No. 771,720. PATENTED OCT. 4, 1904.

F. E. DAMON & C. P. THIEL.

SPINNING AND TWISTING MACHINE.

APPLICATION FILED MAY 25, 1904.

NO MODEL. 2 SHEETS—SHEET 1.

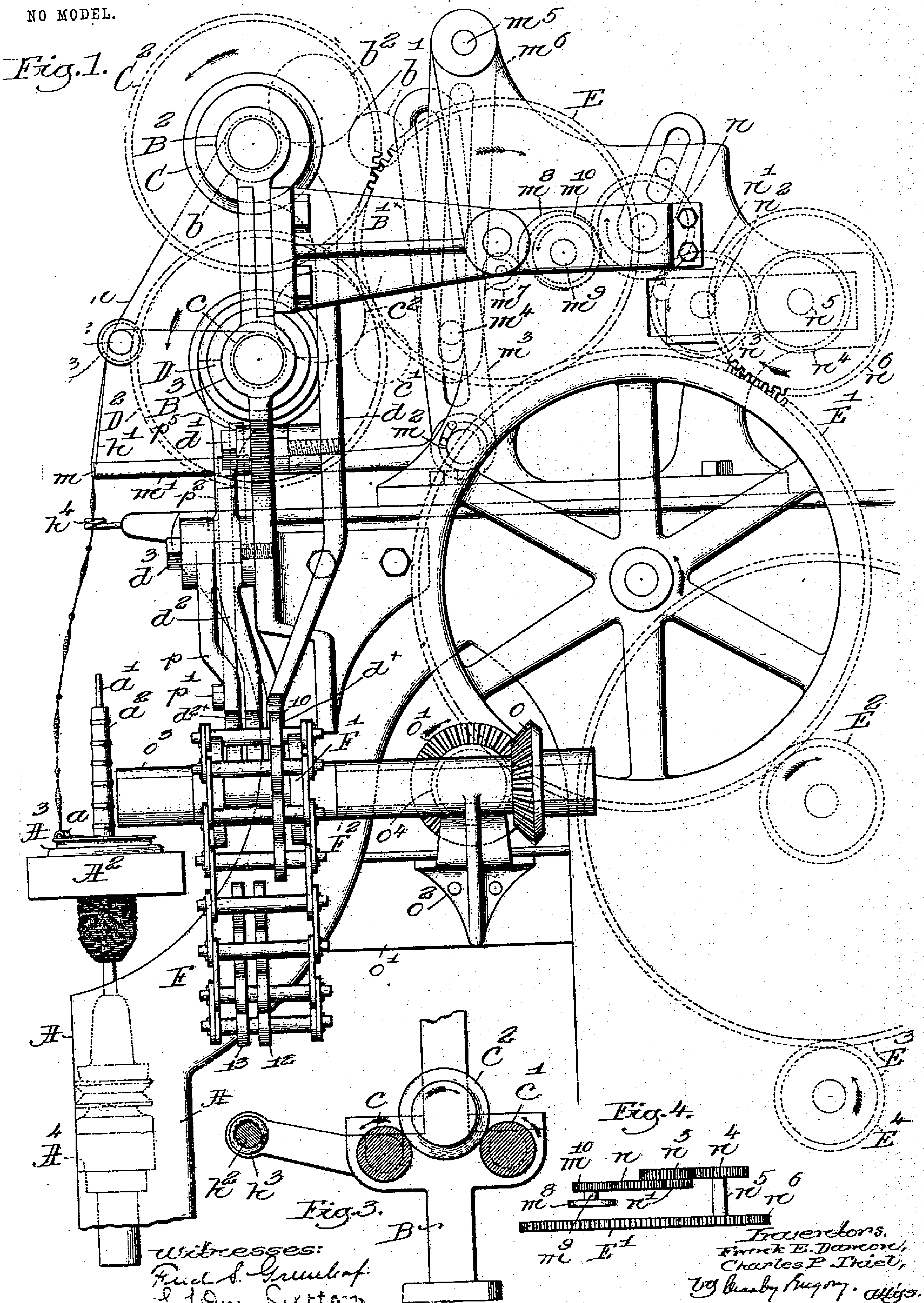

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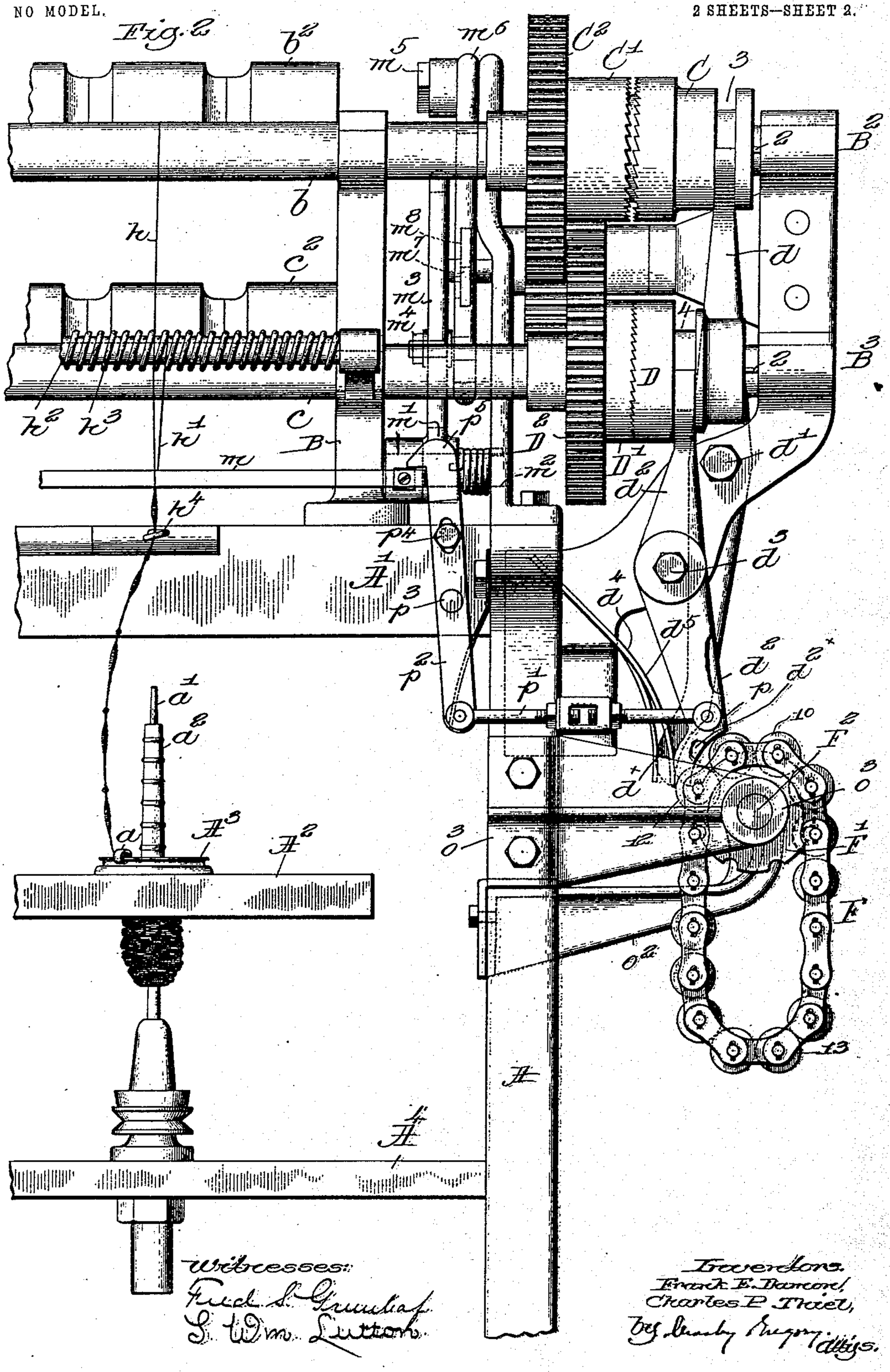
Fig. 2



No. 771,720. BEST AVAILABLE COP Patented October 4, 1904.

UNITED STATES PATENT OFFICE.

FRANK E. DAMON AND CHARLES P. THIEL, OF LAWRENCE, MASSACHUSETTS, ASSIGNORS TO DAVIS & FURBER MACHINE COMPANY, OF NORTH ANDOVER, MASSACHUSETTS.

SPINNING AND TWISTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 771,720, dated October 4, 1904.

Application filed May 25, 1904. Serial No. 209,637. (No model.)

To all whom it may concern:

Be it known that we, FRANK E. DAMON and CHARLES P. THIEL, citizens of the United States, residing at Lawrence, in the county of Essex and State of Massachusetts, have invented an Improvement in Spinning and Twisting Machines, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention has for its object to improve that class of spinning and twisting machines employed for the production of "knob" or variegated yarn. Prior to this invention it has been customary in such machines to employ a plurality of delivery-rolls and to run one set of said rolls at a faster speed than the other set, and with said rollers there has been employed a so-called "vibrator" to control the slack in the fibrous material, which may be yarn and delivered by the roller running at the faster speed, said vibrator by its change of position causing the slack in the yarn which is delivered at the faster speed to be wound on the slower-delivered body or core yarn to either form a bunch or knob or wind the same more or less spirally about the body-yarn. So, also, it has been customary to temporarily arrest by a mutilated gear the movement of said rollers driven at different speeds, so as to cause unequal delivery of one or the other yarn so that either yarn may be wrapped about the other. In this latter plan a different set of mutilated gears had to be provided for each pattern of knob yarn, and it has been found impractical to make various desirable patterns of knob yarn, because of the impossibility of using gears of a size large enough to effect the production of the more desirable patterns.

In our studies to improve this class of machine and enable any pattern of knob yarn to be readily made we have introduced a system of clutches which may be made to engage the rolls and drive the same or may be disconnected therefrom to leave the rolls at rest, and we have controlled the engagement and disengagement of the clutches with the rolls by a pattern-surface, herein illustrated as a chain the rolls or risers of which may be changed at will to adapt the machine for the production of any desired pattern of knob yarn.

Our invention therefore consists, essentially, in a machine of the class described in which the time of movement of the rolls with relation to each other is controlled by a pattern-surface.

Figure 1 may be considered a partial right-hand end view of a spinning or twisting machine embodying our invention in one practical form; Fig. 2, a partial front side elevation. Fig. 3 is a detail showing part of one of the roller-stands and the front and back rollers of the multiple sets of delivery-rollers, and Fig. 4 is a detail showing the gearing for moving the vibrator.

Referring to the drawings, A represents portions of the end frame of a spinning or twisting machine; A', the roller-beam; A^2, the ring-rail; A^3, usual rings on which the travelers a move; A^4, the step-rail; a', a spindle, preferably of the sleeve-whirl variety, and a^2 a bobbin adhesively applied to the spindle. The parts so far referred to are and may be as usual in spinning or twisting machines.

Erected upon the roller-beam at or near its opposite ends are roller-stands B, (see Figs. 1 and 3,) having suitable bearings to sustain the lower front and back rolls b c b' c' of the multiple set of delivery-rolls, the top rolls coacting therewith being designated, respectively, b^2 c^2. The end of the frame has suitably bolted to it a stand B′, having suitable bearings B^2 and B^3 to sustain the extremities of the under rollers b c. The top rolls b^2 c^2 of the delivery-rolls are sustained by the under rollers in usual manner. Each of the under rolls b c is splined at its ends at 2. The splined end of the under roller b receives upon it the movable member C of a clutch, the coacting member C′ extending from a gear C^2, loose on said roller. The front roller c of the lower set of delivery-rolls has applied to its splined end a loose member D of a clutch, the coacting member D′ of which forms part of or is extended from a gear D^2, loose on said

roller. The gears C^2 D^2 are adapted to be rotated continuously at the desired speed by or through a gear E, in turn rotated by an intermediate E', deriving its motion from a pinion E^2, connected with a larger gear E^3, that derives its motion from a pinion E^4, supposed to be mounted upon and rotating with the usual spindle-driving drum. The gears E to E^4 are omitted from Fig. 1, and the speed of the gear E may be changed as desired by substituting for the gears E' E^2 E^3 gears of any other size. These gears form no part of our invention and are common in spinning and twisting machines.

When the clutch parts referred to are in mesh, as represented by the clutch D D', the under roller *c*, with which said clutch coacts, will be rotated, and when the clutches are separated, as represented by the clutch C C', then the rotation of the under roller *b*, coacting therewith, will be arrested. It will be apparent that inasmuch as the clutch parts C and D are splined on the ends of the rollers *b* and *c* that they when rotated rotate said rollers, but when the clutches are separated then the gears C^2 and D^2, which constitute the drivers for the rollers, become inoperative.

The hubs of the clutches C and D are provided, respectively, with annular grooves 3 4. The groove 3 receives the forked end of a clutch-mover, represented as a lever *d*, having a heel $d^\times$ and sustained on a fulcrum *d'* on the stand B'. The groove 4 receives the forked upper end of a clutch-mover d^2, having a heel $d^{2\times}$ and free to turn about the fulcrum d^3 on said stand. These heels $d^\times$ $d^{2\times}$ are acted upon, respectively, by suitable springs d^4 d^5, that normally effect the engagement of the clutches when a blank space of a pattern-bar arrives opposite the ends of said heels. Fig. 1 shows the heel of the clutch-mover d^2 as opposite a space of the pattern-chain and said lever as having effected the engagement of the clutch D D', and the lowermost delivery-rolls *c* *c'* c^2 are supposed to be rotating. Said figure shows that the heel of the clutch-mover *d* is acted upon by one of the rollers or risers 12 of the pattern-chain F and said roller has turned said clutch-mover into a position to disengage the clutch part C C', and in such condition the rollers *b'* b^2 are supposed to be at rest.

The yarn *h* *h'* or textile material delivered by the respective sets of rolls is represented as passing over a separator which in the best form now known to us comprises a rod h^2, having a surrounding spiral spring h^3, the interstices between the wrappings of the spring receiving and guiding the yarns and preventing the same from contacting above the point where they should be twisted together or overlapped one on the other. Prior to our invention we are not aware that a separator of this class has ever been used in a twisting-machine.

The roller-beam carries a guide-eye h^4 for each set of yarns to be made into a knob yarn, and above said guide-eye is located a vibrator comprising, essentially, a bar *m*, which, as shown in Fig. 2, separates the yarns to be twisted in the formation of the knob yarn. This bar is carried by elbow-levers *m'*, connected with a rock-shaft m^2, extended lengthwise of the machine. The upturned arms m^3 of said levers are slotted and have connected therewith in a suitable slot thereof a stud m^4, that may be adjusted in said slot according to the amount of movement it is desired to impart to the vibrator, that depending upon the variety or pattern of knob yarn to be made.

To move the vibrator-levers, as shown in the drawings, I mount on a suitable stud m^5 a lever m^6, slotted to receive the stud m^4 in any adjusted position in which it may be placed, and said lever has a roller or other stud m^7. This roller-stud in accordance with our invention is acted upon by a cam m^8, mounted on a shaft m^9, (see Fig. 1,) to which is connected a gear m^{10}. This gear is driven by a changeable intermediate gear *n*, that derives its motion from a pinion *n'*, (see Fig. 4,) fast on a shaft n^2, to which is attached an intermediate n^3, said intermediate deriving its motion from a pinion n^4 on a shaft n^5, having at its opposite ends a gear n^6, that derives its motion from the intermediate gear E'. The gears m^{10} *n* *n'* n^3 may be changed according to the speed at which it is desired to rotate the cam. In machines heretofore made the movements of the vibrator have been controlled by detachable cams carried by a disk and the patterns of knob yarn that could be produced were limited to the number of cams that could be put on a disk, which could not be over a certain size. Herein by changing the speed of the single cam described we are enabled by it to control the movement of the vibrator for any desired pattern of knob yarn.

The pattern-chain F is sustained by a barrel F', carried by a pattern-shaft F^2, that is revolved, as herein shown, continuously through a bevel-gear *o* thereon, that is engaged by a bevel-gear *o'*, mounted on a stud projecting from a stand o^2, suitably sustained by the framework inside of the end bearing o^3 for said pattern-chain shaft. The bevel-gear *o'* has a connected spur-gear o^4, that is driven by the gear E', and that gear therefore becomes the driver for the pattern-surface. The gears *o'* o^4 are changeable to provide for any desired speed of the pattern-surface.

We have shown our invention as embodied in a pattern-chain having a continuous motion; but we desire to have it understood that the pattern-surface and the means for moving it may be varied at will and any other usual or suitable pattern-surface and actuating means be substituted for the pattern-surface shown without departing from our invention, as the pattern-surface must be varied

according to the particular knob yarn to be made. In some instances we may use in connection with our pattern-chain-actuating mechanism a multiplier of any usual variety to thereby shorten the chain, and in such instance the pattern-chain shaft and pattern-chain might be moved intermittingly by ways well known.

The pattern-chain shown comprises three rows of balls or risers 10, 12, and 13. Each ball or riser is carried by one of the links of the chain, and when the balls or risers 10 contact with, say, the heel of the clutch-mover *d* the clutch C C′ is open, and when the heel of said clutch-mover contacts with a bar where a ball or riser is omitted then the clutch is closed. The series of rolls or risers 12 actuate the clutch-mover d^2, and the third set of rolls or risers 13 act to turn the lever *p* on the stud d^3.

The lever *p* of the same shape as the lower end of clutch-mover d^2 is connected by an adjustable link *p*′ with the lower end of a latch p^2, having its fulcrum at p^3, the upper end of the lever *p* having adjustable therewith through a clamp-screw p^4 a hook p^5, that in one position engages and locks the vibrator in its lowermost position, as when the yarn being delivered is being wrapped about the yarn the delivery of which is restrained and while the vibrator is so locked enveloping the yarn or being applied as a knob or knot, and the size of this knot may be varied according to the extent of time that the vibrator is held locked. A knot having been formed, the roll or riser passes the lever *p*, and immediately the vibrator is released and put under the control of the cam m^8, which thereafter controls the speed of movement of the vibrator according to the distance it is desired to wrap one yarn about the other, the wrapping-yarn predominating and usually concealing the core-yarn, the delivery of which is temporarily stopped.

It will be obvious that the number and positions of the rolls or risers on the bars of the pattern-surface may be changed at will, according to the particular pattern of yarn to be made, and by a change of position of the rolls or risers it is possible to make any desired pattern of knob yarn, and either yarn may be made to envelop and conceal the other at will, and the wrapping-yarn surrounding the yarn which is temporarily the core may be wound to form a knot of greater or less size or may be made to surround the core in spirals for any desired distance. If the rolls or risers 13 are temporarily omitted, then a yarn can be produced which will present either yarn enveloping the other as the core for any desired distance—a quarter of an inch or for any other desired length—and one yarn may be exposed on the core-yarn at any desired interval and for any desired length. The movement of the vibrator is timed with relation to the movement of the chain, and the cam m^8 will always be rotated one or more times with each complete rotation of the chain.

When a black and white yarn are used and the vibrator is employed to lock and then release the vibrator and move it upwardly after the formation of each knob, it is possible to use one yarn—say the white yarn—and wind it on the black yarn to form a white knob and to wind the black yarn outside the white yarn between the white knobs, thus making all the knobs of the same color, or, if desired, all the knobs may be black and be separated by a portion of knob yarn which shall be black. By holding the vibrator in its locked position the knobs will be alternated in color—*i. e.*, one knob will be made from each colored yarn alternately—and the yarn used in making the knob will wrap about the core-yarn until the next knob is to be made, when what was the core-yarn will come to the surface and form a knob about the other yarn. By moving the pattern m^8 at a slow speed the knob may be elongated. It will be understood that the rotation of one or the other set of delivery-rolls is arrested only when the knob or knot is being produced and that both sets of rolls are rotated while the yarns are twisted together between the knots.

Having described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In a machine of the class described, multiple sets of delivery-rolls, a clutch for each set of rolls, and means to effect the engagement and disengagement of said clutches according as it is desired to rotate one set of rolls to the exclusion of the other set.

2. In a machine of the class described, multiple sets of delivery-rolls and a pattern-surface, combined with means controlled by said pattern-surface to effect the rotation of one set of rolls while the other set of rolls remains at rest.

3. In a machine of the class described, multiple sets of delivery-rolls, combined with a pattern-surface and means controlled thereby for rotating said rolls simultaneously or suspending the rotation of either set of rolls according to the demands of the pattern-surface.

4. In a machine of the class described, multiple sets of delivery-rolls, a vibrator, a pattern-surface, and means controlled by said pattern-surface to effect at times the rotation of sets of rolls, and at other times to arrest the rotation of one set of rolls, and locking means intermediate said pattern-surface and controlled thereby to lock the vibrator in position during the formation of a knot.

5. In a machine of the class described, a vibrator, means to temporarily lock the vibrator in position to form a knob, a cam, means to actuate said cam constantly, the latter controlling the movement of the vibrator after the same has been unlocked.

6. In a machine of the class described, a vibrator, a cam, means to move said cam constantly, and means intermediate said cam and vibrator to move the latter.

7. In a machine of the class described, multiple sets of delivery-rolls, a pattern-surface to control the times at which said rollers shall be rotated in unison and when one of said sets of rollers shall be arrested in its movement, a vibrator, a cam, means between said cam and vibrator to move the latter, and means to move said cam at a slower or faster speed with relation to the speed of movement of the pattern-surface.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

FRANK E. DAMON.
CHARLES P. THIEL.

Witnesses:
OSCAR M. GODFREY,
HENRY D. ROCKWELL.