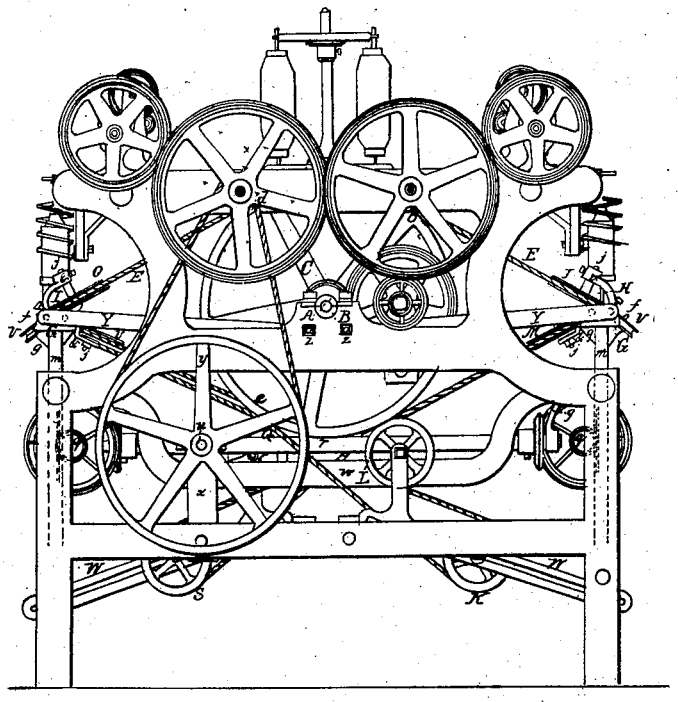
Sheet 1,
6 Sheets.

C. Danforth.

Spinning Mach.

No. 2,077. Patented May 4, 1841.

Fig. 1.



Sheet 2
6 Sheets.

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Spinning Mach.

No. 2,077. Patented May 4, 1841.

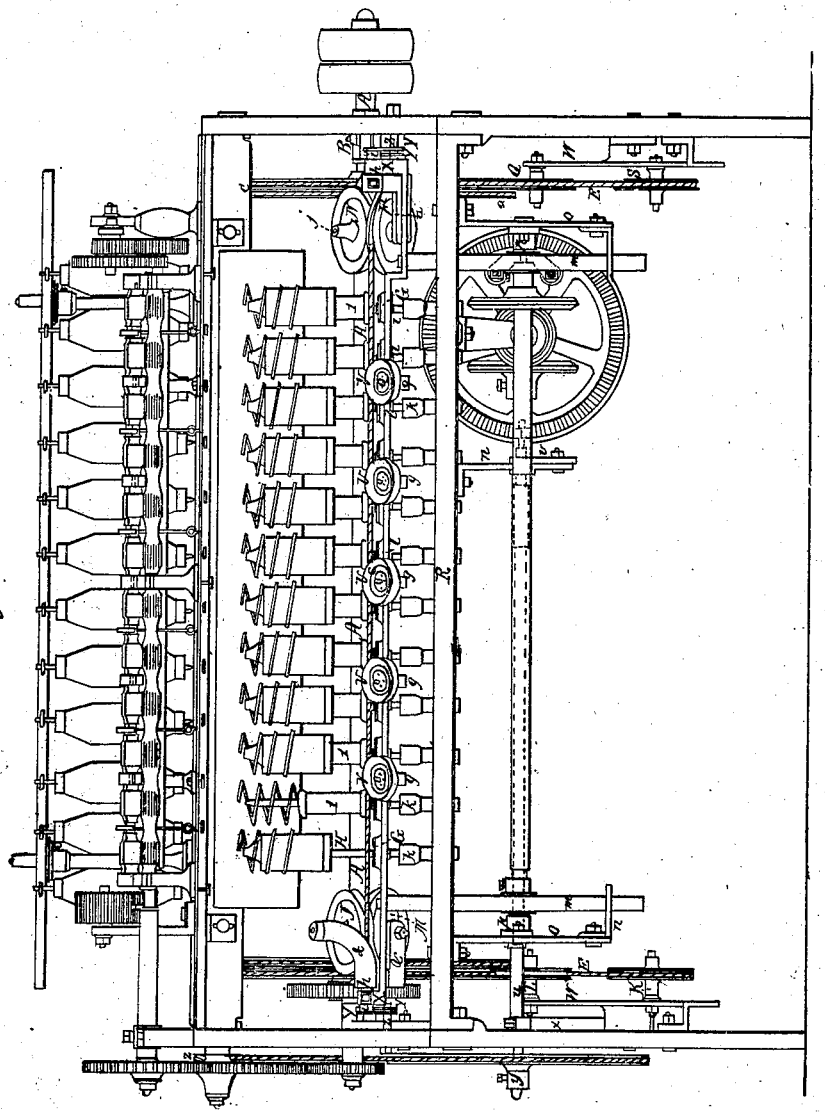

Fig 2

Sheet 3,
6 Sheets.

C. Danforth.

Spinning Mach.

No. 2,074. Patented May 4, 1841.

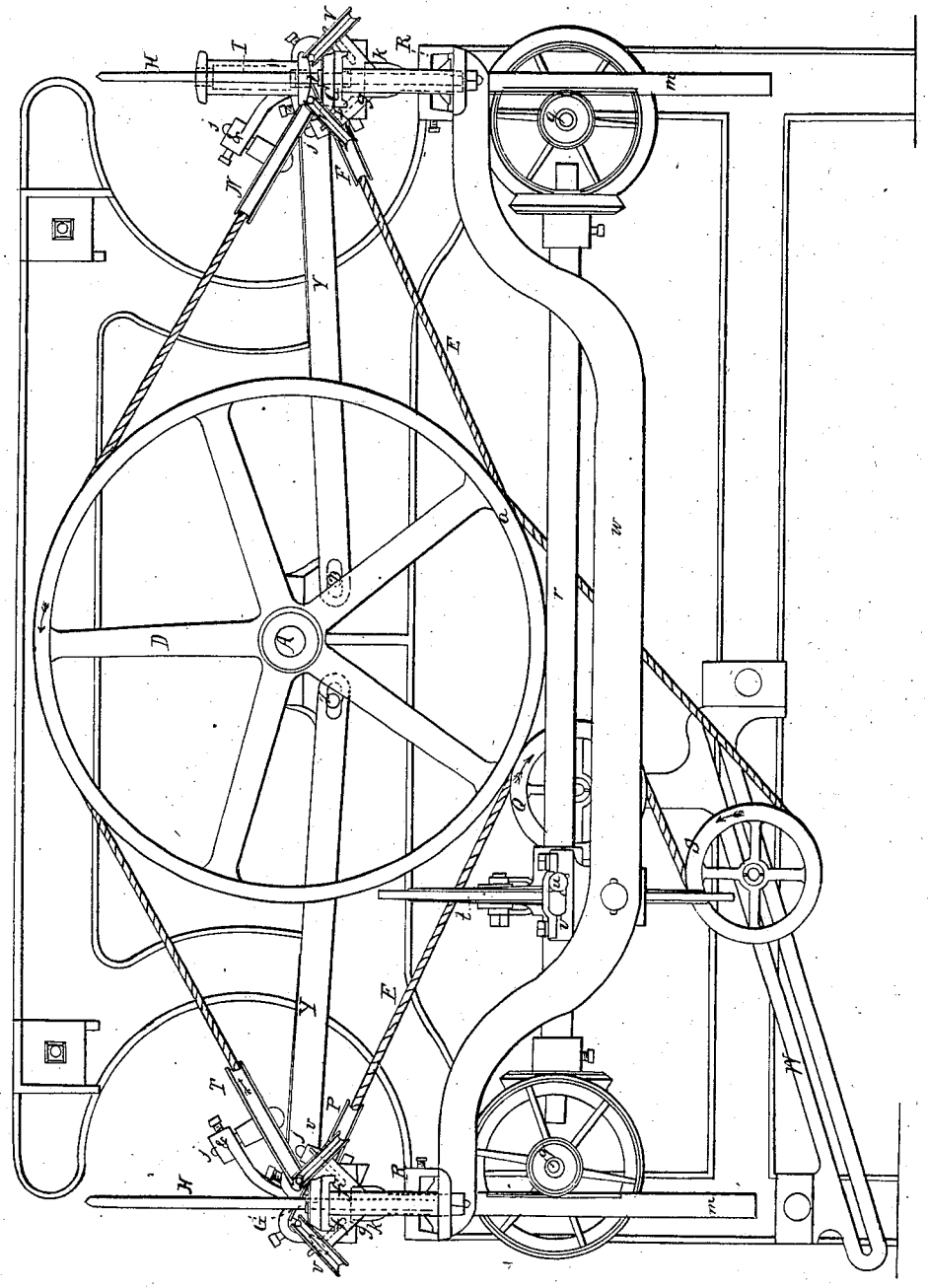

Fig. 3.

Sheet 4,
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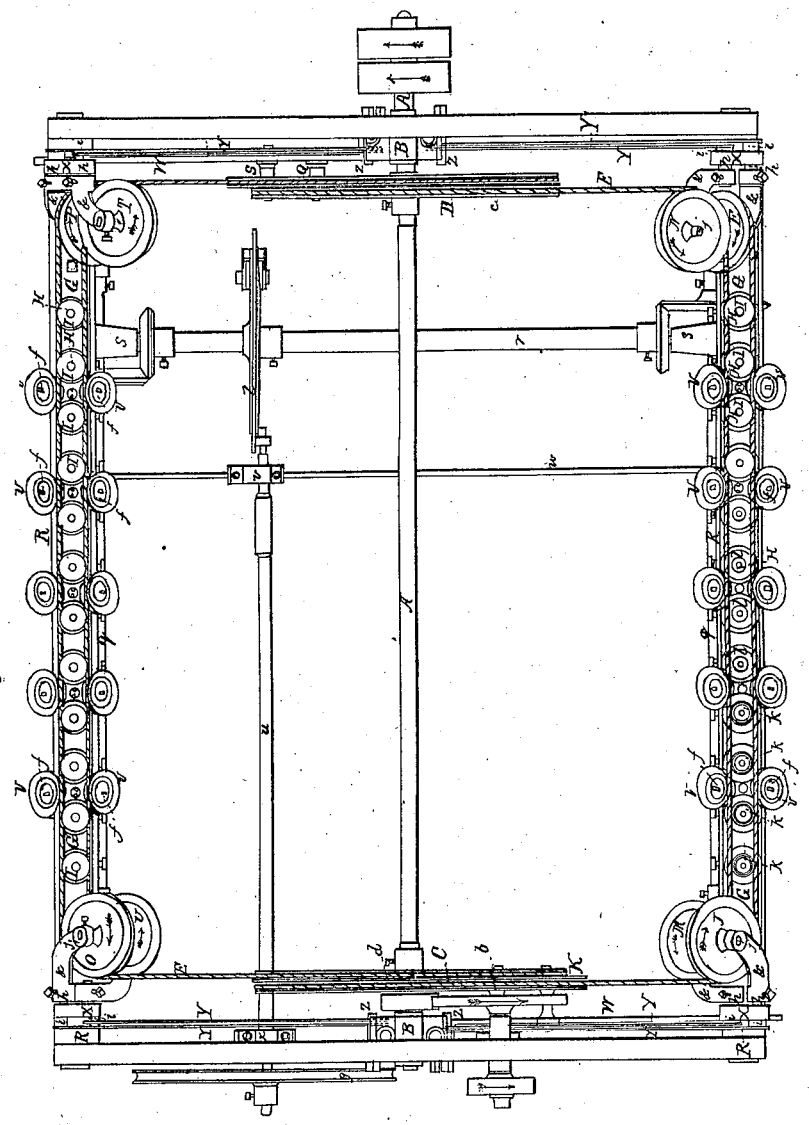
C. Danforth.

Spinning Mach.

No. 2,077. Patented May 4, 1841.

Fig. 4



Sheet 5
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Spinning Mach.

No. 2,077. Patented May 4, 1841.

Fig. 5

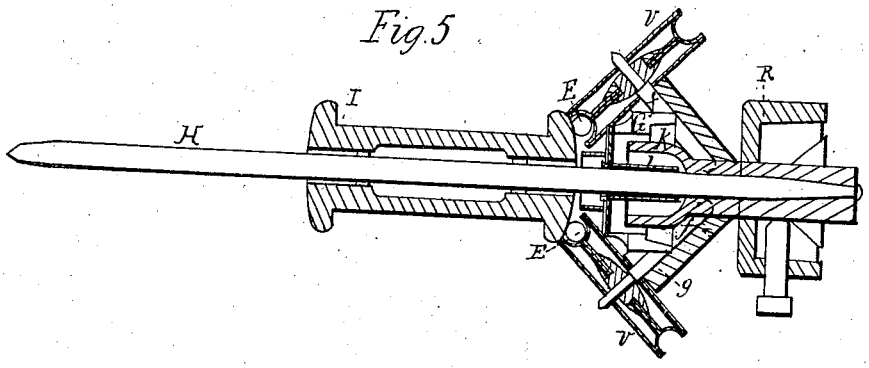


Fig. 6

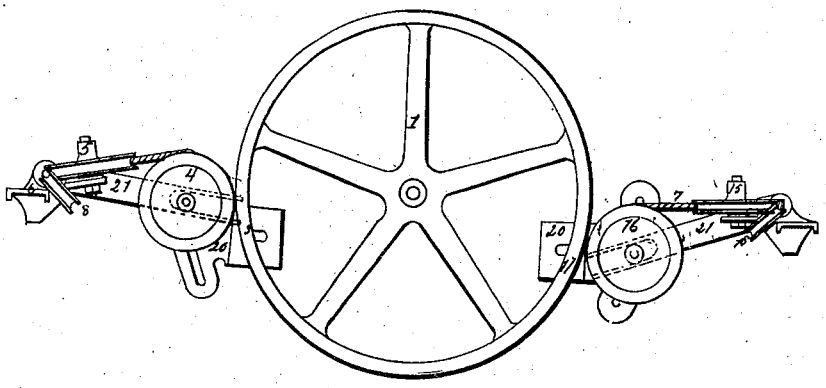
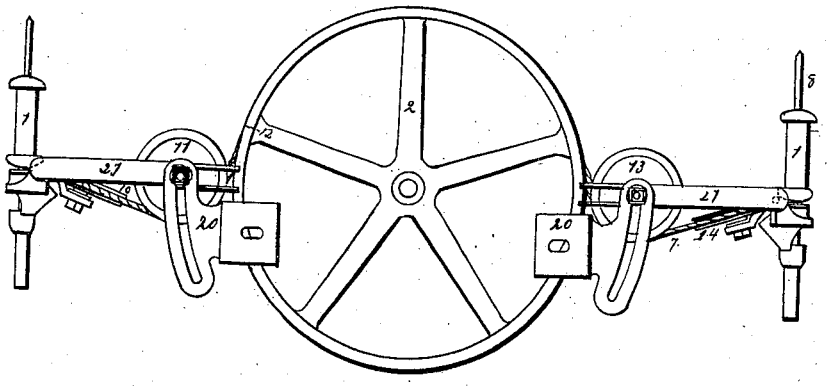


Fig. 7



Sheet 6,
6 Sheets.

C. Danforth.

Spinning Mach.

No. 2,077. Patented May 4, 1841.

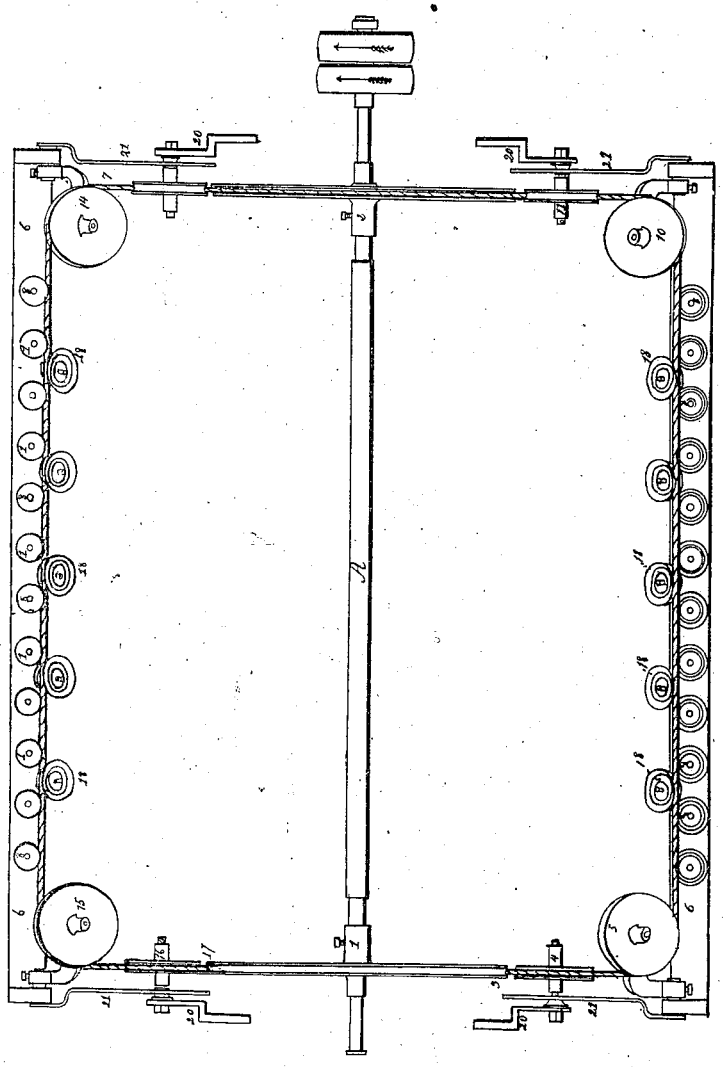


Fig. 8

UNITED STATES PATENT OFFICE.

CHARLES DANFORTH, OF PATERSON, NEW JERSEY.

CAP-SPINNER.

Specification of Letters Patent No. 2,077, dated May 4, 1841.

To all whom it may concern:

Be it known that I, CHARLES DANFORTH, of Paterson, in the county of Passaic and State of New Jersey, have invented new and useful improvements on a spinning-machine commonly called the "cap-spinner" or "Danforth frame" and other spinning and twisting machines to which it is applicable, of which the following is a full and exact description.

The drawings hereunto annexed and which I desire may constitute a part of this specification consist of eight parts—the first five represent the machine adopted to, and worked with, two endless cords or bands and are as follows, to wit.

Figure 1 is an elevation view of the geared end of the machine. Fig. 2 is a front or side elevation view. Fig. 3 is an inside elevation view with the machine divided in two parts through the center from side to side, the roller beams, rollers, and creel taken off looking toward the driving end. Fig. 4 is a ground view with the creel, roller beams, rollers, guide wire boards taken off and the caps and wire guards removed from the spindles. Fig. 5 is an end view of the oil cup feeder, bobbin, spindle, and carrying pulleys drawn in section half size. All the figures herein mentioned except the fifth are drawn upon a scale of three inches to the foot.

The same letters on all the above figures represent the same parts of the machine.

The other three parts represent parts of the machine adapted to and worked with one endless cord or band and are as follows to wit. Fig. 6 is an inside end elevation view with the machine cut in two parts from side to side looking toward the geared end. Fig. 7 is an elevation view from the driving end, the frame end taken off to show the pulleys and mode of working the band. Fig. 8 is a ground or horizontal view of the main shaft, pulleys, lifters &c.

The parts of the three last named figures are numbered, the numbers being the same on all of them and having reference to the same parts of the machine.

In the first place I dispense with the tubes, warves, or pulleys commonly used for supporting and giving motion to the bobbins, and instead thereof I bush the bobbins with cast iron or other suitable metal, these bushes are bored to fit the spindles and are about one quarter of an inch deep, their outer surfaces are turned to fit the bore in the heads of the bobbins into which they are driven three-fourths of an inch deep from the ends of the heads. I next dispense with the cylinder by which motion is commonly communicated to the warve or pulley on the spindle and instead I use a main shaft A, of a suitable size (say one and one-eighth inches in diameter) which passes lengthwise through the center of the machine, the journals of which run in bearings B, B, similar to and in the same position in the frame as the cylinder journals commonly run in. On this shaft is fixed near the journals two double grooved pulleys C, D of convenient size for getting up speed and taking hold on the band (say eighteen inches in diameter). These pulleys give motion to two endless bands or cords E, E, of suitable size for giving motion to the bobbins (say one quarter of an inch in diameter) one of which operates the bobbins on one side of the machine and the other on the opposite side. They are applied in the following manner, to wit, the first leading off the inside groove of double grooved pulley D, at *a*, (Fig. 3) thence to grooved end pulley F, connected with the end of the lifter or copping rail G, G, around said pulley F, ninety degrees thence it passes along parallel with the lifter G, and about half an inch above it at a suitable distance from and in front of the spindles, H, H, H, to receive and support the bobbins I, I, I, I, and cause them to revolve when placed on the spindles and their weight resting on it to end pulley J, which is connected with the other end of the lifter or copping rail G, taking a turn of ninety degrees around said pulley thence it leads on to the outer grooves of double-grooved pulley C, at *b*, thence around said pulley C, until it reaches a point where a tangent line drawn from the lower edge or groove of sliding pulley K, intersects the periphery of said double grooved pulley C, thence around said sliding pulley K, to the inside of pulley L, thence around said pulley L, seen at Fig. 1, until it strikes a point meeting a straight line drawn from end pulley M, thence around the last named pulley ninety degrees thence in a straight line parallel with the lifter or copping rail G, G, back of the spindles H, H, and the same distance from them as that part of the band heretofore described as passing in front of said spindles H, H, and on a level with it to

end pulley N taking a turn of ninety degrees around said pulley N, it passes to the inner groove of double-grooved pulley D, at *c*, thence around said double-grooved pulley D, to *a*, the place of beginning. The other band leads off the inside groove of double grooved pulley C, at *d*, thence around grooved end pulley O, ninety degrees, thence in a straight line parallel with the lifter G, the same distance above it, and in front of the spindles H, H, as described for the band on the other side, to end pulley P, taking a turn of ninety degrees around said pulley P, it passes to pulley Q around the last named pulley to the upper side of sliding pulley S, around this pulley thence to the outside groove of double-grooved pulley D, thence around said double grooved pulley D, to end pulley T, taking a turn of ninety degrees around this pulley it passes in a straight line parallel with the lifters G, G, back of the spindles H, H, and the same distance from them as the parallel part in front of said spindles and on a level with it to end pulley U, taking a turn of ninety degrees around the last named pulley it leads on the inside groove of double grooved pulley C at *e*, thence around said double grooved pulley C, to *d*, the place of beginning. It will be perceived by this arrangement that those parts of the bands which are in front of the spindles are passing in one direction while those parts in their rear are passing in the opposite, so that the bobbins being free on the spindles and their weight resting on the two parts of said bands are made to revolve with greater strength from being in contact with the band in two places at once—the heads are turned rounding as shown in the drawings that they may cause no unnecessary friction on the bands—the bands should be carefully spliced in such manner as to make as little inequality in their size or surface as possible. I prefer cotton cords.

Those parts of the bands running parallel with the lifters or copping rails both in front and rear of the spindles are supported and kept in their places by a series of grooved carrying pulleys V, V, V, of a suitable size (say two inches in diameter) the grooves of which are made rather larger than the band so that it will work freely in them, these carrying pulleys are fastened to the tops of small spindles *f*, *f*, *f*, about three-sixteenths of an inch in diameter and about one inch and three-quarters long—they are placed between every alternate spindle H, H, at an angle of about forty-five degrees in such manner that the upper side or groove receives the band or cord and serves as a guide for it as well as to prevent it from sagging by the weight of the bobbins. The small spindles *f*, *f*, *f*, to which these pulleys V, V, V, are attached run in socket bearings, drilled or bored into hubs *g*, *g*, *g*, on the lower side of the lifter at a proper angle and position to bring their respective pulleys to which they are attached to the position described above and in a line with each other—these carrying pulleys for cheapness as well as for lightness of construction, I make of common tin or tinned sheet-iron, the tin is first punched in a press to a proper size, and then with a pair of dies made to correspond to the shape of one-half of the pulley divided through the center of the groove in which the band runs. I form them by pressure, I then punch a round hole half of an inch through the centers and by fastening two of them together back to back by means of a brass rivet and washer (the rivet large enough to fill the hole in the tin), I make a very cheap, light, and durable pulley. The rivets should be drilled and permanently fixed to the spindle and turned on them perfectly true before uniting them with the tins to insure the truth of the pulleys.

The sliding pulleys K, and S, and the pulleys L, and Q, run on studs and their office is to take up the bands when they become too slack, the studs on which the sliding pulleys run, are fastened by nuts in slots to brackets W, W, and may readily be removed to regulate the tension of the band as may be required.

The grooved end pulleys F, J, M, N, O, P, T, U, are connected with the end of the lifters or copping rails G, G, &c., as follows, on each end of the lifters is cast a block X, X, X, X, about one inch thick and three inches long running lengthways across the end of the lifter G, G, &c., and projecting up at right angles with it about three-fourths of an inch above the center of that part of the bands which run parallel with the lifters through each of these blocks or projections are bored two holes about three fourths of an inch in diameter the centers of which range exactly with the centers of the parallel parts of the endless cards or bands in front and rear of the spindles. Passing through these holes are studs *h*, *h*, *h*, *h*, *h*, *h*, *h*, *h*, of a diameter to fit them and about two inches long having a collar *i*, *i*, *i*, *i*, *i*, *i*, *i*, *i*, with a small shank on their outer end. The collars in the front or outside studs are made about one quarter of an inch longer than those in the rear or inside ones for the purpose of admitting the radius rods or levers Y, Y, Y, Y, Y, Y, Y, Y, hereafter described to pass outside of those attached to the collars of the inside studs without interference. To the collars of each of these studs are permanently riveted by means of the small shanks turned on their outer ends a radius rod or lever Y, made of rolled iron about an inch and an eighth wide, and an eighth of an inch thick, these are riveted to the studs through a hole made to fit the

shank on the collar of the studs near their outer ends and extend from thence to the other studs Z, Z, Z, Z, which are fastened to the frame end near the main shaft A. These last mentioned studs Z, Z, Z, Z, pass through slots which are made through the radius rods near their inner ends of a width to fit the studs and of sufficient length to admit the radius rods to slide endways in the studs as their other ends rise and fall on a perpendicular with the traverse of the lifters or copping rails. These studs *h*, *h*, *h*, *h*, *h*, *h*, *h*, *h*, to which the radius rods are riveted project through the blocks X, X, X, X, on the ends of the lifters about one inch to which are fastened cast iron brackets &, &, &, &, &, &, &, &, by means of sockets bored through hubs on their outer ends to fit the studs and are held by set or pinching screws passing through the sides of the hubs with their points passing against the sides of the studs. The brackets &, &, &, &, &, &, &, &, support other studs *j*, *j*, *j*, *j*, *j*, *j*, *j*, *j*, on which the grooved end pulleys F, J, M, N, O, P, T, U, revolve and are so shaped as to bring the points of support of said studs in a position that will bring the groove in the front edge of the end pulleys when placed on their studs *j*, *j*, *j*, *j*, *j*, *j*, *j*, *j*, in exact range with the center of studs *h*, *h*, *h*, *h*, *h*, *h*, *h*, *h*, so that the parallel parts of the bands in passing from one end pulley to another passes in range with the *h*, *h*, *h*, *h*, *h*, *h*, *h*, *h*, supporting the brackets &, &, &, &, &, &, &, &.

It will be seen by the drawings that some of these brackets are made to support the studs *j*, *j*, *j*, *j*, *j*, *j*, *j*, *j*, at their tops by means of a socket and set screw while others pass under the pulleys and support the studs from the bottom as the situation of the pulleys require, those studs supported at their tops have a collar or head on their lower ends on which the weight of the pulleys rest. Those supported at the bottom have a collar and shank and are either riveted to the brackets or fastened with a nut. These studs are about seven-sixteenths of an inch in diameter and long enough to afford a bearing for the pulley to run on one and a half inches long. By this arrangement as the lifters or chopping rails rise and fall the end pulleys F, J, M, N, O, P, T, U, being connected by the brackets &, &, &, &, &, &, &, &, and studs *h*, *h*, *h*, *h*, *h*, *h*, *h*, *h*, with the radius rods Y, Y, Y, Y, Y, Y, Y, Y have a reciprocating motion the back sides or grooves changing their positions to suit the angle of the bands as they pass to and from the double-grooved pulleys C, D, while their front grooves which direct the bands in their parallel directions along the lifters remain in the same relative position with the lifters or chopping rails. Thus it will be perceived that the end pulleys F, J, M, N, O, P, T, U, have three distinct motions. First a rotary motion produced by the bands passing around them. Secondly an undulating motion with the lifters as they rise and fall to distribute the yarn on the bobbins, and lastly the reciprocating motion produced by the radius rods and studs as before described.

I also make use of the following mode or contrivance for supplying the spindles H, H, &c., with oil and keeping them constantly lubricated, viz, instead of fastening the spindles directly to the spindle rails R, R &c., with set screws in the usual way, I fasten them to cast iron cups *k*, *k*, *k*, &c., of suitable dimensions (say one inch in diameter and one inch deep) on the bottom of which are shanks seven-eighths of an inch in diameter and two and three-fourths of an inch long.

The cups and shanks are cast in one piece and turned true and the tops dished out to form a reservoir for oil, the bottom or shank is turned in a cylindrical form to fit the size of a hole in the spindle rail made to receive it. A set or pinching screw is put through the side of the spindle rail the point of which is made to press against the side of the shank of the oil cup and thus support and keep it in its place. In the center of these shanks commencing at the bottom of the oil cup is made a cylindrical hole of a size exactly to fit the spindles about one and a half inches deep from the bottom of which a tapering hole extends through the residue of the shanks the small ends or bottoms of which are about one-eighth of an inch in diameter forming conical sockets to fit cones or tapers on the bottom of the spindles, the spindles are driven tight into these holes and their ends riveted at the bottom. This forms a good support for the spindles, and as the cups and spindles are fastened together they can be adjusted to make the bobbins fill properly by means of the set screws as usual.

I make the lifters or copping rails with holes through them large enough to admit the oil cups to pass through them when the lifters are down and the bobbins are filling at their tops for the purpose of bringing the oil cups as near the bobbins as can be conveniently done. Around these holes I cast a rib or projection about three-eighths of an inch deep to strengthen the lifters, on the top of this rib or projection and supported by it I place a circular piece of tin large enough to cover the holes in the lifter. Through the center of this circular tin is a hole in which is inserted and soldered to it a tin tube *l*, *l*, *l*, &c., about one and a quarter inches long and of a diameter to suit the spindle and work freely up and down it by its own gravity with the traverse of the lifters or copping rails. The top of this

tube projects about one-eighth of an inch above the circular tin or collar to which it is attached and is flared outward to prevent the oil from passing over the outside as it slides on the spindles. The resevoir extends below and when the lifters descend to the bottom of the traverse dip into the oil in the cups and when they ascend they carry a portion of oil up with them and distribute it on the spindles and as the bobbins follow the tubes on their descent their lower bushes are sure to be supplied with oil and the bushes being fixed in the bobbins as before described, the lower bush when the lifter goes up rises high enough to supply the upper bush with oil. By this arrangement the spindles receive continually a sufficient supply of oil every time the lifter rises. On the top of circular tin which forms a collar and support for the oil tube or feeder *l*, *l*, *l*, *l*, &c., I sometimes solder a ring made of stout tin about three-fourths of an inch in diameter, and three-eighths of an inch deep. This ring projects up to within about an eighth of an inch of the top of the band on which the bobbins rest. The object of this is to prevent the bobbins from being depressed down between the two parallel parts of the band by any accidental pressure or settling down by their own gravity when the bands are too slack.

The copping rails or lifters may be worked by any of the ordinary means employed for that purpose, but the plan which I adopt and recommend on machines constructed for spinning warp or twist-yarn is as follows: There are cast iron bars or rods *m*, *m*, *m*, *m*, &c, about one inch square and about sixteen inches long attached to the bottom of the lifters about six inches from their extreme ends and as near the first spindle from the ends as convenient, they are fastened to the lifters by means of set screws passing through the lifters into holes drilled and tapped in the upper ends of the bars or rods to receive them, these bars extend down in a perpendicular direction passing through extreme square holes in the spindle rails which serve as a guide for them as well as the lifters which they support and cause to rise and fall. On the back sides of these bars or rods *m*, *m*, *m*, *m*, &c., are cast racks the tops or commencement of which are about four inches below the spindle rails when the lifters are down, and extend below about five inches, they are so made as to agree in pitch with pinions of sixteen cogs to the inch in diameter. The bottom of these lifter bars or rods *m*, *m*, *m*, &c. pass through square holes in brackets *n*, *n* (shown in Fig. second) which are placed in a position about nine inches below and exactly perpendicular to the holes through which they pass in the spindle rails, thus each bar or rod has two bearings or guides through which they pass and by which they are kept in a perpendicular position—these last named brackets *n*, *n*, are bolted by a flange to the bottom or lower ends of other brackets *o*, *o'*, which are bolted to the spindle rails by a flanch and extend down in a perpendicular direction low enough to support the brackets *n*, *n*, for guiding the lifter rods. There is also a slide or stand *p*, *p*, bolted to each of the brackets *o*, *o*, about five inches below the spindle rails with hubs on one side which are bored out to fit the journals and form bearings or supports for two lifter shafts *q*, *q*, about one inch in diameter which run lengthway of the machine and parallel with the spindle rails and at a proper distance from the lifter bars or rods *m*, *m*, to admit pinions which are fastened to each of their ends near the journals to gear into the racks on the back sides of the lifter rods. These pinions are one and five-eighths inches in diameter to their pitch line and contain twenty-six cogs each. It will be seen that as the shafts *q*, *q*, are made to turn backward and foaward with their pinions in gear with the racks, that the lifter rods and lifters will be made to rise and fall, to produce this motion the two lifter shafts are connected together by a cross shaft *r*, which has a bevel wheel on each end about four inches in diameter containing thirty-two cogs, these gear into other bevel wheels which are fixed to the lifter shafts containing fifty-six teeth or cogs each—this cross shaft is supported by stands or brackets *s*, *s*, which are bolted to the spindle rails. On this cross-shaft is fixed a mangle-wheel *l*, similar to those used for working the traverse on roping machines called counter twist speeders, this is worked with a pinion containing four teeth made to suit the pitch of the wheel, this pinion is fastened to the end of a horizontal shaft *u*, running lengthwise of the machine from the periphery of the mangle wheel and extending through the geared end of the machine. It is supported at the end next the mangle wheel by a stand *v*, fastened to a crosspiece or bar *w*, which extends from one spindle rail to the other and is bolted to them, this stand *v*, has an opening in it forming a bearing for the shaft *u*, wide enough to admit the shaft to slide sidewise to change the pinion from one surface of the mangle wheel to the other to reverse the motion of the mangle wheel with all that it gives motion to; the other end of the shaft *u*, is supported by a stand or pedestal *x*, bolted to the end of the machine; there is an overneck on this shaft extending beyond the outside bearing on which is fixed a grooved pulley *y*, about fifteen inches in diameter—this pulley receives motion from an endless band passing around it and a grooved pulley *z* about three inches in diameter fixed to the inside hub of the intermediate or carrying

wheel on the end of the machine which gives motion to the rollers, the bevel-wheels on the lifter shafts are geared on the reverse side of those on the cross-shaft so that the lifters are made to rise on one side while they are falling on the other and thus counterbalance each other.

I have thus described the manner in which I work the lifters or copping rails by means of a mangle wheel racks and pinions, but something similar has been used before. The rollers are geared from the main shaft similar to the mode in which they have heretofore been geared from the cylinder but as this part of the machine, as well as the rollers and roller gearing is familiar to those versed in spinning machinery, I deem it unnecessary to describe them.

I have described the manner in which I construct the machine for propelling the bobbins with two endless cords or bands, or with two parts of the same band, in front and rear of the spindles. But it is obvious that the particular mode of applying and working the bands or cords is susceptible of various modifications, the following method I sometimes adopt, viz, instead of using two double-grooved pulleys on main shaft A, I use two single grooved pulleys 1 and 2, about eighteen inches in diameter which give motion to an endless band 7, or cord for propelling the bobbins as follows: Leading off of grooved pulley 1 at 3, it leads on to binding pulley 4, over the top of this pulley to grooved end pulley 5, taking a turn of ninety degrees around this last named pulley, it passes in a straight line parallel with the lifter and about half an inch above it, back of the spindle 8, and a suitable distance from them to receive support and give motion to the bobbins 9, to grooved end pulley 10, taking a turn of ninety degrees around this pulley it passes to the lower side of binding pulley 11, passing under this pulley it leads on to grooved pulley 2, at 12, thence around said pulley 2, to the lower side of binding pulley 13, passing under the last named pulley it leads on to grooved end pulley 14, taking a turn of ninety degrees around said pulley it passes in a straight line parallel with the lifter 6, the same distance above it, and back of the spindle 8, as described for the parallel part on the other side of the machine to grooved end pulley 15, taking a turn of ninety degrees around this pulley it leads on to binding pulley 16, passing over this last named pulley it leads to grooved pulley 1, at 17, around the last named pulley to 3, the place of beginning. The parts of the band that run parallel with the lifters or copping rails are supported and kept in their places by a series of grooved carrying pulleys 18, 18, 18, 18, placed at an angle of about forty-five degrees between every alternate spindle in the same manner as hereinbefore described for supporting the two pulleys parallel parts of the band in the other described mode of banding. The binding pulleys 4, 11, 13, 16, run on center pins or studs which are fastened by a screw and nut to brackets 20, 20, 20, 20; these brackets are fastened with a bolt to the frame end; they have circular slots in which the studs for the binding pulleys are fastened for the purpose of raising and lowering the binding pulleys to regulate the tension of the bands as may be required. The grooved end pulleys 5, 10, 14 and 15, run on studs and have a reciprocating motion as hereinbefore described by means of brackets, studs and radius rods. The radius rods 21, 21, 21, 21, in this case are made crooked as shown in Fig. 8, and of a suitable length to admit of the slot or fork in their inner ends, straddling the collars of the studs on which the binding pulleys 4, 11, 13, 16, run, so that the grooved end pulleys being acted on and regulated in their reciprocating motion by the radius rods 21, 21, 21, 21, will run fair with the band as it passes to and from the binding pulleys 4, 11, 13, 16.

I have described the inclined carrying pulleys on the lifters as being fastened to the top of small spindles, which run in socket bearings. But these spindles may be made longer and have a bearing at each of their ends, and the pulleys fixed to them near their middle. I have also described the grooved end pulleys as running on center pins or studs, but they may be fixed to the middle of short spindles, which are supported at each of their ends. It is obvious that other parts of this improvement may be varied according to fancy or for the purpose of evasion, and yet the principle of this mode of operation remains the same.

The principle of the invention for which I claim a patent consists of—

1. The combination of the main shaft and pulleys thereon with the inclined pulleys on the lifters and the end pulleys and radius rods, carrying, sustaining, and guiding a band or cord so as to drive the bobbins resting on the band or cord at the required rate and force, the bobbins being constructed and kept supplied with oil as aforesaid substantially as above described.

2. I also claim the method of supporting, guiding and working said endless band or cord by means of the inclined carrying pulleys on the lifters and the grooved-end pulleys in connection with the grooved pulleys on the main shaft, thereby giving motion to the bobbins by causing an endless band or cord to pass under them with their weight bearing on said band or cord substantially as aforesaid by whatever mechanical means the regulating action effected by the radius rods may be produced.

3. I also claim the reciprocating motion

given to the grooved end pulleys by means of radius rods, studs and brackets essentially as herein described.

4. I also claim the method of applying oil to the spindles and bobbins in spinning machinery substantially as above described.

5. And I further claim as my invention the use of inclined pulleys upon lifters carrying and guiding a band or cord upon which bobbins are made to rest and be turned substantially as aforesaid by whatever mechanical means the said band or cord may be guided to and from said inclined pulleys as the lifters rise and fall in the operation of any spinning machines to which said inclined pulleys, bands, or cord may be applied.

6. I also claim the combination of pulleys whether inclined or not upon the lifters with a band or cord and bobbins resting upon them, and carried by said band substantially as aforesaid.

7. I also claim the combination of pulleys inclined or not upon spindle rails, carrying, guiding and moving bobbins by the weight of these on a band or cord as aforesaid.

CHAS. DANFORTH.

Witnesses:
GEORGE SULLIVAN,
JOHN F. BRADY.