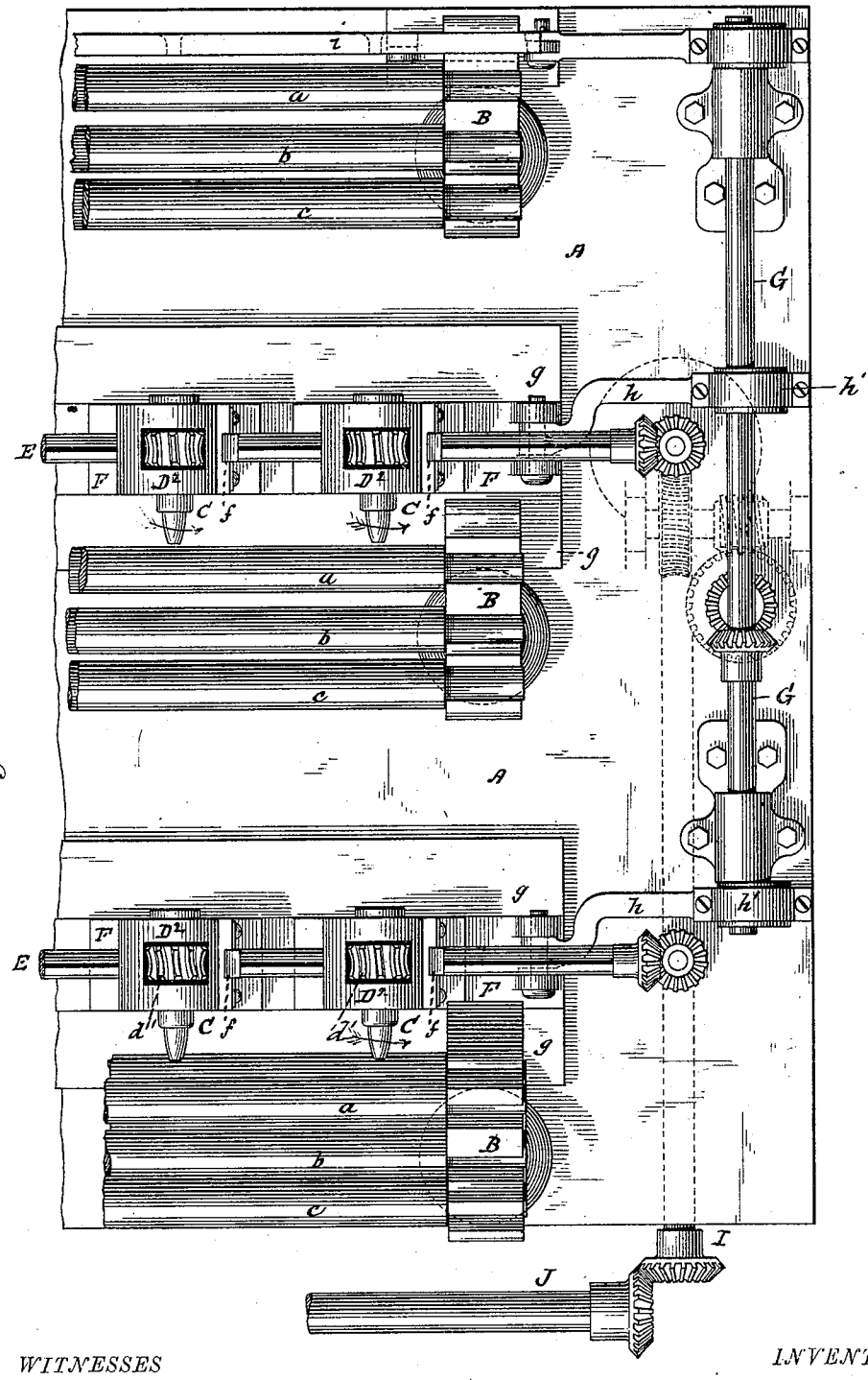
Fig. 3.



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(No Model.) 4 Sheets—Sheet 4.

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MACHINERY FOR THE MANUFACTURE OF ROVING.

No. 250,043. Patented Nov. 22, 1881.

Fig. 4,

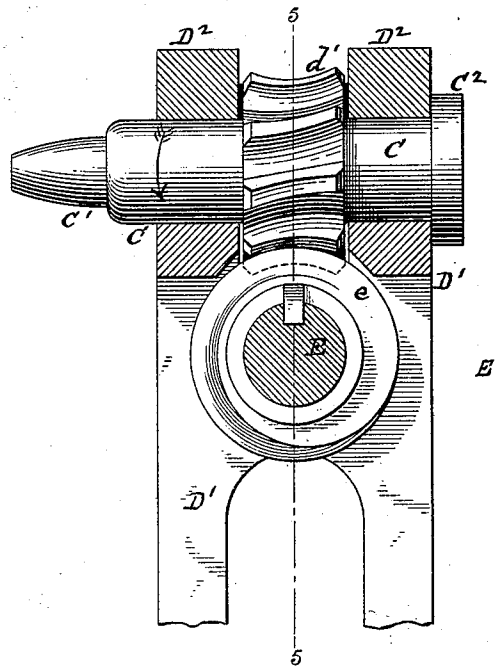


Fig. 5,

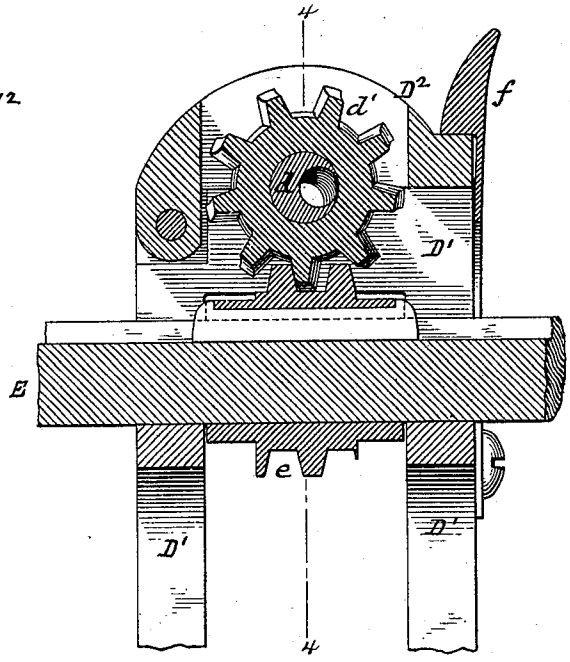


Fig. 6,

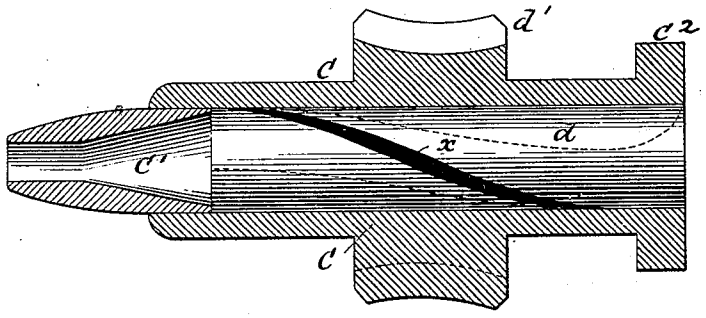
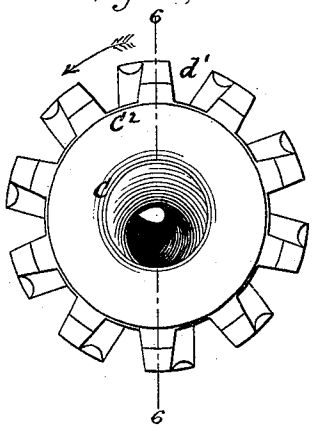


Fig. 7,



WITNESSES

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By his Attorney

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UNITED STATES PATENT OFFICE.

EDWARD W. KELLEY, OF LOWELL, MASSACHUSETTS, ASSIGNOR OF TWO-THIRDS TO WHITEHEAD & ATHERTON MACHINE COMPANY, OF SAME PLACE.

MACHINERY FOR THE MANUFACTURE OF ROVING.

SPECIFICATION forming part of Letters Patent No. 250,043, dated November 22, 1881.

Application filed October 8, 1881. (No model.)

To all whom it may concern:

Be it known that I, EDWARD W. KELLEY, of Lowell, Massachusetts, have invented certain new and useful Improvements in Machinery for the Manufacture of Roving for Spinning Purposes, of which the following is a specification.

The customary way of making cotton roving for spinning purposes is to pass the sliver which comes from the drawing-frame, and which is usually termed the "drawing," through two or more "speeders," so called, which reduce the sliver ultimately to roving of the required size and quality. Each speeder consists of a stand of drawing-rolls, by which the sliver is drawn, and a flier and spindle and their appurtenances, by which the sliver delivered from the drawing-rolls is twisted and wound onto a bobbin. The roving produced by the first speeder is again drawn and twisted in the second speeder, and so on, until roving of the desired fineness is finally produced. It is usual, also, to double the strands of roving in each speeder—that is to say, the second or intermediate speeder takes and condenses into one, two, or more rovings, such as are made by the first speeder, and so on. This method of manufacturing roving is disadvantageous on many accounts. It necessitates the employment of two or more separate machines, which not only are expensive, but require the separate handling of the cotton for each machine, which is objectionable, inasmuch as the material, in order to obtain the best results, should be handled as little as possible. Furthermore, each speeder after the first acts, not upon a sliver in which the fibers lie straight and substantially parallel with one another, but upon a roving which has been previously permanently twisted by a spindle and flier. This twist which remains in the roving gives rise to kinks in the finished thread or yarn, and also puts the fibers in a position in which the staple is liable to be injured or broken when the roving is subjected to the drawing operation. Owing to these and other objections which attend the method of manufacture referred to, the thread or yarn made from the roving is harsh, kinky, and lacking in strength.

It is my object to overcome these objections, and this object I find I can attain by subjecting the sliver while in untwisted condition to successive drawing operations until it is reduced and drawn out to the proper extent, and then, and only then, twisting said sliver into roving of proper fineness by means of the usual flier and spindle. In other words, supposing it be desired to subject the sliver to three drawing operations, I mount in one frame, at proper intervals apart, three sets of drawing-rolls, through which the sliver successively passes, and, dispensing with fliers and spindles for the first and second sets, I employ only a flier and spindle with the third or final set. I thus dispense with two sets of fliers and spindles, avoid all handling of the cotton during the several drawings to which it is subjected, and make one machine do the work that has heretofore required the use of three. The sliver, as it leaves each set of drawing-rolls, is a thin ribbon-like product, too delicate and fragile to permit of its being carried to and taken by the next set, without first having been condensed and put into a more compact shape. To this end I interpose between each two adjoining sets of drawing-rolls a distinct condensing device, which acts to compact and condense the sliver as it passes from one set of rolls to the other, without, however, putting any twist in it or exerting any appreciable drag upon it.

I am aware that it has before been proposed to use between drawing-rolls, for the same purpose that I have in view, stationary tapering or funnel-like troughs or tubes in order to compact, without twisting, the sliver as it passes along through the machine from one set of rolls to the next set; but a device of this kind is not adapted for industrial use. The unavoidable drag or friction between the walls of a stationary trough or tube and the delicate and fragile body of sliver is sufficient to break the latter, so that such a machine would not possess practical utility. It is essential to obtain condensing action without exerting such strain or drag on the sliver as to endanger its breaking; and to this end I employ not a stationary but a moving or rotating condenser, and I so construct this rotating condenser that it will in moving act not only as a

condenser, but also in some measure as a conveyer, the tendency of its action being to carry along the sliver in the direction in which it should move through the machine to such an extent as to counteract and neutralize the drag to which the sliver would otherwise be subjected with the injurious consequences above stated. It is this combination, with two adjoining sets of drawing-rolls, of an intermediate rotary condenser—by which term I intend a condenser which acts also in some sort and in the sense above indicated as a conveyer—that mainly characterizes my invention. By this combination of instrumentalities I am enabled to carry the sliver uninterruptedly through as many sets of drawing-rolls as may be desired, condensing and compacting without twisting the sliver as it passes from one set to the other in such manner as to impart to it all needed strength and to put it into shape and condition in which it can be effectively operated on by the set of rolls to which it may be delivered from the condenser.

Rotary condensing devices of various forms may be employed in carrying my invention into effect.

The preferred form of condenser, and the one which I find embraces all conditions necessary to successfully carry out the object I have in view, is a rotary tube having a bore cylindrical in cross-section and extending spirally, instead of in a right line, from end to end of the tube. In the bore the sliver is compacted and condensed and brought from the form of a thin flat ribbon to the cylindrical or approximately cylindrical form. The object of the spiral arrangement of the bore is to counteract the tendency to drag or friction between the walls of the bore and the sliver, which otherwise would cause the latter to break down. When (as is the case when the machine is in operation) the condensing-tube rotates the tendency of the spiral arrangement of its bore is to cause it to feed or carry forward the sliver passing therethrough, consequently neutralizing the tendency to drag and preventing any breaking strain coming upon the sliver from that cause. Thus the device acts not only as a condenser, but also as a conveyer. The rotary movement of the spirally-bored condenser, which movement is slow and bears a definite relation to that of the sliver, imparts no appreciable twist to the sliver, which, after passing from the mouth of the condenser, passes untwisted into the bite of the succeeding set of drawing-rolls. If the sliver were stationary during the rotation of the condenser, it might be otherwise; but during the rotary movement of the latter the sliver moves forward continuously, the main and only appreciable effect of the rotary movement being to bring about the condensing of the sliver and to carry it along without strain. Practically, and as a matter of fact, the sliver passes untwisted between the drawing-rolls of all the sets, and is twisted and formed into roving only after it passes the last pair of the final set of drawing-rolls. The result, so far as the product is concerned, is that the thread or yarn made from roving manufactured under my invention is almost entirely free from kinks and is much smoother, finer, and quite as strong, if not stronger, than thread or yarn made under the methods heretofore employed.

The nature of my invention and the manner in which the same is or may be carried into effect will be understood by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of a machine embodying my invention. Fig. 2 is a like elevation, on an enlarged scale, of the head or upper part of the frame which carries the stands of drawing-rolls. Fig. 3 is a plan, on a like scale, of a portion of the machine. Figs. 4 to 7, inclusive, represent, on enlarged scale, the condensing and conveying tube, the tube-supporting stand, and the mechanism for rotating the tube.

The frame of the machine is indicated at A. Upon the platen or top plate of the frame are mounted the stands which carry the drawing-rolls and the condensers. There are in the present machine three sets of drawing-rolls, each carried by a stand, B, secured to the platen. Each set of drawing-rolls consists of three pairs of rolls, *a b c*, which are mounted in their stand and driven in the usual way. In each set the "draw" is effected principally between the second and third pairs, *b c*, the second pair, *b*, revolving but slightly faster than the first pair, *a*, while the third pair, *c*, of rolls, of greater diameter than those of the other pairs, revolve at a considerably greater peripheral speed than the first pair; and the initial pair *a* of each set of rolls revolve at the same peripheral speed as that of the terminal pair, *c*, of the set of rolls next in rear relatively to the movement of the material through the machine, this being to avoid undue draft on the sliver passing from one set of rolls to the next succeeding set. The drawing-rolls of each set are arranged in a manner similar to that employed heretofore in speeders, and the gearing for driving the same may be of any ordinary or suitable kind well known to those skilled in the art to which my invention pertains. I consequently omit description of the same, and have also omitted the same from the drawings, in order not to obscure those parts of the machine in which my invention more particularly is comprised.

It is sufficient to say that the several sets of drawing-rolls can obtain motion, each independently of the other, from the shaft I, hereinafter referred to, the initial rolls of each set taking their motion from the shaft by means of intermediate shafting and gearing, so organized and proportioned that each initial pair of rolls will have the same peripheral speed as the terminal pair of rolls of the set next in rear. The second and terminal pairs of rolls of each set obtain movement from the initial pair of that set by means of gearing in the usual way.

At the delivery end of the machine beyond the terminal set of drawing-rolls are the spin-

dle and flier, or equivalent devices for twisting the sliver into roving and winding the roving upon the spools or onto bobbins, one of which spindles and fliers is shown at O. At the other end of the machine are placed the cans (one of which is shown at D) containing the drawing to be operated on in the machine. The material from the can passes between and is acted on by the drawing-rolls of the different sets successively, until, after having been reduced and drawn out to a sliver of the proper size, it passes from the terminal set of drawing-rolls to the flier and spindle, where it is twisted and wound in the usual way. Inasmuch, however, as the sliver, when passing from one set of drawing-rolls, is a thin ribbon-like product, too fragile and attenuated to be acted on by another set of drawing-rolls without first having been condensed or brought to a shape in which it may again be drawn without being broken or ruptured, it becomes necessary to combine with the sets of drawing-rolls means intermediate between adjoining sets for condensing the sliver as it passes from one set to the other; but in this condensing operation it is important, for reasons hereinbefore stated, to avoid putting a twist in the sliver, or subjecting it to injurious drag or strain. To this end I combine with any two adjoining sets of rolls an intermediate rotary condenser, which acts on the sliver as it passes from one set of rolls to the other, to compact and condense it, and bring it from the flat to the cylindrical, or approximately cylindrical, form without exercising twisting action on it.

The form of condenser which I find answers all these conditions, and which I believe to be practically the best adapted to effectuate my invention, is represented in the drawings. It may, in a general way, be described as a rotatory tube, having a bore, substantially cylindrical in cross-section, extending through the tube, not in a right line, but in a spiral—in other words, a cylindrical bore extending spirally from end to end of the tube. Through this spiral bore of cylindrical cross-section the sliver passes, and in it is condensed without being twisted. The conditions under which this condenser can most successfully be used may be gathered from the following: If we suppose the spiral on which the bore is formed is of such a pitch as to make one turn in two inches, then the rate of rotation of the condenser-tube on its axis to the travel of the sliver should be such that the tube will make one revolution while the sliver travels forward two inches or thereabout. Under these conditions the spirally-bored tube acts as a conveyer to carry along the sliver through it, overcoming the tendency to drag due to friction. It also acts to condense and compact the sliver, and bring it to cylindrical form without, however, twisting it.

In the drawings, Fig. 4 is a side elevation of the condenser, together with a sectional elevation of its supporting-stand on line 4 4, Fig. 5. Fig. 5 is a section on line 5 5, Fig. 4. Fig. 6 is a sectional elevation, on enlarged scale, on line 6 6, Fig. 7; and Fig 7 is an elevation of that end of the condenser which the sliver enters.

I prefer to make the condenser by cutting a spiral bore of cylindrical cross-section in a brass core, *d*, (the slot through which the bore-cutting tool works in cutting the bore being shown at *x*, Fig. 6.) After the core is spirally bored it is driven tightly into an iron or steel tube, C, provided with a nozzle, C′, and with a flanged rear end, C^2.

Inasmuch as I prefer to rotate the condenser by means of toothed gearing, I provide the tube C, about midway between its ends, with a worm-gear, *d′*, designed to engage a worm, *e*, on the power-driven shaft E, hereinafter referred to. The end of the bore which is entered by the sliver is widened out or flared gradually and evenly, so as to offer no obstruction to the entrance of the sliver, as shown in Fig. 7.

The condenser-stand D′ is formed with an opening to permit the unobstructed passage of the shaft E, and with bearings to receive the cylindrical ends of the tube C on each side of the central worm-gear, *d′*. The tube when thus positioned is held in place by a hinged cover, D^2, which fits down over the journals and forms in effect the upper half of the bearings. The tube is prevented from endwise movement in the stand by the flange C^2 and gear *d′*. A spring-latch, *f*, holds the cover D^2 down, and permits the latter to be raised whenever it becomes necessary to remove the condenser. The stand is placed in the machine so that the nozzle of its condensing-tube shall be close to the first pair of the set of drawing-rolls in front, as indicated in Figs. 1, 2, and 3. The direction of rotation of the condenser is indicated by the arrow thereon in the same figures.

A number of condensers are, of course, used between each two sets of drawing-rolls, corresponding to the number of rovings to be produced on the frame.

It is desirable that the point at which the roving enters between the drawing-rolls should continually vary, so as to avoid grooving or wearing away the rolls in one spot. To this end the condenser-stands are so mounted as to have a slow movement of lateral reciprocation when the machine is running. A convenient arrangement for the purpose is shown in the drawings. Each set of stands is attached to a dovetailed plate, F, which is arranged to slide crosswise of the machine between gibs *g*. Each plate F is slowly reciprocated by means of an arm, *h*, jointed to the plate at one end, and at the other terminating in a strap, *h′*, encircling an eccentric on a shaft, G, extending lengthwise of the machine. This shaft, which also actuates in the same way the guide-plate *i*, through which the drawing passes to the first set of rolls, is speeded down to the degree requisite to impart slow reciprocating movements to the plate, deriving its

movement from shaft H, (which drives the condenser-rotating shaft E through the intermediary of worm-wheels and worms *j j' k k'*, counter-shafts *l l'*, and beveled gears *m m'*.) The shafts E, which communicate rotary movement to the several sets of condenser-tubes, are actuated by gearing and shafting H' H² I, the latter getting its movement from main shaft J. In order to allow the worms *e* on shafts E to follow the lateral reciprocations of the condenser-tubes, they are united with their shafts E by a spline and groove or equivalent connection, as indicated in Figs. 4 and 5.

Having now described the nature of my invention and the best way known to me of carrying the same into effect, I wish it to be understood that I do not confine myself to the details hereinbefore described, for the same may be varied to a considerable extent without departure from my invention; but

What I claim as of my own invention is—

1. The combination, with two sets of drawing-rolls, of an intermediate rotating condenser, arranged and operating to compact and condense without twisting the sliver as it passes from one set of rolls to the other, substantially as and for the purposes hereinbefore set forth.

2. The combination, with two sets of drawing-rolls, of an intermediate rotating tubular condenser, provided with a spiral bore, of substantially cylindrical cross-section, substantially as and for the purposes hereinbefore set forth.

3. In machinery for the manufacture of roving for spinning purposes, the combination, substantially as hereinbefore set forth, of two or more sets of drawing-rolls, rotating condensers between each two sets of drawing-rolls, arranged and operating substantially as described, to compact and condense the moving sliver without putting twist therein, and means, substantially as described, for twisting and winding the sliver after it passes from the terminal set of drawing-rolls.

4. The combination, with the condenser-stand and means, substantially as described, for imparting lateral reciprocatory movement to the same, of the condenser-tube and the rotary driving-shaft E, provided with a sliding worm engaging corresponding gear on the condenser-tube, substantially as and for the purposes hereinbefore set forth.

In testimony whereof I have hereunto set my hand this 4th day of October, A. D. 1881.

EDWARD W. KELLEY.

Witnesses:

ALBERT M. MOORE,

SIMON G. LYFORD.