No. 689,557. Patented Dec. 24, 1901.

A. METCALF.

METHOD OF SPINNING FIBROUS MATERIALS.

(Application filed Sept. 5, 1901.)

(No Model.)

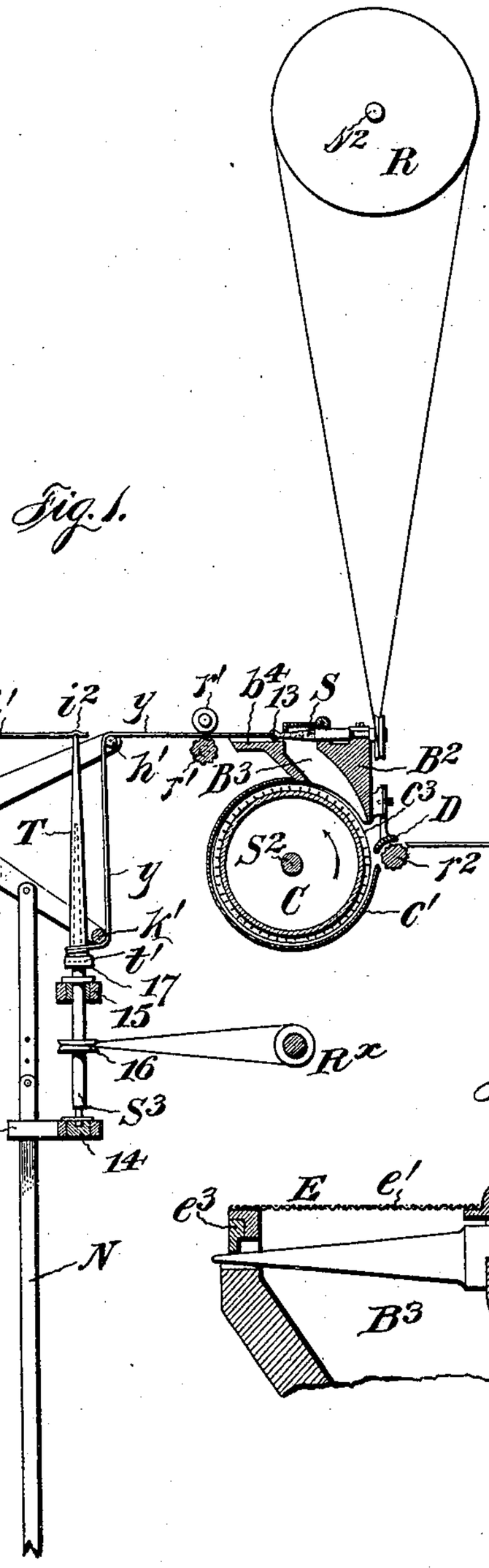

Fig. 1.

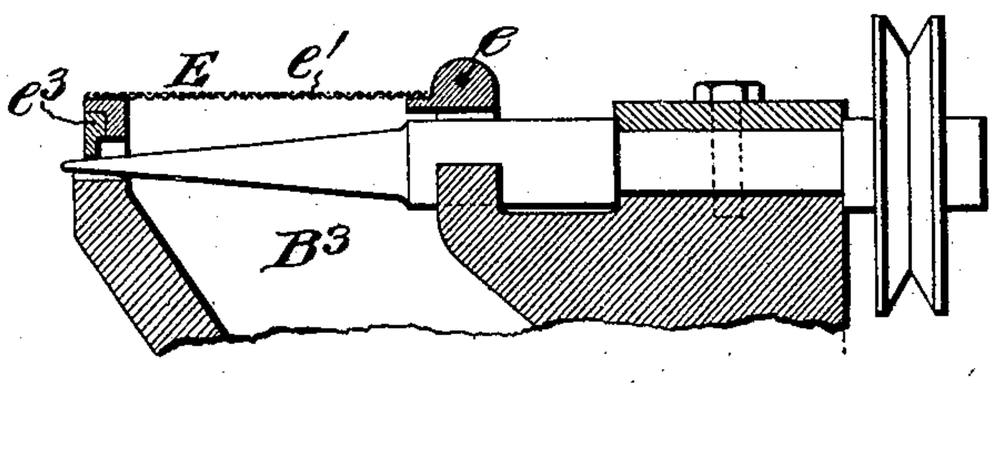

Fig. 2.

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UNITED STATES PATENT OFFICE.

AARON METCALF, OF PRESTON, ENGLAND.

METHOD OF SPINNING FIBROUS MATERIALS.

SPECIFICATION forming part of Letters Patent No. 689,557, dated December 24, 1901.

Original application filed March 27, 1901, Serial No. 53,068. Divided and this application filed September 5, 1901. Serial No. 74,397. (No specimens.)

To all whom it may concern:

Be it known that I, AARON METCALF, a subject of the King of Great Britain, residing at Preston, in the county of Lancaster, England, have invented certain new and useful Improvements in Methods of Spinning Fibrous Materials; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters and figures of reference marked thereon, which form a part of this specification, for which I have made application for Letters Patent in Great Britain, No. 15,325, bearing date August 28, 1900.

This invention has relation to the art of spinning fibrous materials; and it consists, essentially, in a method of spinning fibers whereby the operation is simplified and the expenses materially reduced and whereby yarn or thread for weaving can be obtained, as well as yarn or thread especially adapted as a weft for the so-called "napped fabrics," and for other purposes.

The improved method of spinning consists, essentially, in separating the fibers from a lap, sliver, or fleece and feeding the separated fibers onto a revolving conical or tapering surface, to which they are caused to adhere and to adhere to one another and whereby a conical or tapering fibrous sheath is formed on said surface, the smaller or pointed end of which when drawn off will be twisted into yarn or thread, which may then be copped or further twisted and then copped or wound on bobbins, as required.

Any suitably-organized machine may be used for carrying out the above-described method or process. I have, however, invented a machine suitable for this purpose, which I have shown and fully described in an application for patent filed March 27, 1901, Serial No. 53,068, of which the present application is a division.

In order that the manner in which my said method is carried into practical effect may be fully understood, I will describe the same somewhat in detail, reference being had to the accompanying drawings, wherein I have shown, in—

Figure 1, a vertical sectional elevation of so much of a machine as will be necessary to a full understanding of my invention, and Fig. 2 a sectional fragmentary detail view of the upper part of the spindle-rail.

The fibrous material is first made into a lap or fleece or into slivers. In the latter case it is fed to the machine from cans. In the former case the lap is wound on a lap-roller and fed to the machine in a well-known manner over a feed-table t to a feed-roll r^2 by unwinding-rolls $l\,l'$. With the feed-roll r^2 coöperates a shell D, feeding the lap into a casing c', in which revolves a toothed cylinder C, divided into sections by circular cutter-flanges c^3, which divide the lap into as many strips as there are toothed cylinder-sections and spinning-spindles, said flanges also serving to divide the casing c' into as many chambers.

Above the casing c' is arranged a rail B^2, hereinafter referred to as the "spindle-rail," said rail having as many chambers or fiber-ducts B^3 as there are toothed sections of roll C. Above each of said fiber-ducts B^3 is mounted to revolve in suitable bearings a spinning-spindle S, which spindles are cone or taper spindles at the ends and may have at their pointed end two twisting-prongs 13, though this is not absolutely necessary. The fiber-ducts B^3 are open-ended ducts, the open end above the spindles being, however, covered by a lid or cover E, having a top e' of a foraminous material, so as to allow free passage of air through the duct from below upward and prevent the escape of fiber through the upper end. The spindles are revolved by cord from a tin roller R on a shaft S^2 in a well-known manner, the yarn or thread y coming from the spindles being fed by drawing-off rolls $r'\,r'$ to copping appliances of any suitable character.

As shown in the drawings, a shaft H carries radial arms h, connected by wire h', which I may call the "counter-faller," one or both of said arms having a cam projection h^2 at the hub, on which bears a spring i on a bar I, that is polygonal in cross-section and is free to turn on journals having their bearings in

standards on or secured to the main frame, in which standards the faller-shafts have their bearings also, and K is the faller-shaft, carrying radial arms *k*, connected by faller wire or rod *k'*. To the upper face of bar I is secured a leaf-spring *i'*, one for each copping-spindle, the free end of which spring has bearing on the tip of the shell T upon said copping-spindle. The copping-spindles S^3 are in a well-known manner stepped in a spindle-rail 14 and guided in a guide-rail 15, said spindle S^3 carrying a whirl 16, driven by cord from a tin roller $R^{\times}$.

From the arrangement of the faller and counter-faller wires *k'* and *h'* and the construction of the counter-faller, together with the bar I and its springs, it will readily be seen that when the drag or tension of the yarn or thread pulls the counter-faller *h* downward the pressure of the cam h^2 on spring *i* is reduced, and hence also the pressure of the springs *i'* on the copping-spindles S^3, thus giving less drag upon the threads or yarns, and to prevent the displacement of the tips of the spindles I form on the under face of the free end of springs *i'* a recess i^2.

Any suitable mechanism may be employed for distributing the yarn or thread on the cop-tubes T. Such a mechanism organized to act on the lifter-bar N, I have shown and described in my application for patent hereinabove referred to.

The manner in which my invention may be practiced may be briefly described as follows: Power being applied to shaft S^2 to revolve the toothed cylinder C, and a lap, fleece, or sliver being fed to said cylinder, as hereinabove described, said lap, fleece, or sliver is torn or shredded, and the loose separated fibers are thrown by centrifugal action into contact with the spinning-spindle S, to which said fibers adhere, as well as to one another, and a shell of fiber is rapidly formed on the taper portion of said spindle, which shell of fiber is then drawn off the point of the spindle by hand first and then by the drawing-off rolls *r'* and *r'*. This feed of the fiber to the spindle S is very materially assisted by the current of air, induced by the rotation of the cylinder C, in and flowing upwardly through the fiber-duct B^3, and if the feed of the lap, fleece, or sliver is properly regulated the fibers fed to the spindle S are taken up practically as fast as they are fed thereto, so that the spinning is effected in a very rapid manner, and the liability of the duct B^3 becoming choked up is avoided. As soon as tractive force is applied to the small end oft he fiber shell formed on the spindle S the twisting begins, the shell of fiber being drawn off the spindle practically as fast as it forms thereon and twisted into thread or yarn. The mere rotation of the spindle S, together with the tractive force, will be sufficient to twist the fiber; but this may be assisted by providing the point of the spindle with twisting-prongs 13, as hereinabove set forth, the twist being in a sense put in from the inside of the tapering fiber shell, so that a yarn or thread is produced having one end of the fibers loose or untwisted and projecting from such yarn or thread, which is eminently suitable as a weft for those fabrics which have a nap and are known as "flannelette" and for other purposes. If the yarn or thread to be spun is to be smooth, then I apply to the front wall of the cover E for the fiber-duct B^3 a pressure-plate e^3, Fig. 2, bearing lightly on the point or delivery end of the spindle S, whereby the loose or projecting ends of the fibers are smoothed down and twisted in. Any desired further twist may be given to the yarn or thread thus obtained before copping. Obviously if the speed of rotation of the drawing-off rolls *r' r'* is a fixed one the thickness or counts of the yarn or thread will be determined by the speed of the fiber-feeding appliances, and if desired, and when not twisted too hard, the yarn or thread may be carried to well-known drawing-out or reducing rollers and reduced to the desired extent before receiving the final twist.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. The process of spinning, which consists in feeding loose fibers to a revolving conical or tapering surface to form thereon a fibrous shell, and applying tractive force thereto at the small end to draw it off said surface and twist it, for the purpose set forth.

2. The process of spinning, which consists in feeding loose fibers to a revolving conical or tapering surface to form thereon a fibrous shell, and applying tractive force thereto at the small end to draw it off said surface and twist it, and drawing out or reducing the yarn or thread thus produced, for the purposes set forth.

3. The process of spinning, which consists in feeding loose fibers by centrifugal force to a revolving conical or tapering surface to form thereon a fibrous shell, applying tractive force thereto at the smaller end to draw it off said surface and twist it, for the purposes set forth.

4. The process of spinning, which consists in feeding loose fibers by centrifugal force and a current of air to a revolving conical or tapering surface to form thereon a fibrous shell, applying tractive force thereto at the smaller end to draw it off said surface and twist it, for the purposes set forth.

5. The process of spinning, which consists in feeding loose fibers to a revolving conical or tapering surface to form a fibrous shell thereon, and applying tractive force and pressure thereto at the smaller end to draw it off said surface and twist it, for the purposes set forth.

6. The process of spinning, which consists in feeding loose fibers to a revolving conical surface to form thereon a fibrous shell, applying tractive force at the smaller end of said shell to draw it off said surface and partially

twist it, and then giving it the final twist, for the purposes set forth.

7. The process of spinning, which consists in feeding loose fibers to a revolving conical or tapering surface to form thereon a fibrous shell, applying tractive force thereto at the smaller end to draw it off said surface and twist it, then reducing the yarn or thread so formed and giving it its final twist, and copping or otherwise winding it, for the purposes set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

AARON METCALF.

Witnesses:

WILLIAM FAULKNER,

THOMAS CECIL WALKER.