No. 5,378. PATENTED NOV. 27, 1847.

G. H. DODGE.

MACHINE FOR SPINNING AND WINDING YARN.

5 SHEETS—SHEET 1.

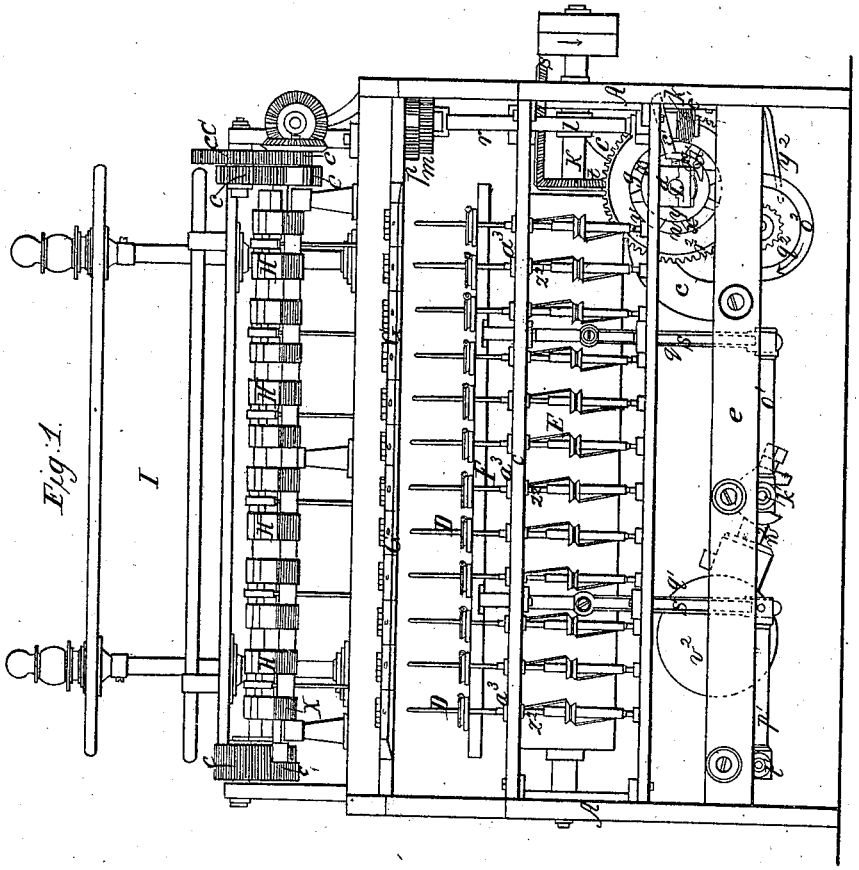

Fig. 1.

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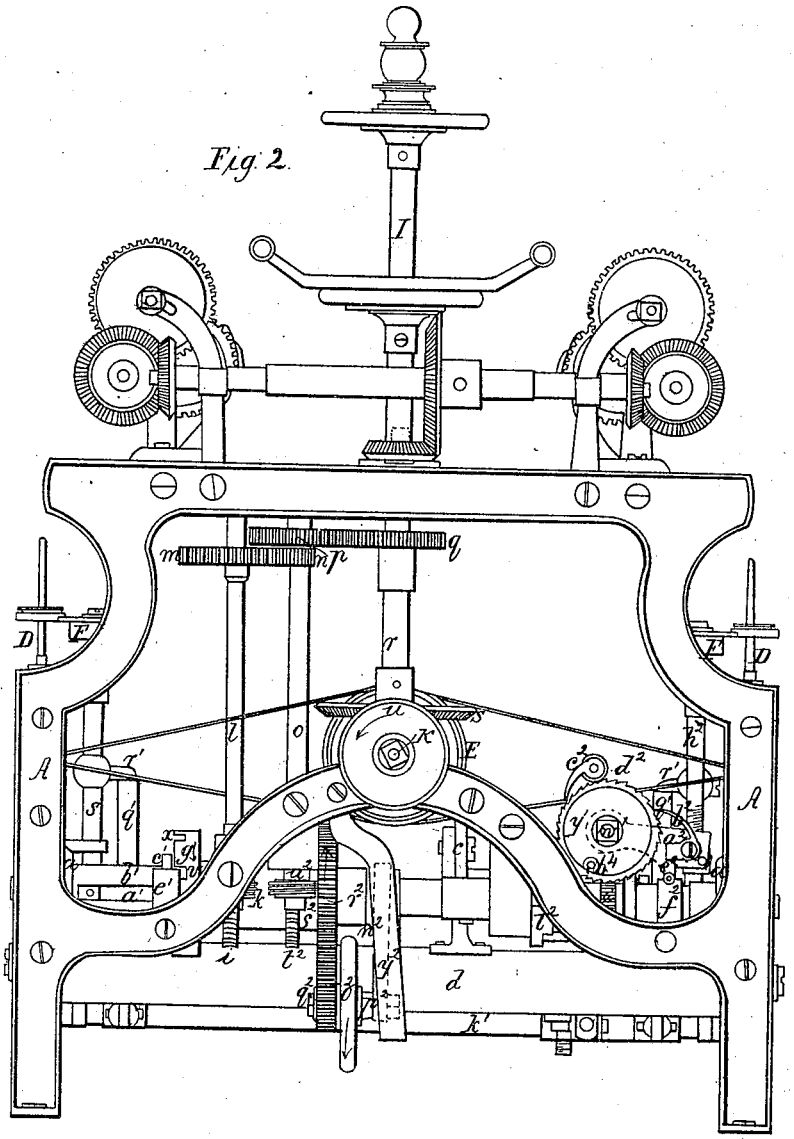
5 SHEETS—SHEET 2.

Fig. 2.



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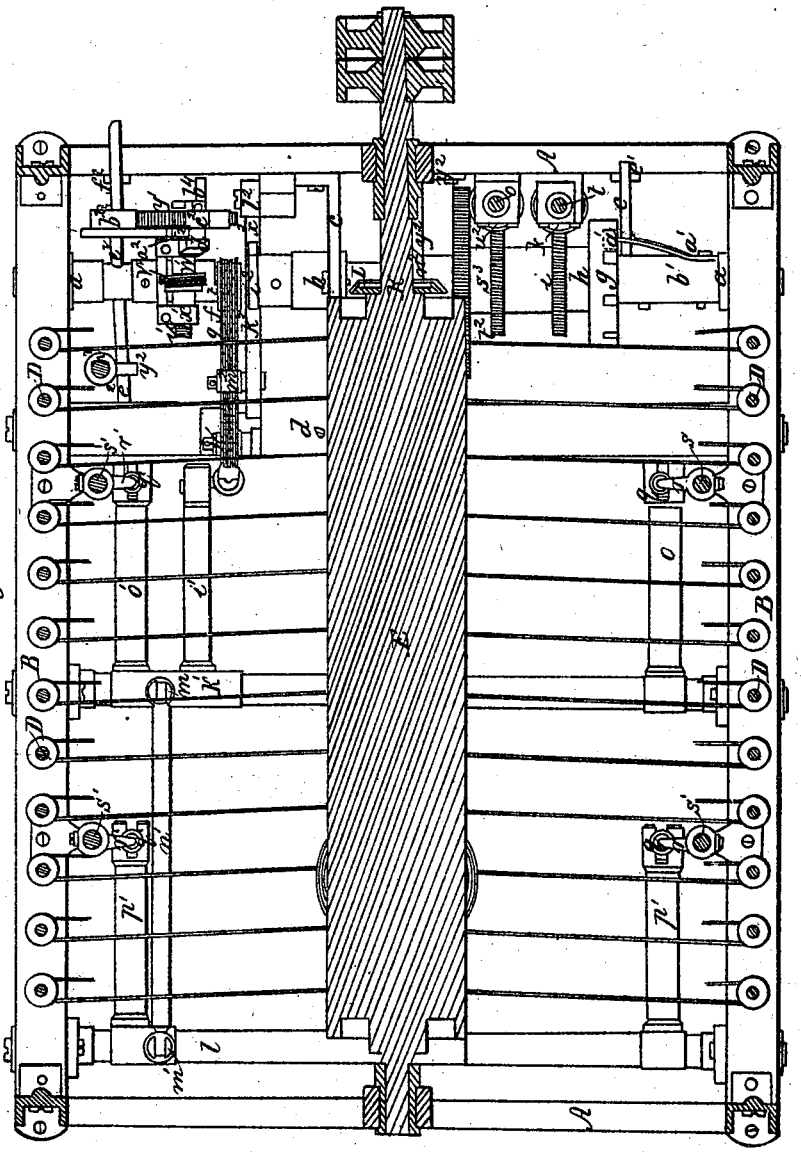
5 SHEETS—SHEET 3

Fig. 3.



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5 SHEETS—SHEET 4.

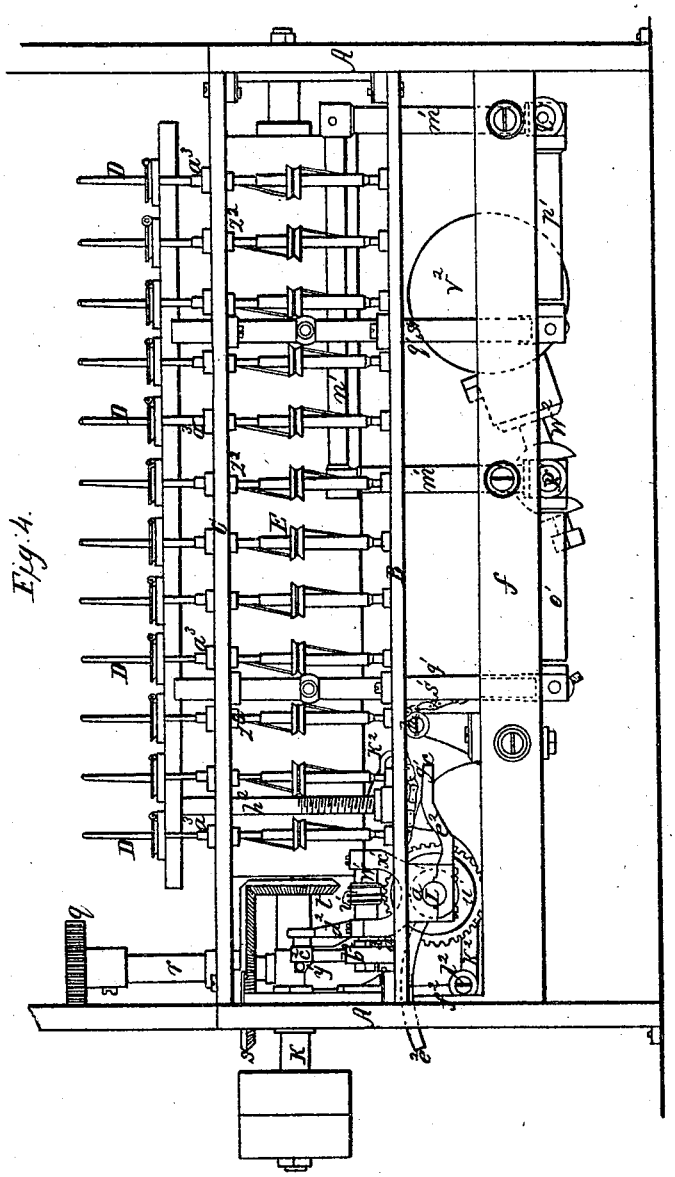

Fig. 4.

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5 SHEETS—SHEET 5.

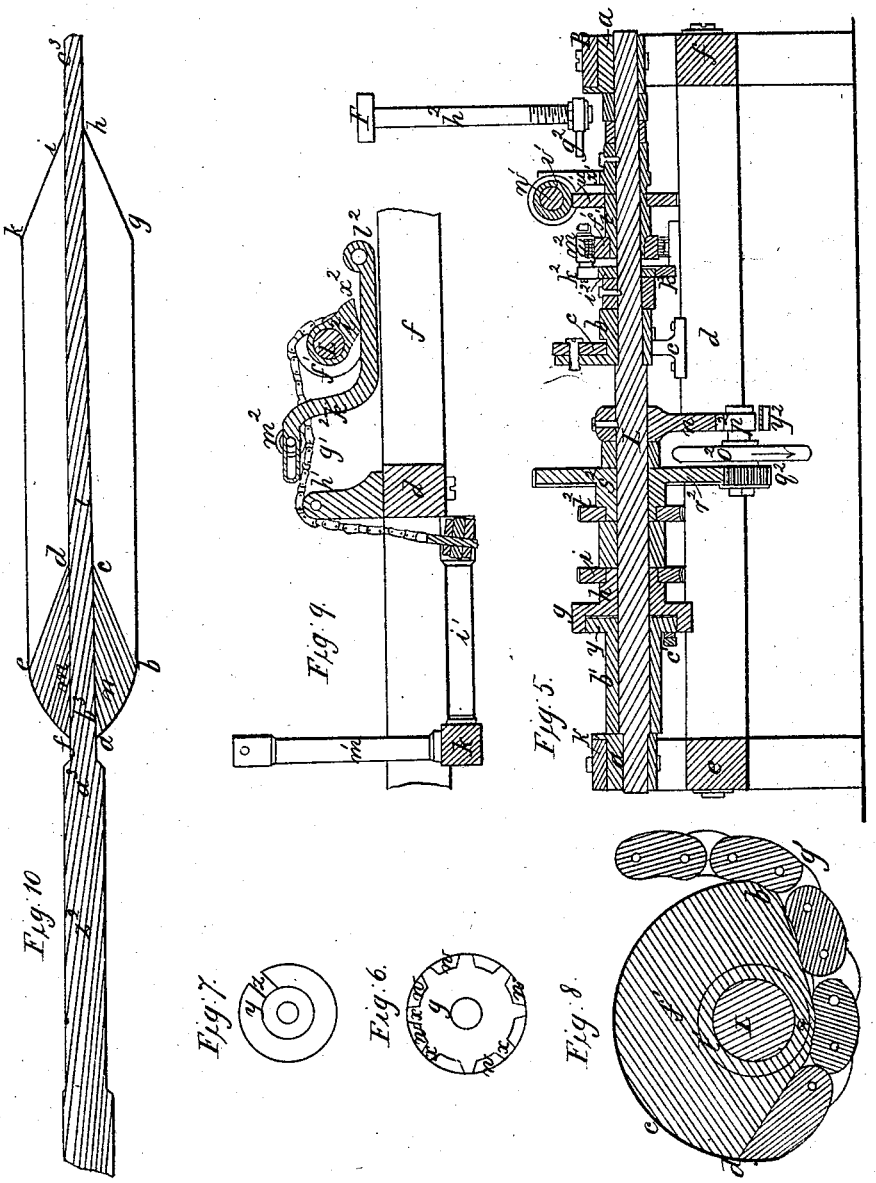

Fig. 10

Fig. 9.

Fig. 5.

Fig. 7.

Fig. 6.

Fig. 8.

UNITED STATES PATENT OFFICE.

GEORGE H. DODGE, OF ATTLEBORO, MASSACHUSETTS.

SPINNING MACHINERY.

Specification of Letters Patent No. 5,378, dated November 27, 1847.

To all whom it may concern:

Be it known that I, GEORGE H. DODGE, of Attleboro, in the county of Briston and State of Massachusetts, have invented certain new and useful Improvements in Machinery for Spinning and Winding Yarn; and I do hereby declare that the same are fully described and represented in the following specification and accompanying drawings, letters, figures, and references thereof.

The peculiar object of my said improvements which are applied to a throttle spinning frame, is to wind the yarn, as fast as twisted, or when properly twisted upon each of the spindles in a regular or proper shaped cop, which shall have a binding thread, between each two adjacent layers of yarn, in order to prevent the cop, from falling apart when removed, or while being removed from the spindle.

Of the aforementioned drawings, Figure 1, exhibits a front elevation of a throttle frame, having my improvements applied to it. Fig. 2 is a right hand end elevation of the same. Fig. 3, is a horizontal section, taken through the axis of the main drum, which drives the spindles the scroll shaft, and other parts below the plane of the section being represented in top view. Fig. 4 is a rear elevation of the frame, with the exception of those parts of the mechanism, which are situated above the tops of the spindles, and which are like those in common use in throttle frames. Fig. 5, is a vertical section of the scroll shaft and parts connected with it. Such other figures as may be necessary to a full description and delineation of my improvements will be hereinafter referred to and described.

In several of said figures A, A, denotes the cast iron ends of a throttle frame.

B, B, are the step rails of the spindles.

C, C, the upper bearing rails of the spindles.

D, D, D, &c., are the spindles.

E the main drum by which they are driven.

F on each side of the frame is the copping or ring rail.

G, G, &c., are the guides to the threads, in their passage from the front pair of drawing rollers to the spindles.

H is a series of drawing rollers, such as are in use in other throttle frames.

I is the bobbin frame or creel.

K is the main driving shaft, from which the drawing rollers and other parts receive their motions.

L is what I term the scroll shaft. It is situated beneath the main shaft, and extends transversely across the machine, and revolves in bearings, *a*, *a*, fastened to the step rails B, B. It is also supported by and revolves in a third box or bearing *b*, secured to a sustaining bar *c*, whose ends are respectively fastened to one end A, of the main frame, and a transverse beam *d*, extending from one lower girt *e*, on one side of the frame to the other (*f*) on the other side thereof, as seen in the drawings. The said scroll shaft has a reciprocating partial rotary motion imparted to it, it being made to move first in one direction, viz forward, with a slow motion, and next in the other direction or backward, with a much faster one.

The mechanism by which the forward motion of the scroll shaft is obtained is as follows: A dog or clutch wheel *g* is fixed upon a hollow shaft *h*, made to run loosely upon the scroll shaft, in the position as seen in Figs. 3 and 5. The said shaft *h*, has a worm gear *i*, fixed upon it, which is made to engage with an endless screw or worm *k*, attached to the lower end of a vertical shaft *l*, supported by and made to revolve in suitable bearings. On the upper part of the said shaft *l*, is a spur gear *m*, which is made to engage with and is turned by a pinion *n*, fixed on another vertical shaft *o* see Fig. 2. The said shaft *o*, turns in proper bearings and has a spur gear *p*, fixed upon it which (gear) is made to engage with a spur gear *q*, fixed upon a third vertical shaft *r*, put in motion by two beveled wheels *s*, *t*, the former of which is placed upon it, and the latter upon the main driving shaft K. Consequently when the main shaft is put in revolution in the direction denoted by the arrow *u*, in Fig. 2, motion will be given to the clutch or dog wheel *g*, in the direction denoted by the arrow *v* thereon.

The clutch or dog wheel *g*, consists of a circular plate, having a series of projections *w*, *w*, &c., or wide teeth arranged in a circle upon one side, and near the periphery of it. These projections are disposed at equal distances apart or have spaces *x*, *x*, between them as seen in Fig. 6, which is a side elevation of the dog wheel, as removed from the scroll shaft. The teeth *w*, *w*, &c., pro-

ject over the periphery of a circular plate y, which is fixed upon a hollow tube b', screwed to the scroll shaft, and has a recess z, cut or made in it (as seen in Fig. 7, which is a side view of the plate y) for the reception of a spring dog a', the spring of which is secured to the hollow tube or hub b'. A bent lever c' (of the shape seen in Fig. 1,) is made to turn upon a screw pin or fulcrum d', inserted in the face or side of the plate y. The said lever should be so curved as to rest against the spring of the dog a', and when its outer end is elevated to press against the spring of the dog, and move it and the dog inward, or out of one of the spaces x of the dog wheel and into its recess z. A stud or standard e', is fixed to the side of the frame, for the lever c' to rest on.

From the above it will be seen that while the dog remains, in any one of the spaces x, x, &c., of the dog wheel, the said dog wheel will be so clutched to the scroll shaft as to put the shaft in motion when it (the dog wheel) is rotated. When so put in motion the shaft will continue to move until the lever c', is so borne against the stud e', as to press the spring dog inward, and out of the space x, in which it may happen to be. The scroll shaft will be then unclutched from the dog wheel, and left free to move in an opposite direction, which it will do (as will be hereinafter described) and will drag the spring dog around with it, until it meets the succeeding notch x, and springs into it, and by so doing again clutches the dog wheel to the scroll shaft.

Having thus premised, I shall now proceed to describe my improvements in mechanism, by which the bottom part of a cop is formed on each spindle and the whole cop gradually built up or completed with a binding thread between each two consecutive layers of yarn wound on said cop and making part thereof. On the scroll shaft is a cam or scroll f' formed as represented in section on an enlarged scale in Fig. 8, and made to move freely and loosely on the shaft. This cam has a chain g' attached to it, as seen in the said figure and in Fig. 3. The said chain is carried horizontally over a guide pulley h', and thence downward and is connected to an arm i', which projects from a horizontal transverse rocker shaft k'. There is also another and similar transverse rocker shaft l', arranged parallel to the shaft k', and in other respects as seen in the drawings. From each of said shafts k', l', an arm m' extends upward, and is jointed to a horizontal connecting rod n'. Each of said shafts has also two other arms o', o', or p', p', extending from it as seen in Fig. 3. To each of these last mentioned arms one of four vertical rods q', q', q', q', is jointed. Each ring rail F is indirectly supported on two of the rods q', q',—that is to say, small studs or projections r', r', from its vertical guide rods s', s', rest upon the tops of said rods.

From the above it will be seen that when the chain g', is drawn forward, or in a direction toward the right hand end of the main frame, each ring rail will be raised upward. So when the chain is suffered to move backward, that is in an opposite direction, the ring rails will be left free to fall down by their own weight, or any power made to depress them. The cam or scroll f', is fixed upon a hollow or tubular shaft t', which revolves freely on the scroll shaft L. A worm gear u', is fixed on the said tubular shaft t', and engages with an endless screw or worm v', fixed on a shaft w', which revolves in bearings in the tops of a standard or frame x', which is fastened firmly, to the scroll shaft L. The said shaft w', has a ratchet wheel y' fastened upon its forward end.

The shaft w', extends through one end of a vibrating lever a^2, which is made to play loosely upon the shaft. The said lever carries upon its other end an impelling pawl b^2, which engages with the ratchet wheel. Over the ratchet wheel is a retaining pawl c^2, which is jointed to an arm d^2 extending upward from the frame x'. The ratchet wheel y', has a small crank handle b^4, projecting from its side, the same being for the purpose of enabling a person, to turn the whole back and lower the ring rail when the pawls are thrown up, and when desirable.

Directly under the rear end of the lever a^2, is a bent lever e^2, which turns or moves upon the scroll shaft as a fulcrum. Its outer end rests, when in its lowest position on the top of a stationary standard f^2, which is affixed to the lower girt of the cast iron end of the main frame. The inner arm of the said lever e^2, extends directly under a horizontal projection g^2, which is applied to a vertical rod h^2, extending downward from the adjacent ring rail F. The said projection g^2 should be so adapted to the rod h^2, that it may be elevated or depressed, by adjusting screws and nuts, in order that its position may be regulated as circumstances may require.

The scroll shaft has a cam i^2 fixed firmly to it. The said cam is seen in Fig. 9 which represents a section of it, and the lever beneath it. It also exhibits the chain g', and various parts adjacent thereto. The cam i^2 is made to act upon and depress the lever k^2, whose fulcrum is at l^2. The said lever carries a roll m^2, which is applied to the side of its inner end, and rests on the chain g'.

Before proceeding to describe the peculiar purposes of various combinations I have now specified, as well as their combined action in order to raise the ring rail in the manner required to build the cop or cops, I

deem it advisable to explain the manner in which, and the machinery by which the ring rail is operated in order to deposit or lay the binding threads over or around each layer of yarn composing each of the cops.

From what has been hereinbefore described it will be seen that whenever the scroll shaft has its spring dog a' thrown into gear with the clutch wheel adjacent to it, the said scroll shaft will be put in motion forward, and by means of the scroll or cam f', and the chain g', and various other parts, will elevate the ring rails, and will continue to elevate them while it is so moved. As soon however as the spring dog is forced by the lever c' backward and out of the space x of the clutch wheel in which it may happen to be, the ring rail will be left free to fall down and will do so through the action of gravity, and will cause the scroll shaft, and the spring dog to move backward until the latter meets and springs into the next recess x of the clutch wheel. This fall of the ring rail while the spindles are in rapid revolution, will cause the yarn to be laid on each cop in a helix, which will cross the several threads of the layer of yarn previously spun and wound on the spindle.

Now in order that the ring rail may not fall so quickly or suddenly as to break the yarns, or not put on the cop a sufficient quantity of binding thread, it becomes necessary to make use of some kind of mechanism, which shall ease the ring rail in its fall, or cause it to fall with the variable or required velocity. The said mechanism I shall now proceed to describe.

An arm n^2, fixed to the scroll shaft L, projects downward from it, and carries a small fly wheel o^2 on an axle p^2, extending horizontally from it. Said fly wheel, has a small pinion q^2 affixed to it, which engages with a spur gear r^2, fixed to a tubular shaft s^2, which runs loosely and freely upon the scroll shaft. On the said shaft s^2 is a worm gear t^2, which engages with an endless screw or worm u^2, placed on the vertical shaft o hereinbefore mentioned. The said endless screw u^2, should so be made to revolve the gear wheel t^2, as to cause it to turn the shaft s^2, and the gear wheel r^2 in the direction denoted by the arrow on said wheel r^2. The said wheel r^2, will then act on the pinion and put the fly wheel o^2, in rapid revolution in the direction denoted by the arrow thereon. This taking place while the ring rail is being raised will cause a considerable momentum to be generated in the fly wheel, which rises upward with the arm n^2, which will be carried up, by the forward movement of the scroll shaft. Now when the ring rail falls, the momentum so generated in the fly wheel will be brought into action in such manner as to cause the pinion q^2 to so operate against its gear r^2, as to counterbalance in a certain degree the tendency of the ring rail to fall too quickly or suddenly. The ring rail will thus be eased down, so as not to break the threads, and with the degree of velocity necessary to insure the laying of a due quantity of binding thread on the cops. The ring rail may be further counterbalanced by an adjustable weight v^2 applied to an arm w^2 extending from the rocker shaft k'.

By means of the scroll or cam f', I regulate the length of each successive layer of yarn composing the cop. As the scroll shaft has a positive motion imparted to it, that is as it is always made to rotate forward a like distance, and backward a like distance, it will be seen that in order to increase the length of each successive layer of yarn wound on the spindle to form the bottom part of the cop, the elevation of the ring rail must be gradually increased. This is produced by the peculiar shape given to the scroll or cam f' and the moving or gradually turning said cam around on the shaft.

Fig. 10, represents a longitudinal and central section of a cop, placed on a spindle l. The part a, b, c, d, e, f, of the cop, I term the bottom part of it, while all that above the same I term the top part. The first layer of yarn I suppose to be wound on the spindle a distance a, n, equal to about one half of the length b, c, of the last layer composing the bottom part of the cop. From the above it will readily be understood why the scroll or cam f' must be gradually turned around on the scroll shaft, so as to increase the length of each successive layer of yarn composing the bottom part of the cop.

It is the purpose of the worm u' endless screw t', shaft w', frame x', ratchet wheel y', vibrating lever a^2 impelling pawl b^2, lever e^2, standard f^2, projection g^2, and rod h^2, hereinbefore described, to produce the gradual rotation of the cam, both to form the bottom and top part of the cop. When the scroll shaft is moved forward, the lever a^2, will be moved against the lever e^2, and thereby cause the impelling pawl b^2 to turn the ratchet wheel y', a short distance, so as to create a movement of the scroll or cam f', on the scroll shaft. The movement of the ratchet wheel is increased by elevating the outer end of the lever e^2, which may be effected by depressing the adjustable projection g^2 of the rod h^2. Owing to the manner in which the scroll f', is made it becomes necessary to turn it somewhat faster on the scroll shaft at first, while forming the lower portion of the bottom part of the cop, than it does as the winding of the said bottom part continues to progress. In winding the top part of the cop the scroll has a regular progressive motion upon its scroll shaft, and the portion b, c, d (Fig. 8) of its periphery is then receiving and acting on the chain g'.

While the bottom part of the cop is being made, the portion *a*, *b*, (Fig. 8) is in action upon the chain.

In order to cause the ring rail to rise upward with the increased velocity necessary to prevent the yarn from piling too much in one place, and thereby destroying the conical form of each layer of yarn, I make use of the cam i^2 lever k^2, and roll m^2, the cam being so formed as to properly depress the lever k^2 to the extent required to cause the roll m^2 to bear down upon the chain g', so as to produce the gradual necessary increased rise of the ring rail.

As it is very important that but very little yarn should be wound at the nose or upper part of each layer of the cop, I provide the cam i^2, with an angular projection x^2 (see Fig. 9) which as soon as the cam has completed its action on the lever k^2 shall in its turn depress the lever so as to cause a very quick or sudden rise of the ring rail sufficient to produce the effect required.

A friction spring y^2, is so applied to the end A of the main frame as to act as a stop to gradually check the motion of the arm n^2 when it falls down.

The next part of my invention relates to the manner in which each of the spindles is made in order that it may be elevated so as to enable an attendant on the machine to piece up, or join the ends of the yarn when broken. It often happens that the ring of the ring rail may render it difficult to get hold of the end of the thread wound on the cop. In order to overcome this difficulty the spindle for about one inch and a half below its upper bearing is made of the same size or diameter as the part which runs in the bearing, as seen at z^2 in Figs. 1 and 10. By taking hold of the spindle when so made it may be readily raised upward, so as to carry the broken end of the thread above the ring of the ring rail, and into such a position as will readily enable the operative to seize the same.

It is well known that the part of the spindle on which the yarn is first wound at the commencement of building a cop, must be of a diameter large enough to create a lateral drag on the traveler sufficient to readily overcome its inertia (when it is first started on its ring) and impart to it a velocity on the ring, which will prevent the thread from breaking. As spindles have heretofore been made, they have been constructed of this necessary size at the bottom and with a gradual taper therefrom to the point or top part which was made much smaller in diameter. For various reasons it is very desirable to build the cop, on a spindle of very small diameter, throughout that part on which the cop is made. By using such a spindle there is less danger of drawing or falling in of the yarn at the center of the cop, after its removal from the spindle. Besides this the smaller the spindle the less will be the weight of the spindle required to hold the cop in the shuttle. To obtain the advantages of a small spindle, and with a diameter at bottom, large enough to start the traveler without danger of rupture of the yarn, I make the part a^3 of the spindle directly below that on which the cop is formed, of a diameter large enough to produce the lateral drag upon the traveler, required to overcome its inertia when first started, and give to it a velocity that will prevent the thread from breaking, and before commencing the cop I wind a few turns of yarn on the said part of the spindle. That part of the spindle on which the cop is formed (viz the part b^3, c^3,) I make much smaller in diameter reducing it to as small a size as will be allowable, and admit of its possessing the necessary strength. The spindle so constructed is seen in the drawings. By this mode of making it, I am enabled to doff or remove the cops (from the spindles) after their completion, without first being obliged to raise them upward on the spindles by the hand, far enough to allow of a few turns of yarn to be laid on that part of each spindle on which the cop is first commenced as is generally done in mule spinning.

A convenient velocity for the spur gear r^2, I consider to be one revolution to sixteen of the front drawing roller. The clutch or dog wheel *g*, I cause to revolve at the rate of sixty four one hundredths of a revolution to eighty revolutions of the front drawing roller. I mention these proportions, but do not confine my invention to such.

Having thus specified my improvements that which I claim is as follows:

1. I claim the combination of mechanism by which the scroll shaft has a partial rotary forward motion imparted to it, and is allowed to fall or more backward, the same consisting of the standard e', or any equivalent therefor, the bent lever c', the spring dog a', the clutch or dog wheel *g*, or their mechanical substitutes; the whole being arranged, applied to the scroll shaft and operated and made to operate together substantially as specified.

2. And in combination with the aforesaid shaft, and machinery for imparting to it its rotative motion, or motions I claim the cam and chain and machinery connecting said shaft with the ring rail or rails or any mechanical equivalent therefor, the whole being for the purpose of raising the ring rail or rails and suffering it or them to fall down for the purpose of laying or binding thread over each layer of thread of each of the cops as specified.

3. I further claim the combination of mechanism by which I am enabled to regu-

late the length of each successive layer of yarn composing the cop, the same consisting of the cam f' and made to rotate or partially rotate on the scroll shaft as described, the worm gear u', endless screw t', shaft w', frame x', ratchet wheel y', vibrating lever a^2, impelling pawl b^2, lever e, standard f^2, projection g^2, and rod h^2, extending downward from the ring rail, or their mechanical equivalents, the whole being combined and made to operate substantially as specified.

4. I further claim in its application to the scroll shaft, the combination of mechanism by which the fall of the ring rail is regulated in such manner as to prevent it from descending too suddenly so as to break any of the yarns, the said mechanism consisting of the fly wheel o^2, and machinery for rotating it as applied to the scroll shaft, and made to operate in connection therewith, substantially as specified.

5. And for the purpose of causing the ring rail to rise upward with the increased velocity necessary to prevent the yarn from piling too much in any one place, and thereby destroying the conical form of such layer of yarn composing the cop, I claim the cam i^2, lever k^2, and roll m^2 or any equivalents therefor as combined with the scroll shaft, and the chain g', and made to operate substantially in manner as herein before explained.

6. And in combination with the said machinery I claim the projection x^2, applied to the cam i^2, for the purpose of producing a very quick rise of the ring rail in order to finish the nose or upper extremity of each layer of yarn composing the cop in the manner as specified.

7. And I also claim the above described manner of making each of the spindles in order that it may be elevated so as to carry a broken end of yarn above the ring rail, so that an attendant may readily seize it to piece up or join it to the thread proceeding from the draw rollers without being obliged to wait for the ring rail to fall downward.

8. And I also claim, to construct the spindle directly beneath that part of it on which the cop is formed of a diameter proper to produce the lateral drag on the traveler sufficient to overcome its inertia, and impart to it a velocity necessary to prevent the yarn from being broken in combination with making that part of the spindle on which the cop is formed smaller in diameter as above specified, the same being for the object, or purpose as herein before set forth.

In testimony whereof I have hereto set my signature this twenty ninth day of October A. D. 1847.

GEORGE H. DODGE.

Witnesses:
R. H. EDDY,
CALEB EDDY,