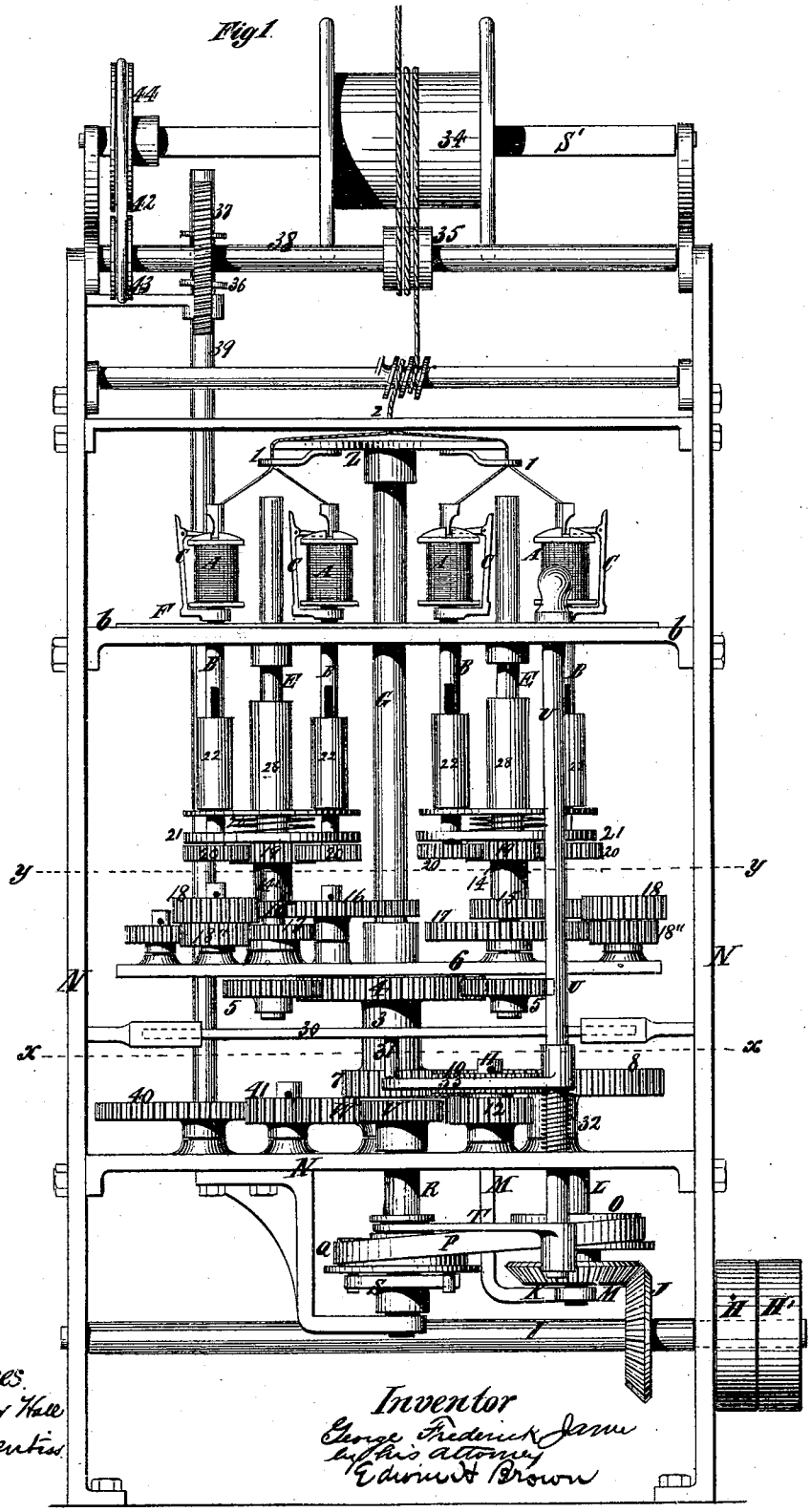
4 Sheets—Sheet 1.

G. F. JAMES.

MACHINERY FOR MAKING CORDS, ROPES, AND BANDS.

No. 251,118. Patented Dec. 20, 1881.

Fig 1.



Witnesses.
Chandler Hall
Owen Prentiss

Inventor
George Frederick James
by his attorney
Edmund Brown

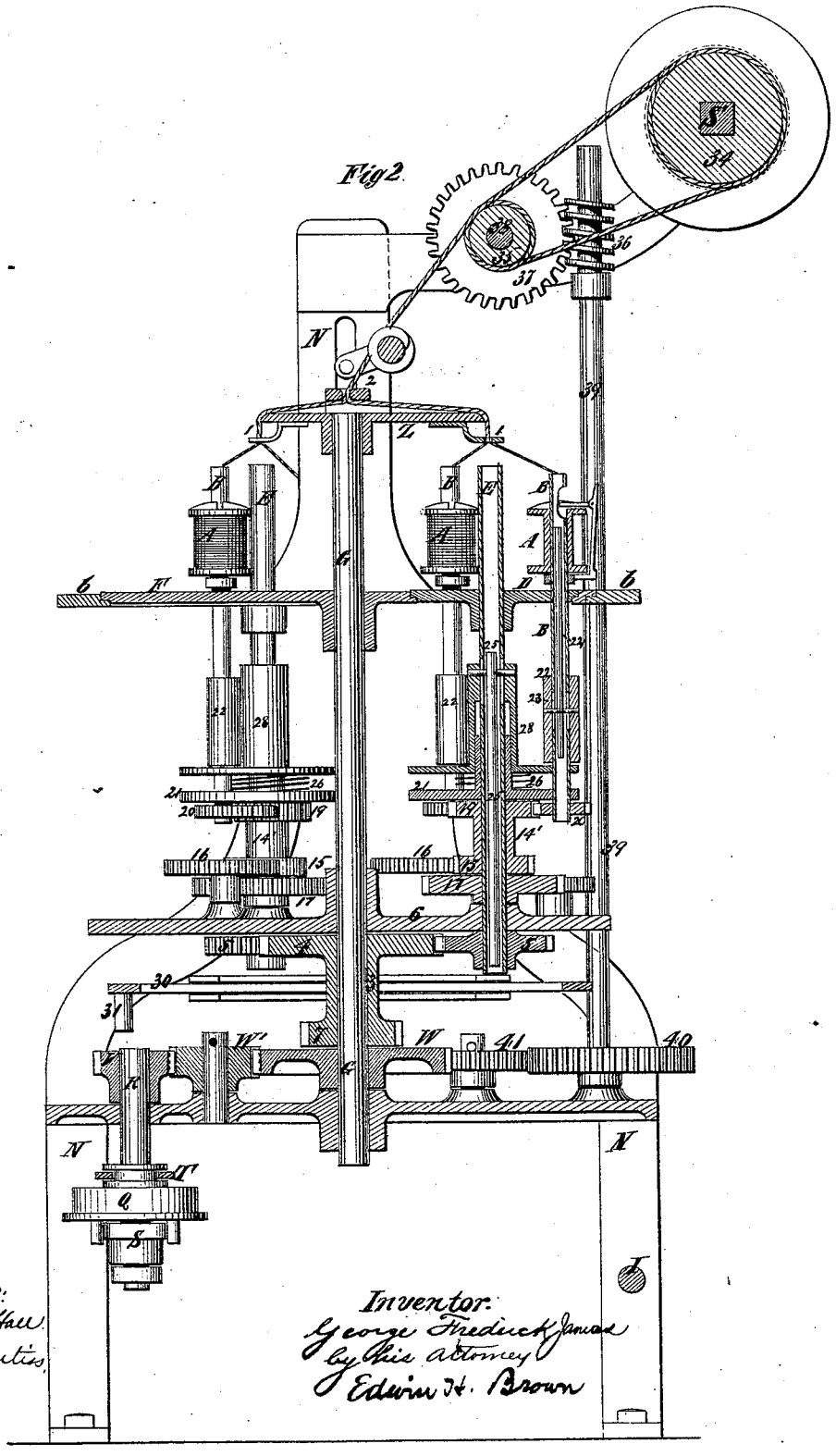
4 Sheets—Sheet 2.

G. F. JAMES.

MACHINERY FOR MAKING CORDS, ROPES, AND BANDS.

No. 251,118. Patented Dec. 20, 1881.

Fig 2.



Witnesses:
Chandlee Hall
Wm Prentiss

Inventor:
George Frederick James
by his attorney
Edwin H. Brown

4 Sheets—Sheet 3.

G. F. JAMES.

MACHINERY FOR MAKING CORDS, ROPES, AND BANDS.

No. 251,118. Patented Dec. 20, 1881.

Fig 3.

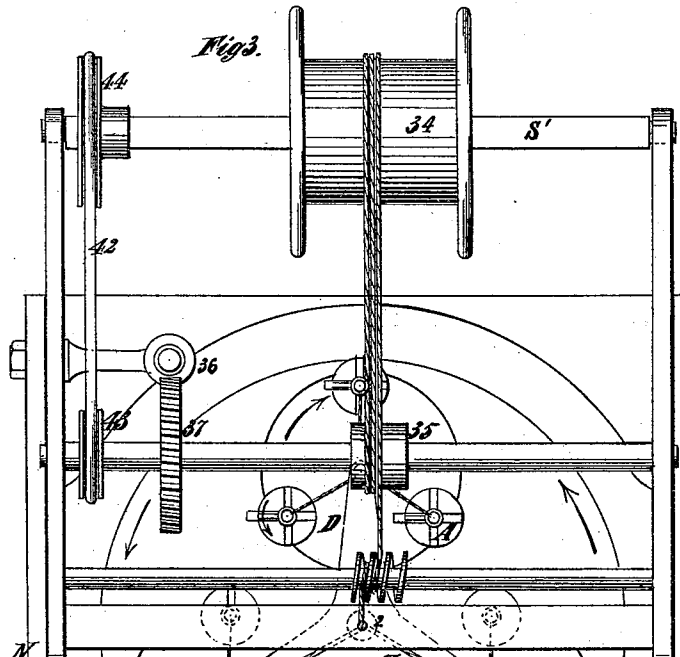
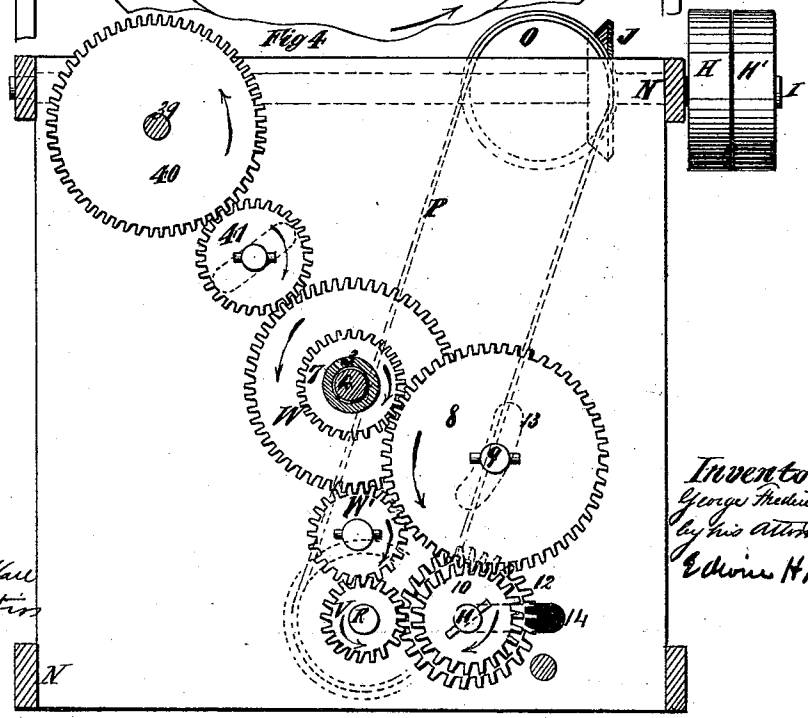


Fig 4.



Witnesses:
Chandler Hall
Owen Prentiss

Inventor
George Frederick James
by his attorney
Edwin H Brown

4 Sheets—Sheet 4.

G. F. JAMES.

MACHINERY FOR MAKING CORDS, ROPES, AND BANDS.

No. 251,118. Patented Dec. 20, 1881.

Fig 5.

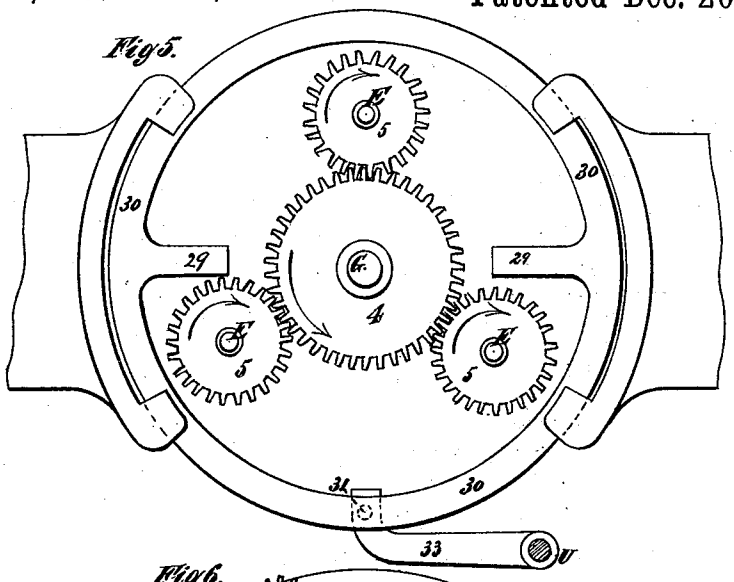


Fig 6.

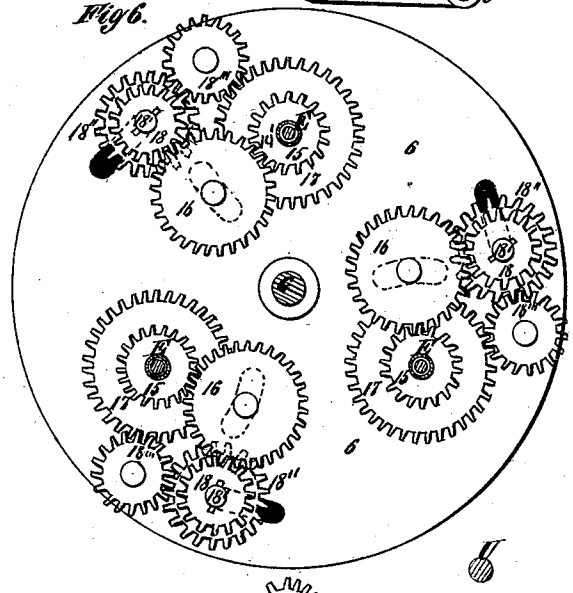
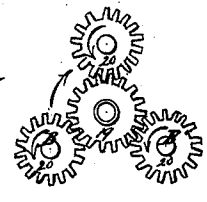


Fig 7.



Witnesses:
Chandler Hall.
Owen Prentiss.

Inventor:
George Frederick James
by his Attorney
Edwin W Brown

UNITED STATES PATENT OFFICE.

GEORGE F. JAMES, OF MANCHESTER, ENGLAND.

MACHINERY FOR MAKING CORDS, ROPES, AND BANDS.

SPECIFICATION forming part of Letters Patent No. 251,118, dated December 20, 1881.

Application filed August 5, 1878. Patented in Belgium May 11, 1878, in England November 20, 1879, and in France July 7, 1880.

To all whom it may concern:

Be it known that I, GEORGE FREDERICK JAMES, of the city of Manchester, England, have invented certain new and useful Improvements in Machinery for Making Cords, Ropes, and Bands, of which the following is a specification.

The object of my invention is to provide a machine more desirable than those heretofore in use for making ropes, cords, or bands, in which the yarns or threads placed in the machine in an untwisted state are first twisted and then laid to form strands, which are themselves laid to form ropes, cords, or bands.

The invention consists in a compact and efficient arrangement of machinery, as specially hereinafter described, for twisting and laying the yarns to form strands and laying the strands to form ropes, cords, or bands at one operation, and for enabling the amount of twist, both in the strands and in the laying, to be varied by positive gearing in a simpler manner than heretofore, each yarn being regulated and maintained at one uniform tension.

It also consists in a novel knocking-off motion or mechanism for stopping the machine upon the breakage of either of the yarns or strands.

In the accompanying drawings, Figure 1 is a front elevation of a machine embodying my invention. Fig. 2 is a sectional side elevation thereof. Fig. 3 is a plan thereof. Fig. 4 is a horizontal section taken on the plane of the dotted line *x x*, Fig. 1. Fig. 5 is a horizontal section taken on the said dotted line *x x*, looking upward. Fig. 6 is a horizontal section on the dotted line *y y*, Fig. 1; and Fig. 7 is a plan of the gearing for twisting the yarn and forming the strands.

Similar letters of reference designate corresponding parts in all the figures.

In carrying out my invention I take a series of bobbins or spools, A, (in this case nine in number,) and after warping the requisite number of yarns thereon, which will vary more or less, according to the desired strength of strands, I place them upon vertical spindles B, provided with fliers C of ordinary or any suitable form. The spindles B have a rotary motion imparted to them in the direction indicated by arrows upon the bobbins, Fig. 3, and thus the necessary twist is put into each of the yarns. These spindles B are arranged in the following manner: They compose three sets of three each, and those of the several sets revolve in bearings in tables D, having a rotary motion around axes E, (hereinafter called the "intermediate axes,") but in the opposite direction to the motion of the spindles, as shown by the arrows, Fig. 3. The three tables D have their bearings in a main table, F, which also has a rotary motion, and is driven by the shaft G. This motion, however, is in the opposite direction to that of the small tables D, being in the same direction as that of the spindles B.

It will thus be seen that the spindles B by their own rotary motion put twist into the yarns as they are drawn off the bobbins A, by rotating around the intermediate axes, E, effect the laying of three of the yarns into one strand, and by the rotation of the entire series around the common center shaft, G, effect the laying of the three strands into one, forming a cord or band of nine yarns or three strands at one operation.

I will now proceed to describe, first, how motion is communicated to the center or main shaft, G; second, how motion is communicated to the intermediate axes, E, with the necessary change motion for obtaining a variation in the amount of hardness in the first laying operation; third, how motion is communicated to the spindles B, with the necessary change motion for varying the amount of twist put into the yarns upon the bobbins A; fourth, how the yarns are maintained at one uniform tension; fifth, the action of the self-stopping or knocking-off motion for throwing off the machine in case of one of the yarns breaking.

Motion is communicated to the center shaft, G, from the fast and loose pulleys H H′ upon the horizontal shaft I. J is a miter-wheel, affixed upon the horizontal shaft I, and gearing with the miter-wheel K upon the vertical shaft L, mounted in the bearing M, attached to the frame N of the machine. O is a pulley upon the vertical shaft L, which, by means of a strap or belt, P, drives the pulley Q, running loose upon the vertical shaft R, mounted in suitable bearings in the frame N. This pulley Q is capable of being secured to the shaft R, so as to impart rotary motion thereto by engaging with a clutch,

S, affixed thereto, and it may be disconnected from the shaft, so as to run free therefrom, by being disengaged from said clutch. A clutch-fork, T, mounted upon the rod U, is provided for operating the pulley for the purpose of driving the shaft R.

V is a spur-pinion, fast upon the end of the shaft R, and through pinion W′ driving the spur-wheel W, secured upon the main shaft G. The lower end of the main shaft G is supported in the lower plate of the frame N, while the main table F, supported in the upper plate, *b*, of said frame acts as the bearing for the upper end of the shaft.

Upon the main shaft G, at or near the top, I mount an eyelet-frame, Z, fitted with eyelets 1, located immediately over the centers of the intermediate axes, E, for guiding the strands as they are formed to an eye, 2, located over the center of the main shaft G, and whereby they are gathered for the final laying operation.

A sleeve, 3, running loose upon the main shaft G and carrying a spur-wheel, 4, gearing with spur-pinions 5 on the ends of the intermediate axes, E, (see Fig. 5,) imparts motion to the latter. These intermediate axes have their bottom bearings in the lower table, 6, which is fast upon and revolves with the main shaft G, while the small tables D, resting in the upper revolving tables, F, serve to carry the upper end of the said axes.

The sleeve 3 is, at its lower end, provided with a spur-pinion, 7, receiving motion from a train of wheels (see particularly Fig. 4) consisting of a spur-wheel, 8, supported upon a stud, 9, gearing with a removable pinion, 10, supported upon a stud, 11, and made fast upon and driven by an under pinion, 12, upon the same stud 11, the latter gearing with the pinion V upon the end of the vertical shaft R, driven as hereinabove described. The stud 9 is set in a slot, 13, concentric to the main shaft G and the stud 11 in a transverse slot, 14, so that the pinion 10 can be readily removed and replaced by another and a proportionate alteration in the speed of the intermediate axes be effected. The result of this combination is that while the intermediate axes are themselves carried or revolved round the main shaft G they are rotated at an accelerated rate of speed and in the opposite direction. The provision for removing the wheel 10 and replacing it by another and adjusting the wheel 8 to gear with the pinion replaced affords a ready and positive means for varying the speed of the intermediate axes, and consequently the degree of hardness of the first laying operation.

Motion is communicated to the several sets of spindles B by a train of wheel-work arranged in connection with each intermediate axis, E, very similar to the last-described arrangement, a plan view of which is illustrated in Fig. 6. A sleeve, 14′, runs loose upon each intermediate axis, E, carrying at its lower end a spur-pinion, 15, gearing through the idle-wheel 16 with the wheel 18, mounted loosely on the stud 18′, and having secured below it another gear-wheel, 18^2, to which motion is imparted through the idle-wheel 18^3 from the wheel 17, mounted rigidly on the intermediate axis, E. Suitable concentric and radial slots are provided in the tables 6, so that the wheels 18 18^2 may be readily changed and the relative speed altered, by which the amount of twist put into the yarns can be adjusted to the greatest nicety. The sleeve 14′ has at its upper end a spur-wheel, 19, gearing with the spur-pinions 20 upon the ends of the spindles B. (See Fig. 7.) By this combination the spindles, while they are carried or revolved round the intermediate axes, E, are rotated in opposite directions, but at a much higher speed. The lower ends of the spindles B are supported in the small tables 21, mounted upon the intermediate axes, E, while their upper ends are carried in the small tables D, as before described.

The yarns upon the bobbins are maintained at one uniform tension by means of the fliers C, notched bobbins, and weights 22. The weights 22 rest upon pins passing through slots 23 in the spindles B from the drop-rods 24 (see Fig. 2) in the hollow spindles B. The yarns are connected with the drop-rods so as to suspend the latter. Hence on a breakage of any yarn the drop-rod suspended thereby will be allowed to drop down in its spindle B. The amount of tension is regulated by the weights 22, and can be varied at pleasure.

In case of one of the yarns breaking, it will be obvious that the weight 22 appertaining to such yarn will drop until the pin supporting it comes to the bottom of the slot 23. This is utilized to stop the machine in the following manner: The intermediate axes or spindles, E, are hollow and provided with drop-rods 25, (see Fig. 2.) secured to the flanged sleeves or tables 28, fitting over and sliding on the hubs of the tables 21 and suspending the drop-rods. When a yarn breaks the weight 22 appertaining to it drops upon the table 28 and, overcoming the spring 26, causes the drop-rod 25 to protrude through the end of the intermediate spindle. As the protruding rod 25 is carried round it strikes against a finger, 29, upon a ring, 30, supported from the main frame N, (see Fig. 5,) and carries said ring round with it. From the ring 30 a stud, 31, projects.

The setting-on rod U is provided with a spring, 32, giving it a tendency to fly upward and pull the pulley Q out of gear with the clutch S.

When the attendant sets on the machine he pushes down the setting-on rod U, so allowing the pulley Q and clutch S to intergear, and places a trigger-finger, 33, branching from the setting-on rod U, under the stud 31, so that if a yarn breaks and the drop-rod of any one of the intermediate axes, E, strikes either of the fingers 29 the stud is carried off the trigger-finger 33, so allowing it to fly upward and draw the clutch S out of gear to stop the machine.

I provide a shaft, S′, and friction-drums 34 and 35 for drawing forward the finished cord at a suitable rate. The drum 35 is represented as mounted upon a shaft, 38, to which motion is imparted from the gear-wheel W, mounted on the main shaft G. The mechanism here shown for this purpose consists of a vertical shaft, 39, driven by means of gear-wheels 40 and 41, from the wheel W, (see Fig. 4,) and provided with a worm, 36, engaging with a worm-wheel, 37, on the shaft 38. A belt, 42, passing over pulleys 43 and 44, serves to transmit motion to the shaft S′.

In conclusion I would remark that although I have only described my improvements as applied to machinery for the manufacture of cotton banding, it should be understood that the same combination of mechanism is equally useful in the manufacture of cords or ropes from hemp or other suitable fibrous material.

I do not confine myself to the number of spindles arranged around the intermediate axes, as more or less than three might be used; also, more or less than three small tables, D, and sets of spindles B might be arranged around the main shaft G, according to the number of yarns and strands required to form the cord, rope, or band.

It will also be obvious that the intermediate axes, E, might themselves constitute the twisting-spindles by carrying bobbins and fliers, and in this latter case a cord of three yarns would be produced, and the small tables D and corresponding spindles, B, would be dispensed with.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with the main shaft G, the shaft R, and two or more rotary intermediate axes, E, revolving about said main shaft, of a sleeve, 3, and gear-wheels 4 and 7, mounted loosely, and a gear-wheel, W, mounted rigidly, on said main shaft, gear-wheels 5, mounted on said intermediate axes, gear-wheels W′ and V, through which motion is imparted to said main shaft from the driving-shaft R, and gear-wheels 12, 10, and 8, through which motion is imparted to said sleeve 3 from said shaft R, whereby the said intermediate axes are driven at a different speed and in a reverse direction to that of the said main shaft, substantially as specified.

2. The combination, with the main shaft G, the shaft R, driving-pulley Q, fitting loosely on the shaft R, and the clutch-piece S, rigidly secured on said shaft R, with which the said pulley may engage, of the tables 28, rotating with said main shaft, the hollow axes E, drop-rods 25, hollow spindles B, supporting bobbins and carried by said axes E, drop-rods 24, suspended by the yarns in each spindle, weights 22, connected to said drop-rods 24, a ring, 30, provided with fingers 29, with which the drop-rods 25 are adapted to engage for the purpose of shifting the same, a pin, 31, projecting from said ring, the rod U, a trigger-finger, 33, extending from the rod U, and the spring 32, the rod U being adapted to control the position of said driving-pulley and to be held down by said pin, substantially as specified, whereby, upon the breaking of one of the yarns or threads, the driving-pulley Q will be disengaged from the driving-shaft R and the machine stopped, as set forth.

3. The combination, with the main shaft G, the shaft R, mounted in fixed bearings, and two or more rotary intermediate axes, E, revolving around said main shaft, of the sleeve 3 and gear-wheels 4 and 7, mounted loosely on said main shaft, gear-wheels 5, mounted on the said intermediate axes, a gear-wheel, 8, a stud, 9, adjustable about said main shaft in the direction of the circumference of said main shaft, a gear-wheel, V, mounted on the shaft R, gear-wheels 10 and 12, and a stud, 11, transversely adjustable, substantially as specified, whereby the speed of the intermediate axes, E, may be varied by changing the wheels 10 and 12 for wheels larger or smaller, as set forth.

GEORGE FREDERICK JAMES.

Witnesses:
JOHN I. ROYLE,
H. WILLIAMS.