No. 617,682. Patented Jan. 10, 1899.

A. D. EMERY.

SPINNING MECHANISM.

(Application filed Sept. 17, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig 1

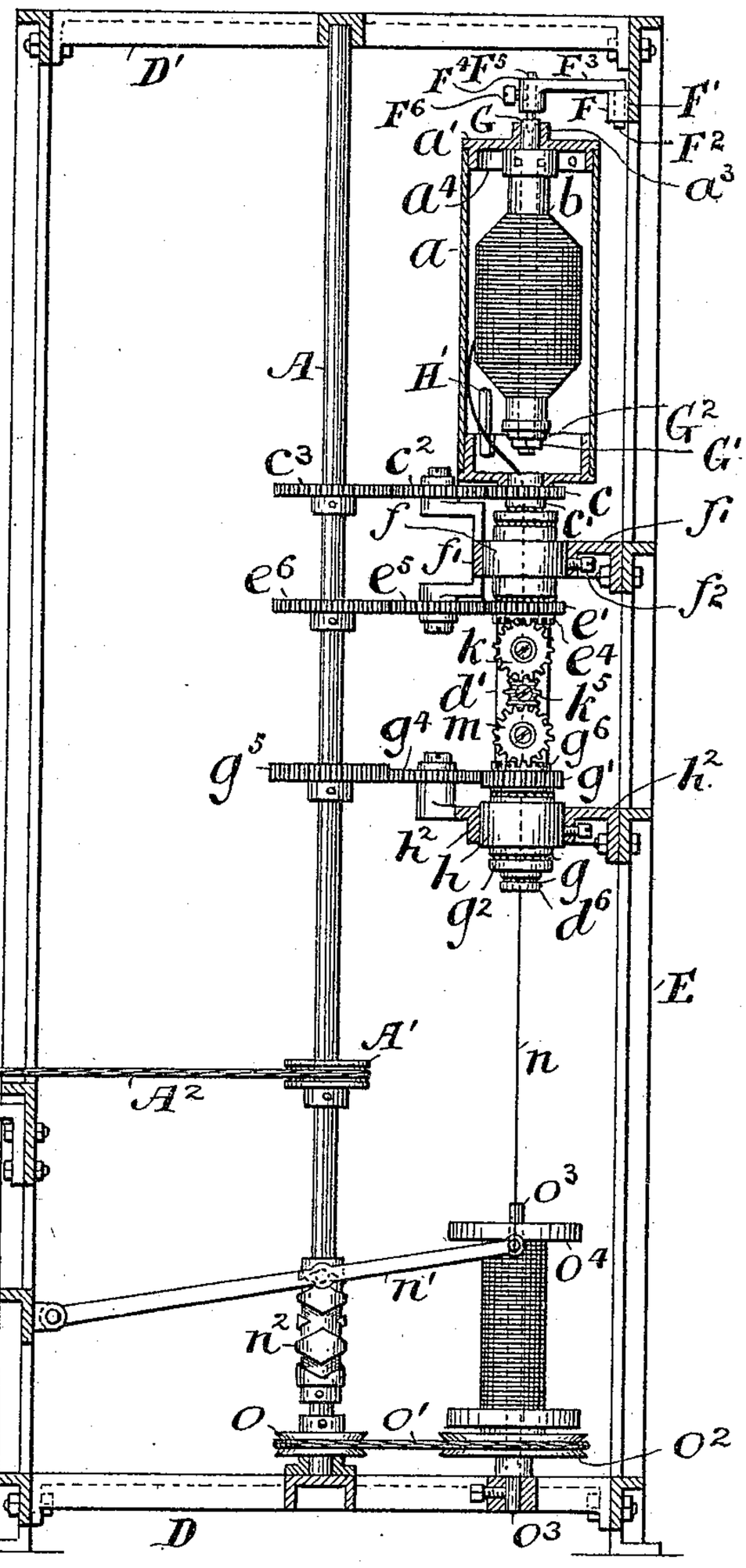

Fig. 2

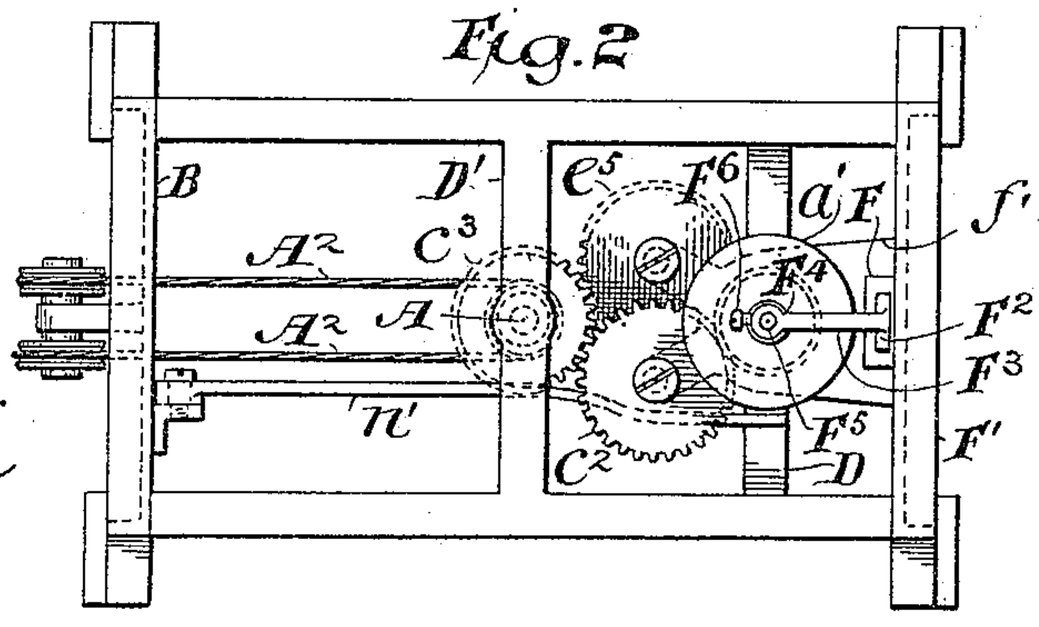

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Fig. 4

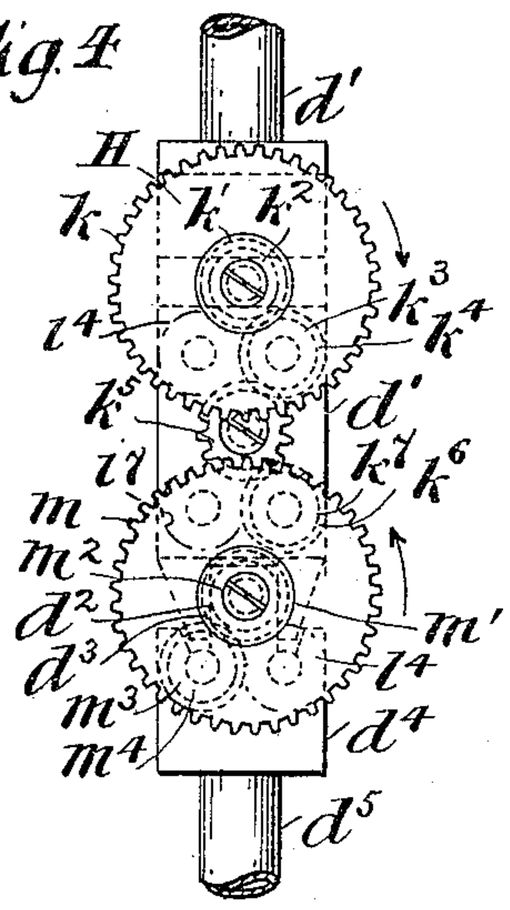


Fig. 5

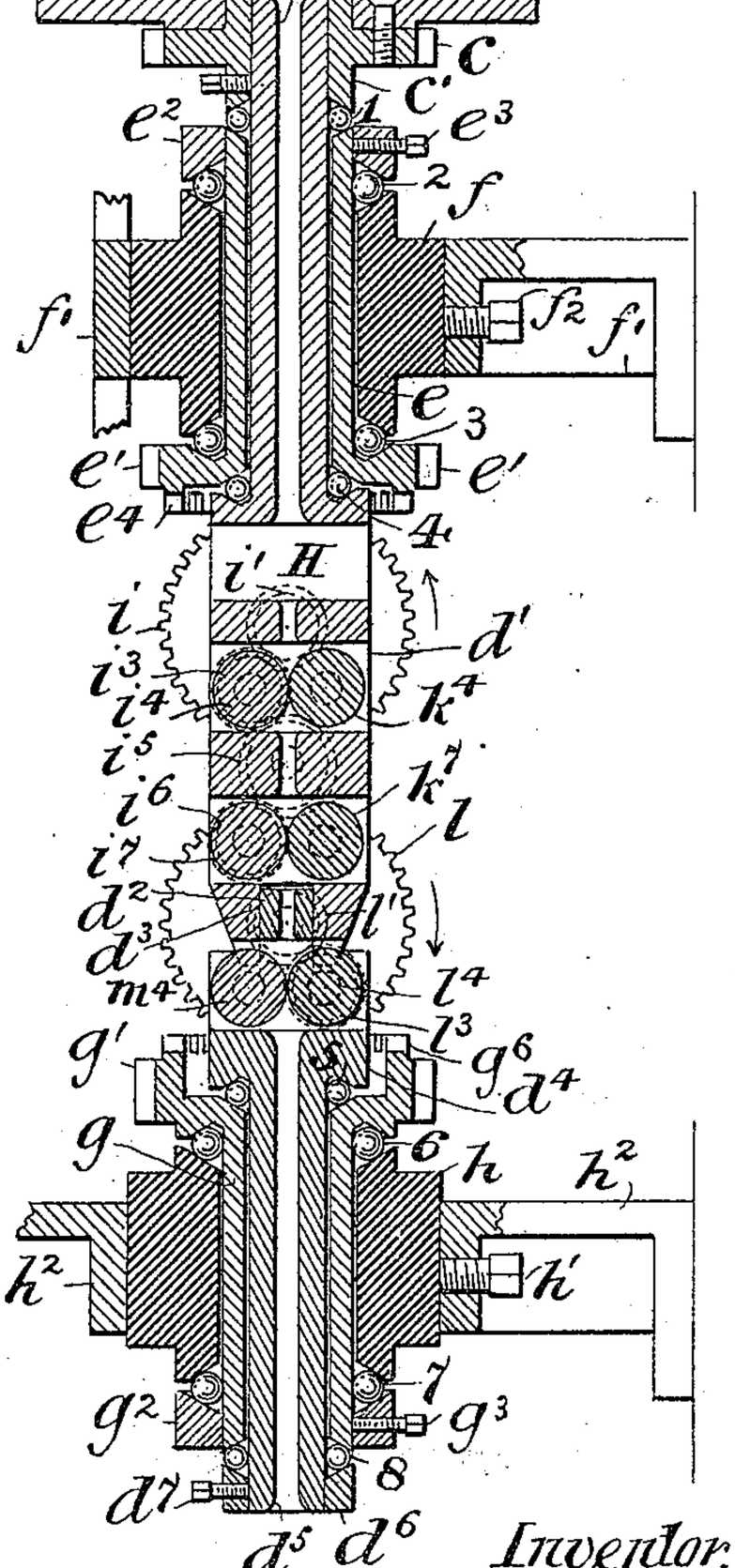
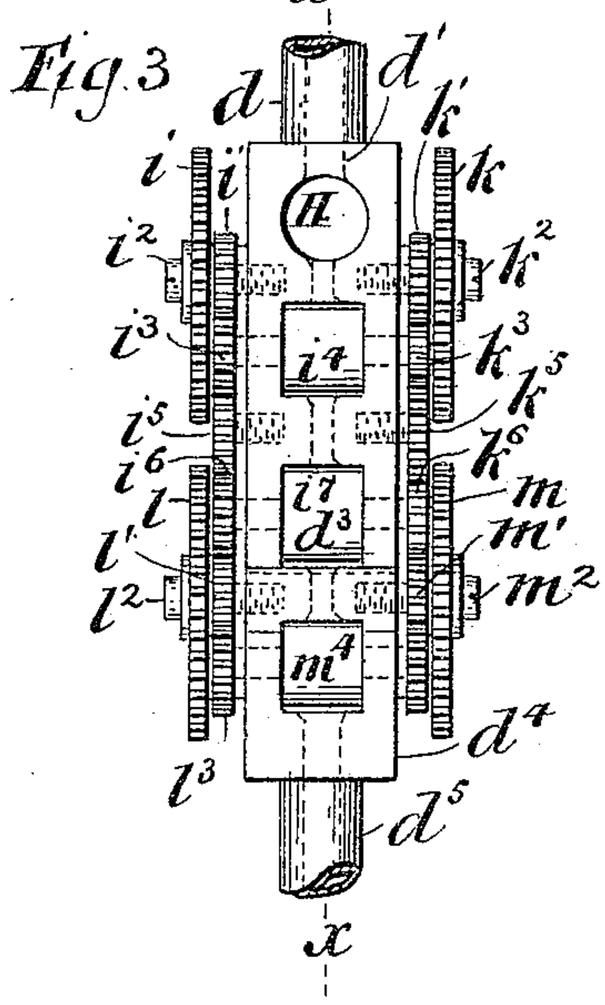


Fig. 3



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UNITED STATES PATENT OFFICE.

ABRAM D. EMERY, OF TAUNTON, MASSACHUSETTS.

SPINNING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 617,682, dated January 10, 1899.

Application filed September 17, 1898. Serial No. 691,137. (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 Mechanism, of which the following is a specification.

The peculiarity of the mode of spinning yarn inherent in the operation of the mechanism embodying the present invention 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 effected by imparting the initial twist to the part of the yarn adjacent the draw-rolls. To this end the bobbin of roving and the draw-rolls are rotated to impart the twist, while the twisted yarn, as it is delivered from the draw-rolls, is taken up by a spool, upon which it is wound without being further twisted. It thus follows that the twisting and winding operations, although performed simultaneously, are not performed on the same parts of the yarn at the same time. Hence the yarn which is being wound is not subjected to the strains to which it is subjected when being spun either upon a ring-frame or upon a throstle-frame. In the case of the ring-frame the yarn has to pull the traveler around the ring. In case of the throstle the yarn, as it runs from the throstle, has to revolve the spool. Owing to the resultant strains, hard-twisted yarns only can be spun on ring-frames or throstle-frames, and soft-twisted hosiery-yarns have had to be spun on mules in which the spinning operation ceases while the winding operation is going on.

It is to be remarked that in the ring-frame, the throstle-frame, and in the mule the twist is always given to the finished end of the yarn, which has to be twisted to excess in order that the twist may run up to the bight of the draw-rolls.

It will be understood that the expressions "finished end" and "unfinished end" refer to the opposite extremities of the length of yarn between the draw-rolls and the spool, the finished end being that adjacent the spool and the unfinished end that adjacent the draw-rolls.

All kinds of yarns, whether hard-twisted warp-yarns or soft-twisted hosiery-yarns, are without difficulty spun and wound by the mechanism embodying the present invention, because in that mechanism the twist is given to the unfinished end of the yarn and also because the length of yarn between the draw-rolls and the spool is not subjected to the strains which are exerted upon it when it is being spun either in a throstle-frame or in a ring-frame, but is only subjected to sufficient strain to keep it from kinking.

The accompanying drawings, which are intended to represent the invention in its simplest form, show a single spinning-head, draw-rolls, and spool. No attempt is herein made to illustrate the grouping of a series of such spinning-heads, rolls, and spools in position to be driven from a common source of motion, because such grouping is about to be made the subject of a separate application for a patent.

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-shaft and gearing for transmitting motion therefrom to 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 an elevation of one of the sides of the draw-roll frame which are parallel with the axes of rotation of the draw-rolls. 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. Fig. 5 is an axial section of the spinning-head, showing the draw-rolls in section on the plane indicated by the dotted line *x x* on Fig. 3, a portion of the roving-cylinder and roving-bobbin being represented as broken away.

The spinning mechanism represented in the drawings and embodying the present invention consists, broadly, of a rotating spinning-head and a spooling device for winding up the spun yarn. The spinning-head embraces, first, a cylinder adapted to rotate upon its geometrical axis and to contain a bobbin of roving, and, secondly, a draw-roll frame which is connected to and rotates with said cylinder and which carries the usual system of draw-rolls, together with suitable gearing for transmitting appropriate rotative motions to said

draw-rolls from the gearing by which the spinning-head is rotated.

Within the cylinder a is a roving-bobbin b, loosely mounted upon a spindle, the upper end of which is secured to the center of the under side of the top cylinder-head a'. The lower cylinder-head a^2 is centrally perforated and affixed to a pinion c, provided with a hollow hub c', which is keyed or otherwise fastened to a tube d, which at its lower end is affixed to or is integral with the upper member d' of the draw-roll frame. The lower end of the hub c' is afforded an annular bearing by the upper end of the elongated hub e of the pinion e'. At its upper end the hub e has a collar e^2 fastened to it by the set-screw e^3, and the under side of the collar e^2 is afforded an annular bearing by the top of the box f, which is adjustably secured in the perforated bracket f' by the set-screw f^2. The under side of the pinion e' is afforded an annular bearing by the upper end of the upper member d' of the draw-roll frame.

The draw-roll frame is quadrangular in cross-section. At its lower end it is provided with the transverse recess d^2, adapted to be engaged by the tongue d^3, extending upwardly from the lower member d^4 of the draw-roll frame. As shown in the drawings, the bracket f' serves to support the pinions e' and c, the upper member d' of the draw-roll frame, and the cylinder a.

The pinion e' is provided with a long hub, so that if it is constructed to have a running fit with the box f it will have a long bearing therein, and thereby be prevented from wabbling. It is, however, preferred not to journal the hub e in the box f, but to have it loosely contained therein and to employ ball-bearings where required for separating and centralizing the superposed members of the rotating structure, as shown in detail in Fig. 5, on reference to which it will be seen that each system of balls is introduced between two annular bearing-surfaces which flare in opposite directions. Thus the uppermost system 1 of balls is interposed between the flaring lower end of the hollow hub c' and the flaring upper end of the elongated hub e of the pinion e', provided with the collar e^2, which is supported upon the next lower system 2 of balls, which are interposed between the flaring under side of the collar e^2 and the flaring upper end of the box f. The system 3 of balls is interposed between the flaring lower end of the box f and the inclined bottom of the groove in the top of the pinion e' for the purpose of providing the hub with two lines of bearing distant from each other, and thereby securing the effect of a long bearing for the hub e and also for the purpose of closely confining the pinion e' and the collar e^2 to the upper and lower ends of the box f. The system 4 of balls is interposed between the annular conical recess in the under side of the pinion e' and the inclined bottom of the recess in the upper end of the upper member d' of the draw-roll frame for the purpose of centralizing the upper member of the draw-roll frame.

The lower member d^4 of the draw-roll frame is integral with the tube d^5, to the lower extremity of which is secured the collar d^6 by the set-screw d^7. The tube d^5 extends loosely downward through the elongated hollow hub g of the pinion g'. The system 5 of balls is interposed between the annular conical recess in the under side of the lower member d^4 of the draw-roll frame and the flaring upper end of the hub g of the pinion g'. The system 6 of balls is interposed between the annular conical recess on the under side of the pinion g' and the flaring upper end of the box h, which is sustained by means of the set-screw h' in the bracket h^2. The collar g^2 is affixed to the lower end of the hub g by the set-screw g^3, and the system 7 of balls is interposed between the flaring lower end of the box h and the oppositely-flaring upper end of the collar g^2. Finally, the system 8 of balls is interposed between the flaring lower end of the elongated hub g and the oppositely-flaring upper end of the collar d^6, this organization serving to confine to the opposite ends of the box h adjacent parts of the rotating structure.

The spinning-head is rotated by motion transmitted to the pinion c, through the intermediate gear c^2, from the spur-wheel c^3, affixed to the vertical driving-shaft a. The pinion e' is rotated through the intermediate gear e^5 from the spur-wheel e^6, mounted on the driving-shaft A, but at a prescribed lower rate of speed than the pinion c for the purpose of effecting the rotation of the upper two pairs of draw-rolls. To this end the pinion e' is provided on its under side with the crown-teeth e^4, which engage the gears i and k, mounted, respectively, on opposite sides of the draw-roll frame.

The gears i and k are made to rotate upon their own axes by reason of the fact that the pinion e', with which they are engaged, rotates at less speed than the draw-roll frame, which is connected with and partakes of the rotation of the pinion c. The slower the speed of rotation of the pinion e' relatively to the speed of rotation of the pinion c the greater will be the extent of rotation of the gears i and k upon their own axes, and vice versa. The gear i is affixed to the hub of the pinion i', which rotates upon the stud i^2, affixed to the side of the draw-roll frame. The pinion i' engages the gear i^3, affixed to the projecting outer end of the shaft of the draw-roll i^4. Similarly the gear k is affixed to the hub of the pinion k', which rotates upon the stud k^2, affixed to the opposite side of the draw-roll frame. The pinion k' engages the gear k^3, affixed to the projecting outer end of the shaft of the other draw-roll k^4.

The gear i^3 engages the intermediate gear i^5, which meshes with the gear i^6 on the projecting outer end of the draw-roll i^7, and simi-

larly the gear k^3 engages the intermediate gear k^5, which meshes with the gear k^6 on the projecting outer end of the draw-roll k^7. The two pairs of draw-rolls i^4 and k^4 and i^7 and k^7 are by this means driven at the same rate of speed. The lowermost pair of draw-rolls are required to be rotated more rapidly than the upper pairs in order to draw the roving from the upper pair. To this end the pinion g' is rotated, through the intermediate gear g^4, from the spur-wheel g^5, mounted on the driving-shaft A, at a lower rate of speed than the pinion e'.

The pinion g' is provided on its upper side with the crown-teeth g^4, which engage the gears l and m, mounted, respectively, on opposite sides of the draw-roll frame. The gear l is affixed to the hub of the pinion l', which rotates on the stud l^2, affixed to the side of the draw-roll frame. The pinion l' engages the gear l^3, affixed to the projecting outer end of the shaft of the draw-roll l^4. Similarly the gear m is affixed to the hub of the pinion m', which rotates on the stud m^2, affixed to the opposite side of the draw-roll frame. The pinion m' engages the gear m^3, affixed to the projecting outer end of the shaft of the draw-roll m^4. It will be seen that owing to the slower rate of rotation of the pinion g' more rapid rotation is imparted to the lower pair of draw-rolls.

Means for imparting different speeds of rotation upon their own axes to draw-rolls mounted in a draw-roll frame having a motion of rotation around its longitudinal axis constitutes one of the features of the present invention.

The spun yarn n is led from the lower end of the spinning-head through the eye in the free end of the traverse-arm n', which is conventionally represented in the drawings as being pivoted to the standard B and vibrated by the traverse-cam n^2, affixed to the driving-shaft A.

A pulley o, affixed to the lower part of the driving-shaft A, is provided with a belt o' for driving a pulley o^2, loosely mounted upon the lower end of a vertical spindle o^3, which extends loosely through the hollow core of the spool o^4, upon which, from end to end, the yarn is progressively laid as the traverse-arm vibrates. The spool is made to rotate by the frictional bearing of its lower end upon the top of the pulley o^2. The spool slips slightly upon the pulley o^2; but the frictional hold of the pulley o^2 on the spool is sufficient to enable the spool to maintain upon the spun yarn just sufficient tension to keep the kinks out.

The driving-shaft A is conventionally illustrated as having affixed to it a driving-pulley A', engaged by a driving-belt A^2. The driving-shaft A is stepped at the bottom in a bearing in the girder D and is journaled at its upper end to the girder D', connecting the vertical standards B and E. A box F, affixed to the transverse girder F' at the top of the frame, is provided with a vertical aperture, rectangular in cross-section, to receive the leg F^2 of the movable bracket F^3, having at its free end a vertically-perforated boss F^4, in which a steady-pin F^5 is secured by the set-screw F^6. The lower end of the steady-pin F^5 is loosely inserted in a cylindrical cavity in the upper end of the spindle G, upon which the roving-bobbin is carried. The spindle G is tightly driven into the hub a^3 of the top cylinder-head. The object of the steady-pin F^5 is to afford a bearing for and thus prevent the wabbling of the upper end of the spinning-head.

As represented in the drawings, the spindle G extends downward through the core of the roving-bobbin and has a screw-thread cut upon its projecting lower end to receive the nut G'. A washer G^2 is interposed between the nut and the lower end of the roving-bobbin. It will of course be understood that any other mode of rigidly connecting the spindle of the roving-bobbin to the upper cylinder-head may be employed without departing from the invention.

When occasion arises for introducing a full bobbin in place of an empty bobbin into the cylinder a, the bracket F^3 is lifted from the box F and the upper cylinder-head a' and cylinder a are lifted from the lower cylinder-head a^2. The nut G' is then unscrewed, and the empty roving-bobbin having been removed a full bobbin is placed on the spindle, after which the nut G', having upon it the washer G^2, is screwed home and the bobbin fastened in place, as before.

To facilitate the threading of the roving downward through the tube d, the upper member d' of the draw-roll frame is provided on one side, near its upper end, with an aperture H to allow of the introduction into the tube d of a flexible wire having a hook on its upper end, to which the roving can be fastened and by which the roving can be drawn down through the tube d and delivered to the upper pair of draw-rolls. A hole H' near the bottom of the cylinder affords opportunity for getting at the free end of the roving, if occasion requires.

The three pairs of draw-rolls illustrated in the drawings in respect of the manner in which they act upon the roving are precisely the same as the corresponding systems of draw-rolls employed in ordinary spinning-frames, in which, as in the present case, the delivery-rolls are made adjustable toward and from the next adjoining pair of rolls for the purpose of adapting the apparatus for drawing staples of different lengths; but in the present case the draw-rolls differ from those ordinarily employed in respect of the fact that they participate in the motion of rotation of the draw-roll frame, in which they are mounted around an axis which is at a right angle to the planes of the axes of rotation of the draw-rolls themselves. The required adjustability of the lower member d^4

of the draw-roll frame, and hence of the lower draw-rolls, is in the present case effected by lessening the set-screw h' and moving the box h upward or downward, as the case may require, and to provide for such movement the pinion g', as will be seen, is constructed with a suitably-wide face to enable it to retain engagement with the intermediate gear g^4, which does not participate in the up-and-down movement of the box h.

One of the most important characteristics of the present invention, adapting it for spinning the softest kinds of roving, is the mode of effecting the unwinding of the roving from the roving-bobbin, which consists in the enlistment for that purpose of centrifugal force, by the influence of which the convolutions of roving are successively detached from the revolving bobbin and the roving is progressively thrown off tangentially without being subjected to the usual longitudinal strain incident to the ordinary method of unwinding by pulling on the roving endwise.

What is claimed as the invention is—

1. In mechanism for spinning yarn, a spinning-head composed of a hollow cylinder adapted to contain and concentrically surround a bobbin of roving and to rotate upon its geometrical axis; a draw-roll frame connected to and rotating with said cylinder and carrying a system of draw-rolls, together with gearing for revolving said draw-rolls; means for guiding the roving from the cylinder to the draw-rolls; winding mechanism for winding up the spun yarn as it is delivered from the draw-rolls, and means for rotating said spinning-head and for operating said winding mechanism.

2. In mechanism for spinning yarn, a hollow cylinder adapted to rotate upon its geometrical axis and to contain and concentrically surround a bobbin of roving; a draw-roll frame carrying draw-rolls and draw-roll gearing, and connected to said cylinder and adapted to rotate upon an axis in alinement with the geometrical axis of said cylinder; means for guiding the roving from the cylinder to the draw-rolls; a spool for winding up the spun yarn as it is delivered from the draw-rolls; means for rotating said cylinder and draw-roll frame, and means for rotating said spool.

3. In mechanism for spinning yarn, employing a spinning-head, all the parts of which rotate upon a common vertical axis and which operate to initially impart the twist to the unfinished end of the yarn; a hollow cylinder adapted to rotate upon its geometrical axis; means for fastening a roving-bobbin centrally within said cylinder; a draw-roll frame consisting of two superposed members having an endwise-sliding connection with each other, the upper of said members being connected to the lower end of said cylinder and carrying draw-rolls and gearing adapted to effect the rotation of said draw-rolls upon their own axes at a certain prescribed speed; the lower member of said draw-roll frame carrying delivery draw-rolls and gearing adapted to effect the rotation of said delivery draw-rolls upon their own axes at a prescribed more rapid speed; and means for vertically adjusting the said two members of said draw-roll frame relatively to each other, as required, for the purpose of spinning staples of different lengths.

4. In mechanism for spinning yarn, employing a spinning-head rotatable upon a vertical axis, and including a draw-roll frame carrying suitable draw-rolls; means for securing to the spinning-head a roving-bobbin with its geometrical axis substantially coinciding with the axis of rotation of the spinning-head, whereby the roving is progressively unwound by centrifugal force; a cylindrical shell concentrically surrounding said bobbin and forming a part of said spinning-head, for serving as a guard to limit the range of tangential movement of the progressively-unwinding roving, and means for guiding the roving downward to the draw-rolls.

5. In mechanism for spinning yarn employing a spinning-head rotatable upon a vertical axis, and including a draw-roll frame carrying suitable draw-rolls, a hollow cylinder for containing a roving-bobbin mounted upon a spindle having its longitudinal geometrical axis in alinement with the axis of rotation of the spinning-head, the said cylinder having its lower end detachably connected with its lower head, and having a fixed upper head, to the center of which the upper end of said spindle is rigidly affixed, a removable bearing for the upper end of said cylinder and hence for the upper end of said head, means for removing said bearing and thus permitting the said cylinder to be removed from its lower head, as and for the purpose set forth.

6. In mechanism for spinning yarn, a rotatable spinning-head embracing a hollow cylinder adapted to contain and concentrically surround a carrier for carrying a bobbin of roving and to rotate upon its geometrical axis; a draw-roll frame carrying a system of draw-rolls, and gearing for revolving said draw-rolls, means for rotating said spinning-head upon an axis perpendicular to the planes of the axes of rotation of said draw-rolls, and means for winding up the finished yarn without thereby diminishing or increasing the twist given to the yarn at the place of its delivery from the draw-rolls by the rotation of the spinning-head.

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