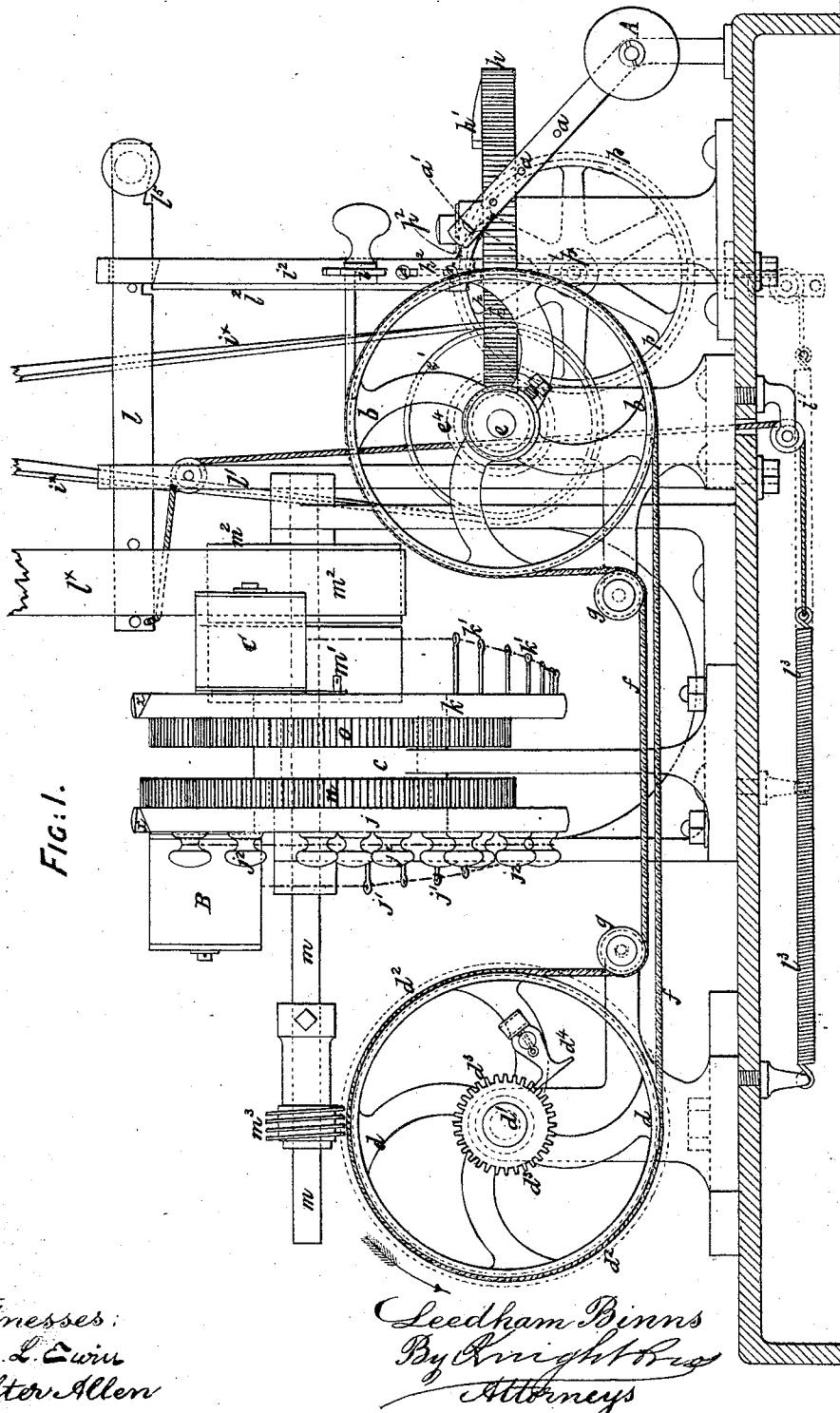


L. BINNS.

Machines for Making Endless Bands.

No. 145,386.

Patented Dec. 9, 1873.



Witnesses:
 Jas. L. Cunn
 Walter Allen

Leedham Binns
By Knight Bage
Attorneys

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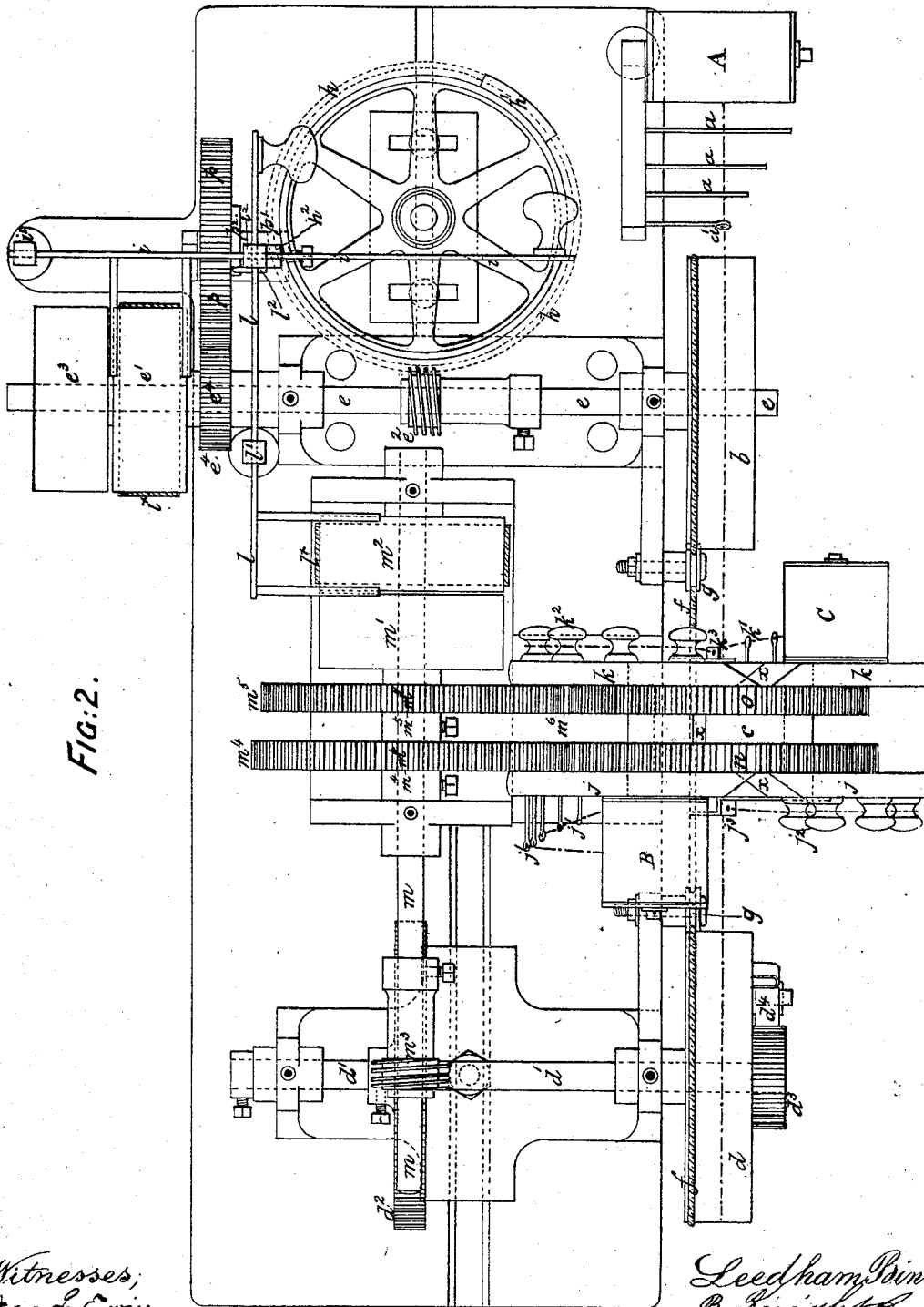


FIG. 2.

Witnesses,
Jas. L. Cwin
Walter Allen

Leedham, Binns,
Bynight Bros
Attorneys

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FIG. 5.

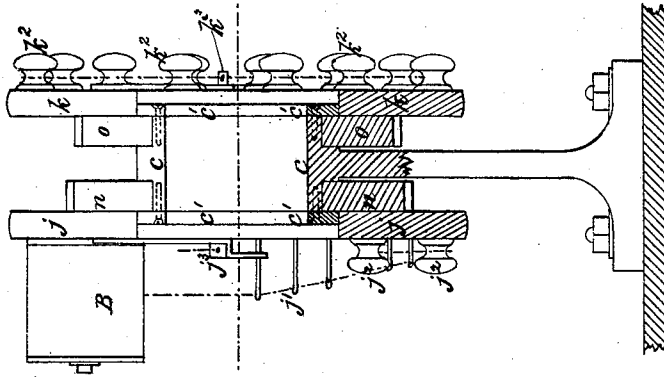
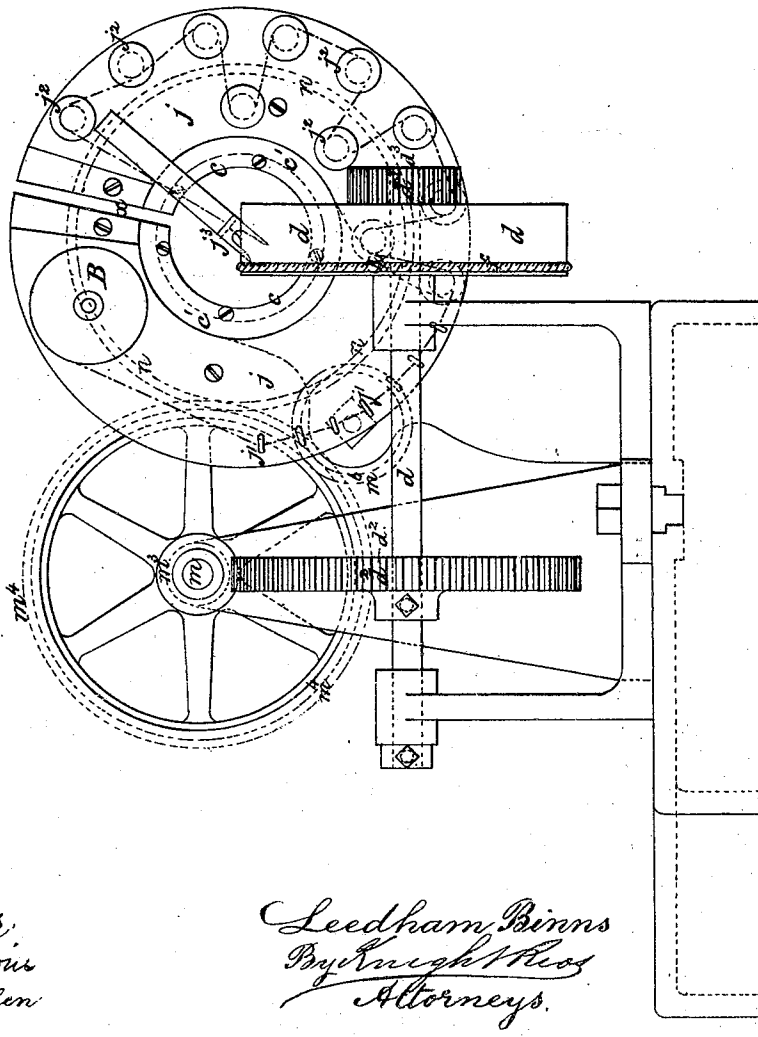


FIG. 3.



Witnesses,
Jas L. Cline
Walter Allen

Leedham Binns
By Knight & Co
Attorneys.

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FIG. 6.

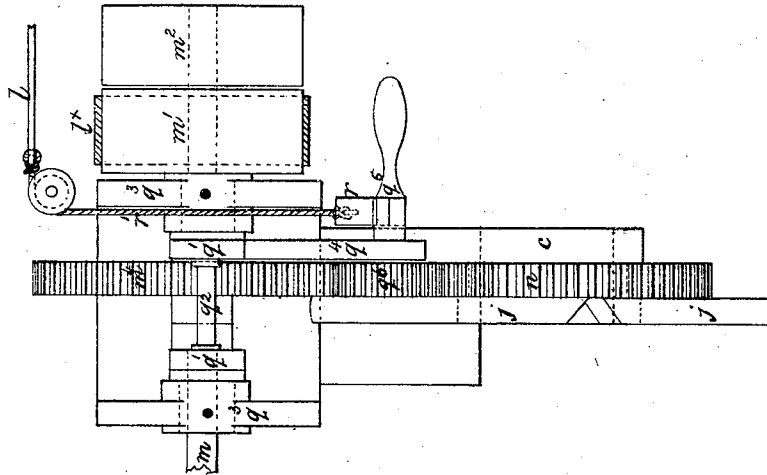
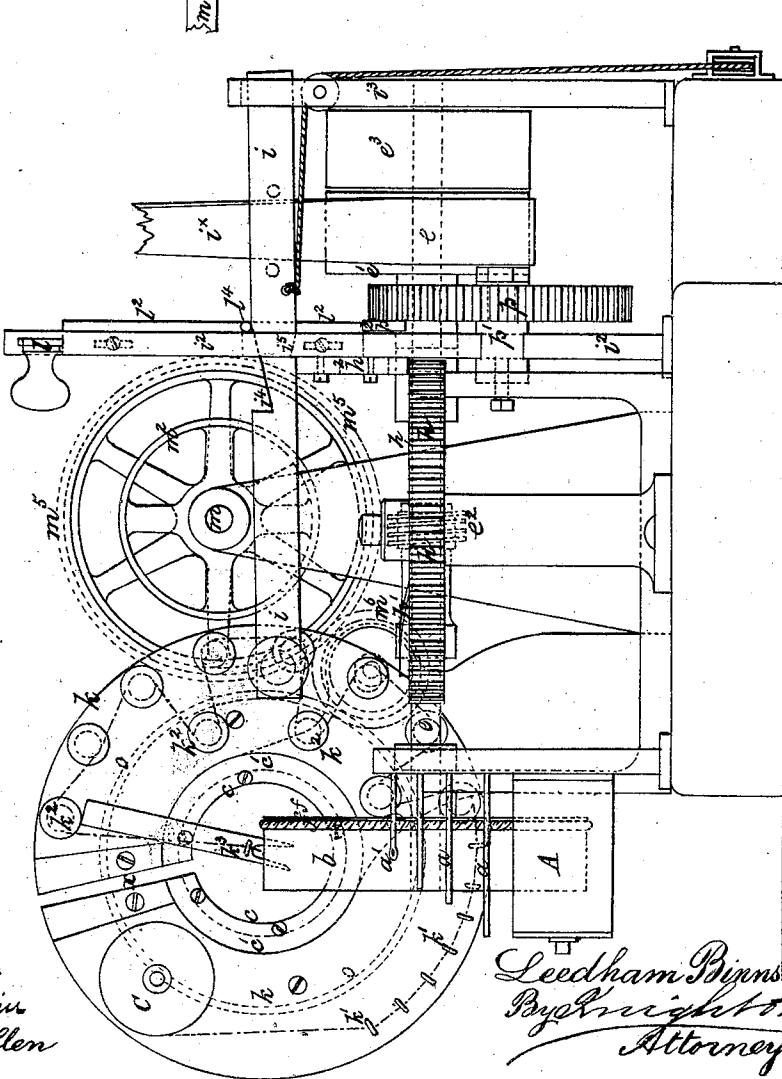


FIG. 4.



Witnesses,
Geo. L. Cunn
Walter Allen

Leedham Binns
Bye Knight Bros
Attorneys.

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FIG. 8.

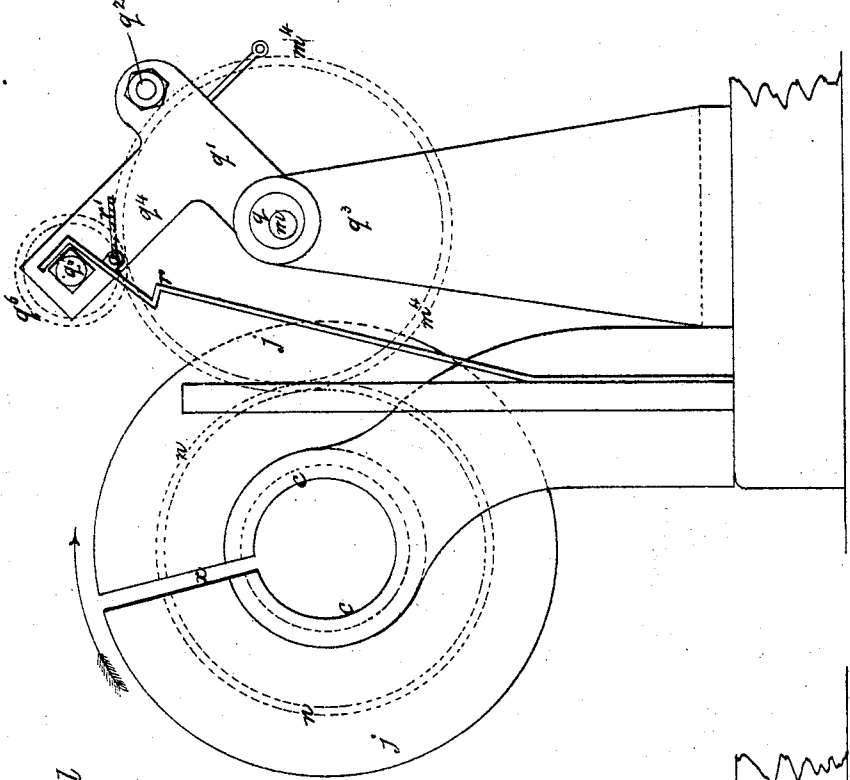
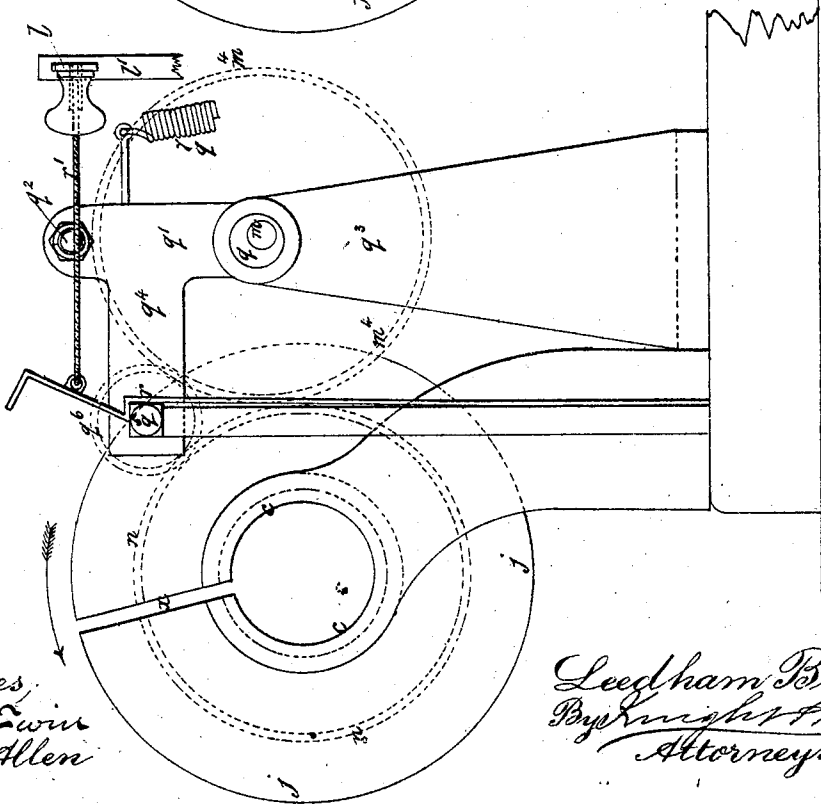


FIG. 7.



Witnesses
Geo. L. Ewin
Walter Allen

Leedham Binns
By *Leedham Binns*
Attorneys.

UNITED STATES PATENT OFFICE

LEEDHAM BINNS, OF OAKENSHAW, NEAR BRADFORD, ENGLAND.

IMPROVEMENT IN MACHINES FOR MAKING ENDLESS BANDS.

Specification forming part of Letters Patent No. **145,386**, dated December 9, 1873; application filed February 23, 1873.

To all whom it may concern:

Be it known that I, LEEDHAM BINNS, of Oakenshaw, near Bradford, in the county of York, England, manufacturer, have invented certain Improvements in the Manufacture of Endless Bands, Cords, or Ropes, and in Machinery or Apparatus to be employed therein, of which the following is a specification:

The invention has for its object improvements in machinery for the manufacture of endless bands, cords, or ropes.

Hitherto endless bands, cords, or ropes have been generally manufactured of india-rubber, gutta-percha cord, or other material cut into lengths, the ends of which have been connected or otherwise fastened together; but, according to my invention, I manufacture endless bands, cords, or ropes complete, without the necessity for connecting the ends thereof together after the separate previous manufacture of the cord, rope, or band. For this purpose I employ yarn-twist cord, wire, or other desired material. Any of these materials I wrap a sufficient number of times around guides or pulleys, with the strands thereof lying close together, until the desired size and strength for the core of the desired endless band, cord, or rope are obtained. I then sever the material forming the core from its source of supply, and I cement the end or ends of the core to the other strands thereof, or I simply pass it or them through such strands or otherwise fasten them off. After the core has been thus formed I connect thereto the ends of one, two, or more strands of material to form the covering of the desired band, cord, or rope, and I wrap, twist, or braid such covering-strands around the core until it arrives at or a little beyond the place or places where the covering material was first applied to the core. The ends are then severed from the source of supply and fastened off in any suitable manner. When using more than one strand of covering material I wrap or twist such strands in contrary directions around the core.

Endless bands, cords, or ropes, according to my invention, may be made by hand, but for the sake of speed, economy, and efficiency, I employ machinery or apparatus arranged in the following manner: I cause the material forming the core to pass from its source of

supply to and around suitable guide wheels or pulleys, one of which is capable of being moved nearer to or farther from the other or others, according to the length required for the endless band, cord, or rope, and I fasten the end or ends of material forming the core so as to form an endless band thereof. I then give rotary motion to these guide wheels or pulleys, so as to draw off the material forming the core from its source of supply, and wrap it a sufficient number of times around the guide wheels or pulleys until the desired size and strength of core are obtained. The motion of the machinery or apparatus is then automatically stopped, and the end or ends of the core fastened off. The covering material is carried by a bobbin or bobbins mounted on a wheel or wheels revolving on a hollow shaft or boss placed between two of the guide wheels or pulleys in such position that the core shall pass through the center of the wheel or wheels carrying the covering material. The covering material has any desired strain put thereon, as will be well understood, and after the end or ends thereof have been connected to the core rotary motion is given to the wheel or wheels carrying the covering material, and to the guide wheels or pulleys carrying the core, so as to cause the covering material to be wrapped or twisted in contrary directions around the core until it arrives at or a little beyond the point where the covering material was first applied, when the motions of the machinery or apparatus are automatically stopped. The end or ends of the covering material are then fastened off, and the finished endless band, cord, or rope removed from the machine, for which purpose I form the hollow boss or shaft of the wheel or wheels carrying the covering material, as also such wheel or wheels, with a split or opening therein, or I form such wheel or wheels in two parts, capable of being readily connected with or disconnected from each other. Each strand of the covering material may be wrapped or twisted more than once along the entire length of the endless band, cord, or rope, and when using more than one strand of covering material they may be simultaneously wrapped or twisted around the core in opposite directions to each other, or one or more strands may be first wrapped or

twisted around the core in one direction, and afterward one or more strands may be wrapped or twisted around the core in the opposite direction. In the former case I use two wheels to carry the bobbins of covering material, and they receive simultaneous rotary motion in contrary directions to each other, while in the latter case only one of such wheels would be required, which would first be caused to rotate in one direction, and after it had wrapped or twisted the covering material around the core in the one direction, it would then be caused to rotate in the contrary direction, to wrap or twist the covering material in such direction around the first covering material.

A guide is fixed to the wheel or wheels carrying the covering material, for the purpose of giving support to the core at the point where the covering material is wrapped or twisted around it.

If desired, instead of wrapping or twisting the covering material around the core, it may be braided or plaited around it by mechanism of a similar construction to that employed in covering certain descriptions of window-cord. By employing different proportions of gearing the covering material may be wrapped, twisted, plaited, or braided around the core, in a more or less open or close manner, as may be desired; and in order that my said invention may be more clearly understood and readily carried into effect, I will proceed, aided by the accompanying drawings, more fully to describe the same.

Figure 1 is a front view, Fig. 2 is a plan, Figs. 3 and 4 are opposite end views, and Fig. 5 is a sectional view, of machinery or apparatus constructed according to my invention. Fig. 6 is a plan, and Figs. 7 and 8 are elevations, showing a modification of part of my invention.

In the manufacture of endless bands, cords, or ropes, according to my invention, I employ any description of material suitable to the particular use to which the endless band, cord, or rope is to be applied. For the core, I use a material capable of resisting the strain which the endless band, cord, or rope may be required to bear, while for the covering I employ a material capable of resisting the wear and friction to which the endless band, cord, or rope may be subjected. In describing the accompanying drawings, I have supposed the core of an endless band, cord, or rope to be made of No. 2 single cotton, wound upon a reel or bobbin, A, while the covering thereof is supposed to be made of twenty-fold 20 cotton cord, wound upon the bobbins B C. If desired, however, instead of employing No. 2 single cotton, wound upon the reel or bobbin A, for the core, such material may be supplied to the machines from one or a number of cops or pins, mounted upon any suitable standard, as will be well understood.

In any case, however, it must be understood that I form the core and covering of the endless band, cord, or rope of material fine enough to prevent the ends thereof forming any ap-

preciable difference in the size of the endless band, cord, or rope where they occur.

In forming an endless band, cord, or rope by the machinery shown in the drawings, I take the end of the yarn or thread from the reel or bobbin A, and pass it between the pins *a a* and through the eye *a'*, to put suitable strain thereon. If desired, the pins *a* may have threaded thereon felt or cloth washers, between which the thread or yarn from the bobbin or reel A may be passed to put extra friction thereon, as will be well understood. From the eye *a'* the end of the thread or yarn to form the core is taken over the guide wheel or pulley *b*; thence through the hole in the boss or bearing *c* to the guide wheel or pulley *d*, partly around which it is passed, and then returns to the guide wheel or pulley *b*, after which it is connected to another part of the same yarn or thread, so as to form an endless band thereof around the two guide wheels or pulleys *b* and *d*. Rotary motion is then communicated to the guide wheels or pulleys *b d* in the following manner, to cause a sufficient quantity of thread or yarn to form the core to be drawn off from the reel or bobbin A, and to be wrapped around the guide wheels or pulleys *b d*. A strap or band, from a suitable driving-shaft, passes around the driving-pulley *e'*, fixed on the shaft or axis *e*, and thereby gives motion to such shaft or axis *e*, and consequently to the guide wheel or pulley *b*, which, by means of a band or cord, *f*, communicates rotary motion to the guide wheel or pulley *d*. The band or cord *f* is passed partly around guide-wheels *g*, so as to escape the boss or bearing *c*, and the wheels and disks mounted thereon. In some cases, however, I find it desirable to communicate motion from one guide-wheel, *b* or *d*, to the other by means of suitable toothed gearing, as will be well understood.

In order that the machinery or apparatus shall automatically stop when the required amount of material has been wrapped around the guide wheels or pulleys *b d* to form the core of the intended endless band, cord, or rope, I fix on the shaft or axis *e* a worm or screw, *e'*, which takes into and gives rotary motion to the worm-wheel *h*. On this worm-wheel *h* is fixed a cam or incline, *h'*, which, at the required time, raises a bar, *h''*, and thereby lifts the fork-bar *i*, so as to permit it, by the action of the spring *i'*, to slide in its bearings in the uprights *i'' i'''*, and thereby shift the driving strap or band *i''* from the driving-pulley *e'* to the loose pulley *e''*, and thereby stop the motion of the machine. The end of the yarn or thread from the bobbin A, or from other source of supply, is then fastened off in any suitable manner; or it may be simply passed through the bulk of yarn or thread forming the core; or in some cases it will retain its position by simple contact with the bulk of the core.

The ends of thread or other material to form the covering of the endless band, cord, or rope are then taken from the bobbins or reels B C,

and passed through the eyes $j^1 k^1$, fixed on the disks $j k$, and thence around the knobs or buttons $j^2 k^2$, according to the strain desired to be put on the covering material. From the last of these knobs or buttons $j^2 k^2$ the covering material is passed through eyes in the guides $j^3 k^3$, and is then fastened to the core of the intended endless band, cord, or rope. When this is effected the fork-bar l is, by hand, slid in its bearings in the uprights $i^2 l^1$, so as to shift the driving-strap l^x onto the driving-pulley m^1 , fixed on the shaft or axis m . On this shaft or axis m is also fixed a worm or screw, m^3 , which takes into and gives a slow rotary motion to the toothed wheel d^2 , fixed on the shaft or axis d^1 , on which shaft is also fixed a toothed or ratchet wheel, d^3 .

The motion of the shaft or axis d^1 is communicated to the guide wheel or pulley d when the covering is being applied to the endless band, cord, or rope by the ratchet-wheel d^3 pushing against the driver d^4 , fixed to the wheel d ; but when the core is being formed around the guide-wheels b and d , motion is communicated to the wheel d by the band f , and the driver d^4 then simply slips over the ratchet-wheel d^3 without communicating any motion to the shaft or axis d^1 .

It will thus be seen that, when the core is being formed around the wheels $b d$, a comparatively fast speed is given to such wheels by the strap i^x acting upon the driving-wheel e^1 , and thereby giving direct motion to the wheel b ; but when the core is completed, and the covering is being applied to the endless band, cord, or rope, a slower speed is given to the wheels $b d$ by the driving-band l^x acting upon the driving-wheel m^1 , and, through the intervention of the worm or screw m^3 , giving a slow rotary motion to the shaft or axis d^1 , and, therefore, as before described, to the wheel d . On the shaft or axis m are also fixed toothed wheels $m^4 m^5$. The wheel m^4 gears directly with and gives rotary motion to the toothed wheel n , to which the disk j is fixed, and the toothed wheel m^5 , by means of an intermediate pinion, m^6 , gives rotary motion to the toothed wheel o , to which the disk k is fixed, but in a contrary direction to that of the toothed wheel n and disk j . Thus the covering material from the bobbin or reel B is wrapped around the core in one direction, and that from the bobbin or reel C is wrapped around the core in the contrary direction. The toothed wheels $n o$ are mounted on the boss or bearing e , and the disks $j k$ are respectively screwed or otherwise fixed to the wheels $n o$. Collars c^1 screwed to the boss or bearing e are employed to retain the wheels $n o$ securely in position on the boss e , as shown more clearly at Fig. 5.

In order that the motions of the machinery or apparatus may be automatically stopped as soon as the covering material has been completely applied around the core, I fix on the shaft or axis e a toothed pinion, e^4 , which takes into and gives rotary motion to the toothed wheel p , which is mounted on a stud, p^1 , which

is fixed with capability of being shifted in position on the upright i^2 , for the purpose hereafter explained. On the side of the toothed wheel p is fixed a cam or incline, p^2 , which, at the required time, acts to raise a slide, l^2 , the upper end of which will lift the fork-bar l in its bearings, and permit it, by the action of a spring, l^3 , to be slid in its bearings, so as to shift the driving-strap l^x from the fast pulley m^1 to the loose pulley m^2 , and thereby stop the motions of the machine. The fork-bars i and l are provided with notches i^5 and l^5 , to hold them in position when either of the driving-straps $i^x l^x$ is acting upon its respective driving-pulley $e^1 m^1$.

In order that the slide l^2 may not be moved up and down at every revolution of the toothed wheel p when the core is being formed around the guide-wheels $b d$, I cause the slide l^2 to be lifted above the line of action of the cam p^2 by means of an inclined notch or recess, i^4 , in the fork-bar i acting on a stud or pin, l^4 , fixed in the slide l^2 . This arrangement has also the effect of preventing the possibility of the two driving-straps $i^x l^x$ acting simultaneously on the driving-pulleys $e^1 m^1$. When the covering material is being applied to the core of the endless band, cord, or rope, the fork-bar i being moved to the right hand, causes the deep part of the inclined notch i^4 to come underneath the stud or pin l^4 , and thereby permits the slide l^2 to fall into position to be acted upon by the cam p^2 , the fork-bar l being then capable of being slid to the left hand, and of being retained in that position until the cam p^2 , by means of the slide l^2 , lifts it in its bearings, and raises the notch l^5 therein above or on a level with the bearing in the upright i^2 , when the fork-bar l will be moved in its bearings, as before described, by the spring l^3 . The guides $j^3 k^3$, at their forked ends, serve to give support to the endless band, cord, or rope during the wrapping of the covering material around it, the endless band, cord, or rope passing between the two parts of such forked ends.

By varying the proportions of the screw e^2 and wheel h the thickness or number of strands of the core can be regulated, and, by varying the proportions of the pinion e^4 and toothed wheel p , the number of times the covering material is caused to travel around the entire extent of the endless band, cord, or rope may be adjusted, while, by varying the proportions of the screw m^3 and wheel d^2 , the "pitch" of the covering material may be adjusted as desired.

Figs. 6, 7, and 8 represent modifications of the mechanism, whereby, instead of wrapping the two threads or strands of covering material simultaneously around the core by means of the two disks $j k$ and wheels $n o$, as before described, only one of such disks and wheels may be employed, as shown at Figs. 6, 7, 8, in which case the disk j is caused, as hereafter described, first, to revolve in the direction of the arrow in Fig. 8, to wrap the first

covering material around the core in one direction, and then to revolve in the direction of the arrow shown at Fig. 7, to wrap the second covering material around the core and around the first covering material. For this purpose the shaft or axis m is mounted eccentrically in bosses q formed at the ends of arms q^1 , which are connected together by the cross bar or rod q^2 , such bosses q being mounted in the upper ends of the standards q^3 . One of the arms q^1 has connected thereto another arm, q^4 , in which a stud, q^5 , is fixed, and on such stud the pinion q^6 is mounted. The stud q^5 is prolonged on one side, so as to form a handle, by which the pinion q^6 can be readily brought into gear with the wheels m^4 and n .

The operation of this arrangement is as follows: When the core has been completed, and it is desired to wrap the first covering material around it, the wheel m^4 gears directly with the wheel n , and the pinion q^6 is thrown out of gear with the wheel m^4 , as shown at Fig. 8; but when it is desired to apply the second covering material, the handle q^5 is acted upon by the attendant to bring the pinion q^6 into gear with both wheels m^4 and n , which operation at the same time, by means of the eccentric-bearings of the axis m in the bosses q , carries the wheel m^4 out of gear with the wheel n , a spring-catch, r , being employed to act upon the stud q^5 , and retain the parts in this position until the second covering material has been completely applied to the endless band, cord, or rope, when, by the sliding of the fork-bar l toward the right hand, to shift the driving-strap l^x from the fast pulley m^1 to the loose pulley m^2 , the cord r^1 pulls the catch r away from the stud q^5 , when a spring, q^7 , acts to pull the arms q^1 and q^4 , and therefore the pinion q^6 and wheel m^4 , into the position shown at Fig. 8, in readiness for applying the first covering material to the next endless band, cord, or rope to be made. I would here remark that other modes of causing the direction of motion of the disk j to be reversed, may be adopted.

When the covering material has been completely applied to the core, I sever the ends thereof from that on the bobbins or reels B C, and pass them through the body of the endless band, cord, or rope, a sufficient number of times to prevent the possibility of the ends becoming loose and the covering material unwinding or separating from the core, or I fasten such ends by the aid of any suitable cementing material.

When the endless band, cord, or rope is completed, it is slipped off the guide wheels or pulleys b and d , and is removed from the center of the boss c , disks j and k , and wheels m^4 and m^5 , by passing it through the slots or openings x , formed therein, as shown in the drawings. Instead, however, of forming such wheels and disks with openings, as shown, such wheels and disks may be formed in two parts, one part of which will be fixed, while the other part may be connected thereto by a hinge or pin joint upon which it is capable of turning to permit of the

removal of the endless band, cord, or rope from the interior thereof, or such movable part may be capable of sliding in or upon guides fixed or formed on the fixed portion, suitable catches or fastenings being employed in any case to retain the movable part in position for work.

The length of the endless band, cord, or rope to be made in the machine may be varied by moving the guide wheel or pulley d and parts connected therewith farther away from the guide wheel or pulley b , or by having an extra guide wheel or pulley below the disks j and k , capable of being raised or lowered according to the length of endless band, cord, or rope desired to be produced.

On commencing to form the core of the intended endless band, cord, or rope, care must be taken that the wheel h is placed in the proper position, with the back of its cam or incline h^1 against the lower end of the slide h^2 , and that the wheel p be placed with the back of its cam or incline p^2 against the slide p^1 , in order that the required quantity of material may be regularly employed in the manufacture of the endless bands, cords, or ropes made in the machine, thereby insuring all the endless bands, cords, or ropes being exactly alike.

It will be readily understood that the covering material, instead of being supplied from the bobbins or reels B C, mounted on pins or studs fixed in the disks j and k , may be supplied from any desired number of bobbins or reels, carried and operated in a similar manner to a braiding or plaiting machine, so as to braid or plait the covering material around the core, the parts carrying the spindles, pipes, and tumblers, as also the central boss or tube, being divided and hinged together, to permit of the withdrawal of the finished band from the machine; but I have not thought it necessary to further describe such modification of my invention, as such will be well understood by a competent mechanic.

It will, however, be understood, that when adopting this mode of covering the core, that part of the core to which the covering material is being applied will run in a vertical direction, to suit the direction in which the threads run from the braiding-machine.

I do not claim, in this application, an endless band, cord, or rope, made as described, as a product, said product being claimed by me in another application for Letters Patent; but

What I do claim herein, and desire to secure by Letters Patent, is—

1. In a machine for the manufacture of endless bands, cords, or ropes, the combination of the guide wheels or pulleys b and d , and disks j and k , and parts carried thereby, or their equivalents, arranged and operated in manner substantially as shown and described.

2. The combination of the disks j and k , wheels n and o , with slots or openings therein, or with pieces capable of removal therefrom, and the

boss *c* with a slot or opening therein, in the manner and for the purpose substantially as herein shown and described.

3. In a machine for the manufacture of endless bands, cords, &c., the open slotted tube or boss *c*, in combination with the open, slotted, spool-carrying disk, the latter acting

to wind the thread carried by the spool about the material passing through the tube or boss, substantially as described.

LEEDHAM BINNS.

Witnesses:

FREDK. HARRIS,
B. J. B. MILLS.