No. 617,678. Patented Jan. 10, 1899.

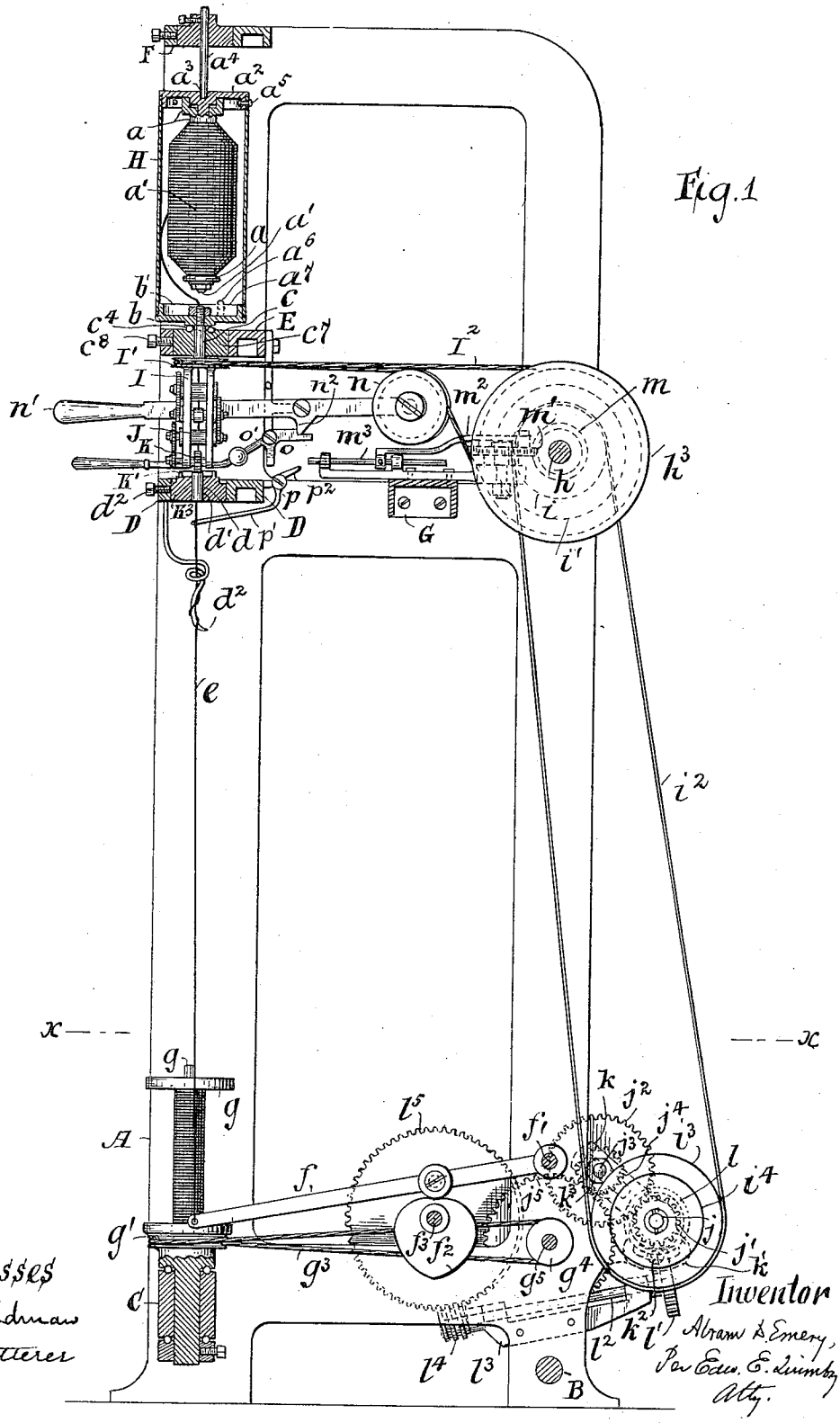
A. D. EMERY.

SPINNING HEAD.

(Application filed Feb. 19, 1897.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1



Witnesses
Geo. Wadman
E. Gatterer

Inventor
Abram D. Emery,
Per Edw. E. Lumbard
Atty.

No. 617,678. Patented Jan. 10, 1899.

A. D. EMERY.

SPINNING HEAD.

(Application filed Feb. 19, 1897.)

(No Model.) 3 Sheets—Sheet 2.

Fig. 2

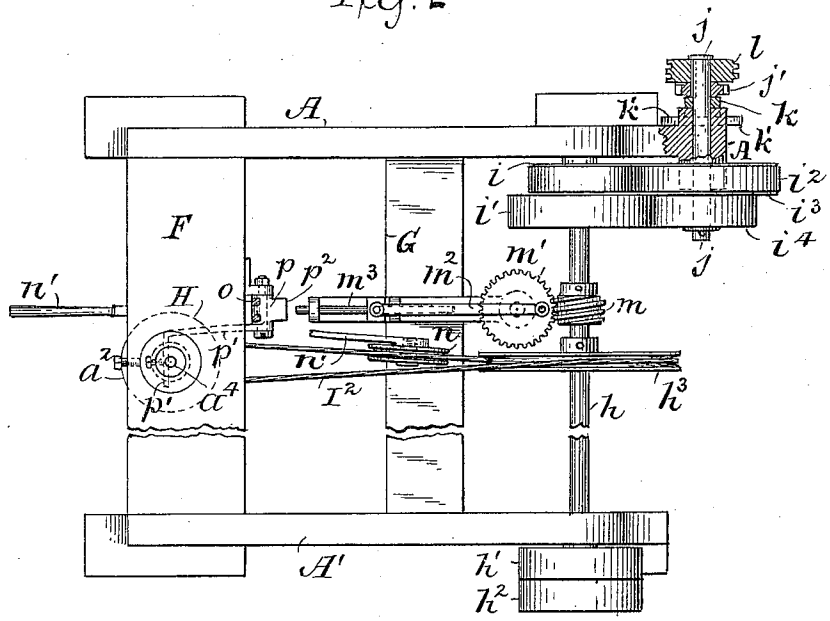
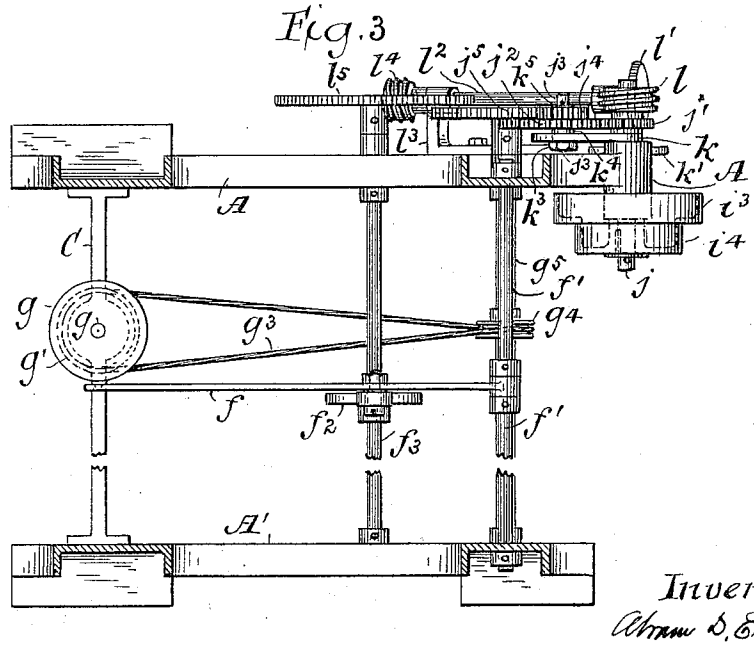


Fig. 3



Witnesses
Geo. Wadman
E. Gatterer

Inventor
Abram D. Emery,
Per Edw. E. Ludwig,
Atty.

No. 617,678. Patented Jan. 10, 1899.

A. D. EMERY.

SPINNING HEAD.

(Application filed Feb. 19, 1897.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 5

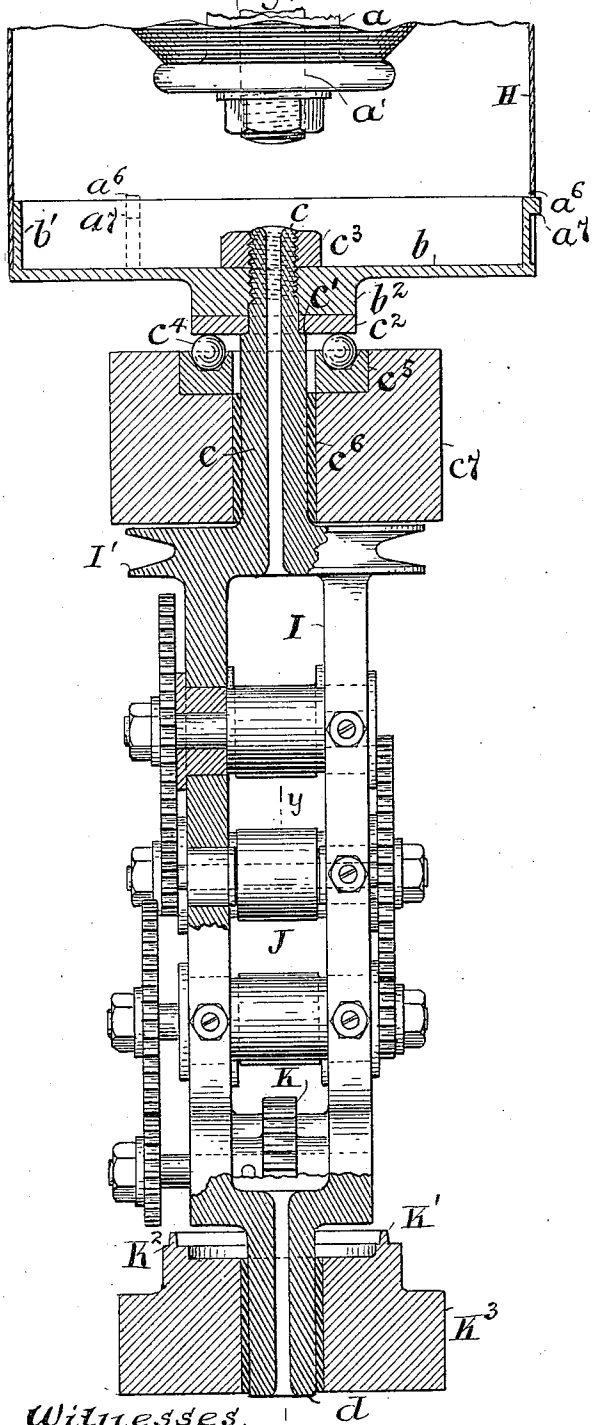


Fig. 6

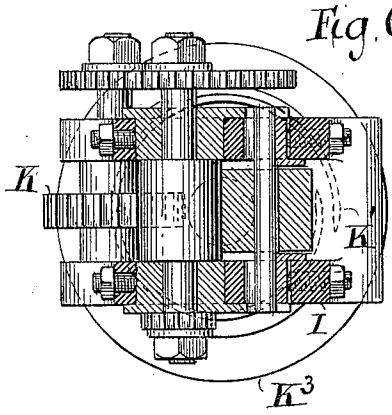
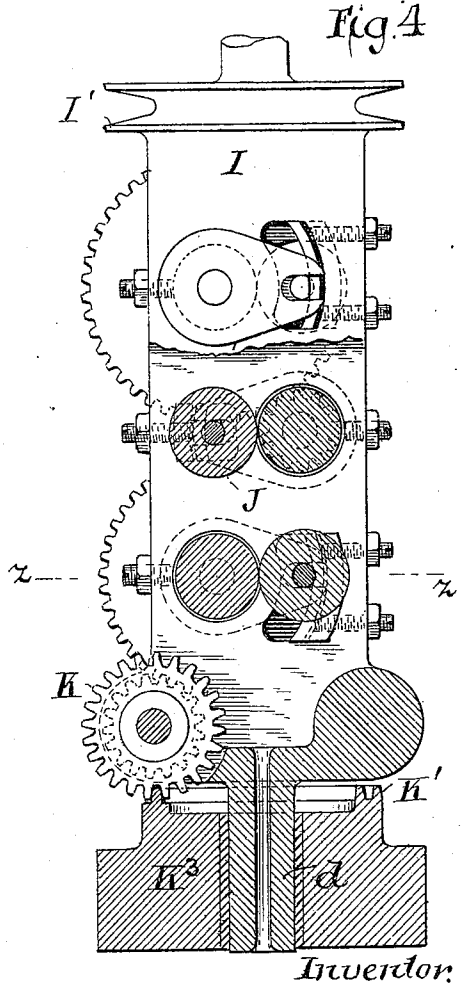


Fig. 4



Witnesses.
Geo. Wadman
E. Gotzler

Inventor.
Abram D. Emery,
Per Edw. E. Linney
Atty.

UNITED STATES PATENT OFFICE.

ABRAM D. EMERY, OF TAUNTON, MASSACHUSETTS, ASSIGNOR TO THE UNIVERSAL LOOM COMPANY, OF NEW YORK, N. Y.

SPINNING-HEAD.

SPECIFICATION forming part of Letters Patent No. 617,678, dated January 10, 1899.

Application filed February 19, 1897. Serial No. 624,112. (No model.)

To all whom it may concern:

Be it known that I, ABRAM D. EMERY, of Taunton, Massachusetts, have invented certain Improvements in Spinning-Heads, of which the following is a specification.

This improvement relates to spinning-heads in which a multiplicity of pairs of draw-rolls rotating at prescribed relative speeds on parallel horizontal axes are carried in a frame which is surmounted by a roving-bobbin holder and in which said frame and roving-bobbin holder rotate upon a common vertical axis. By the present invention a spinning-head of this character is adapted to be driven by a band, and hence rotated at high speed. This is accomplished by the employment of a system of gearing for driving the draw-rolls upon horizontal axes by motion derived from the spinning-head, which rotates upon a vertical axis. To this end there is mounted upon one side of the draw-roll frame, near its lower end, a skew-gear rotating upon a horizontal axis transverse to a radius of the rotating frame and adapted to engage a spiral worm or rib formed upon a horizontal table supported upon the top of the box in which the hollow trunnion of the lower end of the draw-roll frame has its bearing. The said spiral rib surrounds said trunnion at a suitable distance therefrom and is so proportioned in pitch as to engage the teeth of the skew-gear successively as the spinning-head rotates and to thereby effect a complete revolution of the skew-gear during the completion of a prescribed number of revolutions of the spinning-head.

If the spiral worm is stationary and is so proportioned in pitch that its gain in radius in a single convolution is equal to the width of one of the teeth of the skew-gear, then the number of rotations of the spinning-head during each single rotation of the skew-gear will be equal to the number of teeth upon the skew-gear. Of course the speed of rotation of the skew-gear proportionately to the speed of rotation of the spinning-head could be varied if the spiral worm should be made to rotate upon a vertical axis. Such rotation of the spiral worm is, however, unnecessary in the present instance, because with a stationary worm any required speed of rotation of the skew-gear may be obtained by suitably proportioning the diameter and the number of teeth in the skew-gear and the pitch of the spiral worm.

Of course any desired number of pairs of draw-rolls may be employed without departing from the invention, for the purposes of which it is deemed sufficient to herein show and describe a draw-roll frame provided with three superposed pairs of draw-rolls driven, primarily, from the skew-gear and by means of trains of appropriate intermediate gearing driven from one to the other at prescribed relative speeds of rotation. By this organization the speeds of rotation of the rolls relatively to the speed of rotation of the spinning-head is always the same whether the spinning-head as a whole be rotated faster or slower.

The skew-gear referred to partakes of the character of a worm-wheel, but differs from a worm-wheel in not having its perimeter circumferentially grooved.

For the purposes of the present case an ordinary gear the teeth of which are parallel with the axis of rotation answers every purpose so long as the teeth are coarse enough, and hence the grooves between the teeth wide enough, to freely admit the section of the worm which is engaged. As the path of the worm across the perimeter of the wheel is slightly diagonal with the plane of the axis of the wheel, the wheel might, if it were worth while, be provided with skew-teeth, although this is not necessary if coarse teeth are employed. The term "skew-gear" is adapted as a distinctive designation for the wheel in question in view of the diagonal path of the spiral worm across its periphery. It will therefore be understood that an ordinary gear with suitably-coarse teeth is the equivalent of a skew-gear for the purpose of being rotated upon its own axis by its engagement with the spiral worm during the rotation of the spinning-head upon which the said wheel is mounted.

The peculiarity of the mode of spinning yarn inherent in the operation of spinning-heads of the class to which the present invention belongs is that all parts of the yarn are successively given precisely the same amount

of twist and are never given any greater twist than that which they ultimately retain. This is due to the fact that the initial twist is imparted to the part of the yarn adjacent the draw-rolls—in other words, to the unfinished end of the length of yarn extending from the draw-rolls to the winding appliances which may be employed and by which the finished end is wound without being further twisted. As the twisting and winding operations, although performed simultaneously, are not performed on the same parts of the yarn at the same time, it follows that the yarn which is being wound, instead of being subjected to the degree of strain to which it is subjected when being spun either upon a ring-frame or upon a throstle-frame, is only held under such moderate tension as will prevent it from kinking.

The accompanying drawings, which are intended to represent the invention in its simplest form, show in appropriate relation a single spool and a spinning-head having a vertical axis of rotation and provided with draw-rolls rotating on horizontal axes.

The drawings are as follows: Figure 1 is an elevation in which there is conventionally represented an upright frame supporting a spinning-head and spooling mechanism, together with a driving-band engaging a whirl on the spinning-head, the upper part of the spinning-head being shown in section and the remainder in elevation. Fig. 2 is a top view of the structure represented in Fig. 1. Fig. 3 is a horizontal section on the plane indicated by the dotted line $x\,x$ on Fig. 1. Fig. 4 is an elevation of one of the sides of the draw-roll frame, which are at right angles to the axes of rotation of the draw-rolls, partly in section, on the plane indicated by the dotted line $y\,y$ on Fig. 5. Fig. 5 is an axial section of the spinning-head, showing the draw-rolls in elevation, a portion of the roving-cylinder and roving-bobbin being represented as broken away. Fig. 6 is a transverse section of the spinning-head on the plane indicated by the dotted line $z\,z$ on Fig. 4.

The drawings embrace a representation of a draw-roll frame composed of two uprights A A′, united by horizontal members B, C, D, E, F, and G, and a single example of a vertical spinning-head and winding appliances, the frame being adapted to support a multiplicity of such vertical spinning-heads and winding appliances arranged side by side, together with the necessary shafting and gearing for operating the same.

The spinning mechanism embodying the present improvements consists, broadly, of a rotating spinning-head embracing, first, an upright cylinder H, adapted to rotate upon its geometrical axis and to contain a bobbin of roving; secondly, a draw-roll frame I, connected to said cylinder and provided with a whirl I′ for engaging a driving-band I^2, by which the said draw-roll frame and cylinder or roving-bobbin holder are rotated upon a common vertical axis, and, thirdly, a system J of three pairs of superposed draw-rolls mounted in said draw-roll frame and rotated upon their parallel horizontal axes by motion derived from a toothed wheel, herein arbitrarily designated a "skew-gear" K, mounted upon the lower end of the draw-roll frame and engaging a spiral worm or scroll K′, formed upon a horizontal bed K^2, supported upon the top of the box K^3, in which the hollow trunnion at the lower end of the draw-roll frame has its bearing.

Within the cylinder H is a roving-bobbin a, loosely mounted upon a spindle a', the upper end of which is secured to the center of the under side of the top cylinder-head a^2. Upon its upper side the top cylinder-head is provided with the central recess a^3 for engaging the removable steady-pin a^4, by which the upper end of the spinning-head is centralized. The top cylinder-head is rigidly secured to the upper end of the hollow cylinder H. The lower end of the hollow cylinder H is detachably connected to the lower cylinder-head b in any convenient manner—as, for example, by providing it with a vertical slit a^6, adapted to drop over the wing a^7, projecting outwardly from the cylindrical cup b', with which the lower cylinder-head b is provided and which is adapted to be seated within the cylinder H.

The lower cylinder-head b is provided with a downwardly-projecting hollow trunnion b^2, the upper portion of which is tapped to receive the screw-threaded upper portion of the hollow stem c of the draw-roll frame I. The stem c is provided with a shoulder c' for bearing against the under end of the trunnion b^2, or, preferably, against a washer c^2, of especially hard metal, which is interposed between the shoulder c' and the under end of the trunnion b^2. A jam-nut c^3 is applied to the screw-threaded upper part of the stem c, which serves to firmly fasten the cylinder-head b to the stem c. The under end of the hollow trunnion b^2 or under side of the washer c^2, as the case may be, bears upon the system of balls c^4, which are seated in the V-shaped grooves formed upon the upper side of the annular hard-metal washer c^5 at the upper end of metalline bushing c^6, in which the stem c has its bearing and which is inserted within the cylindrical box c^7, the cylindrical box c^7 being inserted in a cylindrical aperture in the horizontal member E of the frame and removably secured therein by the set-screw c^8.

The draw-roll frame is provided at its lower end with the hollow trunnion d, which, as already mentioned, is journaled in the box K^3. The box K^3 is inserted in an aperture d' in the horizontal member D of the frame and is removably secured therein by the set-screw d^2. The spun yarn e, at a short distance below the lower end of the hollow trunnion d, is led through the eye and given one or two turns around the stem of the pigtail d^2 and thence to the free end of the vibrating traverse arm f, by which the yarn is appropriately

fed to the spool g. The spool g is loosely mounted upon the rotating disk g' and stem g, by the frictional influence of which the spool is rotated. The pigtail is a tension device which prevents the direct transmission of strain from the winding devices to the draw-rolls.

The traverse arm f is loosely mounted upon the horizontal bar f', extending entirely across the frame and is vibrated by the heart-cam f^2, affixed to the cam-shaft f^3, also extending entirely across the frame. The disk g', carrying the spool g, is rotated by the band g^3 from the pulley g^4, affixed to the horizontal shaft g^5, extending entirely across the frame.

The number of traverse arms and the number of spools will of course equal the number of spinning-heads mounted upon the frame. Motion to rotate the cam-shaft f^3 and the spool-driving shaft g^5 is transmitted by any suitable gearing from the main driving-shaft h, which is mounted in the standards A and A' and provided at one end with the fast and loose pulleys h' h^2. At appropriate intervals the main shaft h has affixed to it the spinning-head driving-pulleys, one of which, h^3, is shown in the drawings as engaging the driving-band I^2 for rotating the adjacent spinning-head.

The shaft h has affixed to it two adjoining pulleys i and i' of different diameters for engaging the driving-belt i^2, by which rotation is imparted to one or the other, as the case may be, of the pulleys i^3 and i^4, affixed to the counter-shaft j, which is rotated at different rates of speed, according to which pair of pulleys i and i^3 or i' and i^4 is engaged by the driving-belt i^2. The counter-shaft j has its bearing in the standard A. As represented in the drawings, the pulleys i^3 and i^4 are arranged upon the part of the counter-shaft j which projects inside the standard A. On the portion of the shaft j which projects outside the standard A there is affixed the pinion j', which engages the change-gear j^2, loosely mounted upon the adjustable stud j^3. Affixed to the gear j^2 and also loosely mounted upon the stud j^3 is a pinion j^4, which engages the gear j^5, affixed to the spool-driving shaft g^5. The stud j^3 is given the capacity of adjustability for the purpose of permitting the removal of the gear j^2 and its attached pinion j^4 and the substitution of others in their places, as occasion may demand, in order to communicate to the spool-driving shaft g^5 the required rate of rotation. To this end the stud j^3 is carried by the upper arm of the lever k, which is loosely mounted on the counter-shaft j and has its lower arm k' concentrically slotted to admit the set-screw k^2, by the screwing home of which the lever k is clamped to the standard A. The upper arm of the lever k is radially slotted to admit the screw-threaded end of the stud j^3, and is adapted to engage the jam-nut k^3, by means of which the upper arm of of the lever k is firmly clamped against the collar k^4, which is affixed to or integral with the stud j^3. The gear and pinion are retained on the stud j^3 by the usual washer and cotter k^5.

The outer extremity of the counter-shaft j has affixed to it the worm l, which engages and drives the worm-wheel l', secured to the outer end of the transverse counter-shaft l^2, mounted in suitable bearings in the bracket l^3, affixed to the standard A. The inner end of the transverse counter-shaft l^2 is provided with the worm l^4, which engages and drives the worm-wheel l^5, affixed to the cam-shaft f^3.

It will of course be understood that the described trains of gearing for rotating the cam-shaft f^3 and the spool-shaft g^5 are herein shown and described merely for the purpose of illustration and that the invention is not limited to the particular forms of gearing shown.

Provision is made for stopping the rotation of any spinning-head when its bobbin runs out or the yarn breaks. To this end there is provided upon the driving-shaft h, immediately adjoining each of the pulleys h^3, a worm m, which drives the horizontal gear m', the face of which is provided with a crank-pin for engaging one end of a pitman m^2, the opposite end of which is pivoted to and imparts endwise reciprocating motion to the tripper-bar m^3. The driving-band I^2 is held taut and made to rotate its spinning-head by means of the tightening-pulley n, mounted upon the inner end of the hand-lever n'. The tightening-pulley n is retained in its band-tightening position by the engagement of the shoulder n^2 on the hand-lever with the horizontally-extending arm of the trigger o, the downwardly-extending arm of which is perforated to allow of the passage through it of the adjacent end of the tripper-bar m^3. The weighted arm o' of the trigger may be operated manually if it should be desired to stop the rotation of the spinning-head. The automatic stopping of the spinning-head when the yarn breaks or the roving runs out is effected by means of the detector-lever p, the longer arm p' of which is provided with an eye or hook which normally engages the yarn immediately below its point of delivery from the spinning-head, and is thereby normally held upward against the influence of gravity. The shorter arm of the detector-lever is a finger p^2, which normally occupies the position in which it is shown in Fig. 1, in which it is below the path of movement of the tripper-bar m^3; but if the yarn breaks or gives out the detector-lever is released to the influence of gravity, with the result that the finger p^2 is moved upward against the downwardly-projecting arm of the trigger, in which position it receives the impact of the tripper-bar m^3 and by transmitting the motion thereof to the trigger o releases the trigger o from the shoulder m^2 and permits the tightening-pulley n to fall, and thus slack the band I^2, so that it will cease to rotate the spinning-head.

It will be perceived that when the detector-lever is released from its normal position by

the breaking or giving out of the yarn which ordinarily sustains it the finger p^2, by moving into the space between the end of the trigger-bar m^3 and the trigger o, operates to momentarily establish the continuity of a train of connections, by the resultant action of which the device for rotating the adjacent spinning-head is rendered inoperative.

Means other than those shown for transmitting from a common source motions to rotate the spinning-heads separately may of course be employed without departing from the invention, provided such means are combined with the described detector-levers arranged with relation to the spun yarns as herein shown.

What is claimed as the invention is—

1. A spinning-head composed of a roving-bobbin holder; a draw-roll frame connected to and rotating with said roving-bobbin holder upon a common vertical axis; means for rotating said spinning-head; superposed pairs of draw-rolls mounted transversely in said draw-roll frame; a skew-gear mounted near the lower end of said draw-roll frame and adapted to rotate upon a horizontal axis; suitable gearing mounted on said draw-roll frame for transmitting motion from said skew-gear to said draw-rolls, and a spiral worm supported upon the frame in which the lower end of said draw-roll frame has its bearing, and adapted to engage the teeth of said skew-gear successively as the draw-roll frame carrying said skew-gear rotates, as and for the purposes set forth.

2. A spinning-head composed of a draw-roll frame and a roving-bobbin holder adapted to rotate upon a common vertical axis; superposed pairs of draw-rolls mounted in said draw-roll frame; a skew-gear mounted in said draw-roll frame near its lower end and adapted to rotate upon a horizontal axis at a prescribed distance from the axis of rotation of said draw-roll frame and at a right angle, or approximately at a right angle with a radius of said rotating draw-roll frame; a stationary spiral worm surrounding the lower end of said draw-roll frame at a suitable distance therefrom and arranged in a horizontal plane for engaging the teeth of said skew-gear successively, and thereby causing the rotation of said skew-gear and draw-rolls during the rotation of the said spinning-head, and means for winding the spun yarn delivered from said spinning-head.

3. The combination, as herein set forth, of a spinning-head, substantially such as herein described, in which the draw-rolls and the roving-bobbin holder rotate upon a common vertical axis, with winding devices for winding up the spun yarn delivered from said spinning-head, and a tension device interposed between said winding devices and said spinning-head, for the purpose of preventing the direct transmission of strain from the winding devices to the draw-rolls.

ABRAM D. EMERY.

Witnesses:
ESTELLE M. EMERY,
E. GATTERER.