No. 817,167. PATENTED APR. 10, 1906.

F. A. FLATHER.

CAP FOR CAP SPINNING AND TWISTING.

APPLICATION FILED MAY 27, 1905.

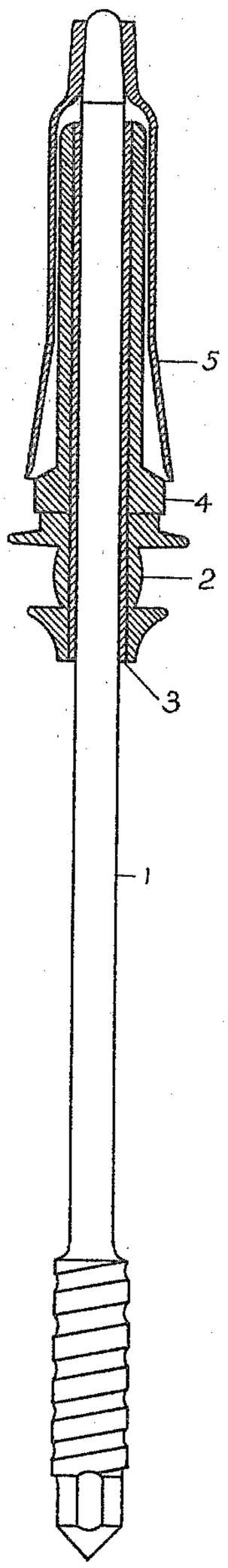

FIG 1

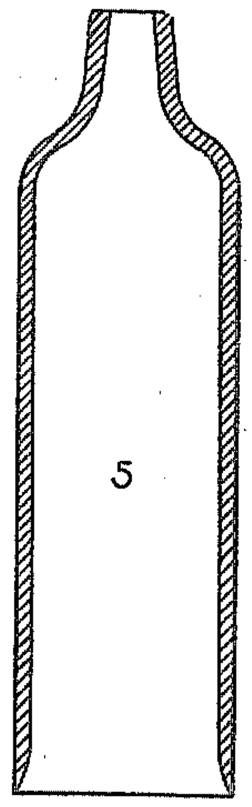

FIG 2

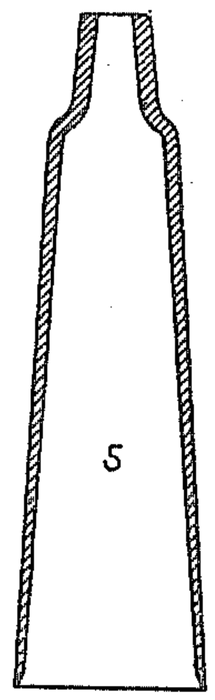

FIG. 3.

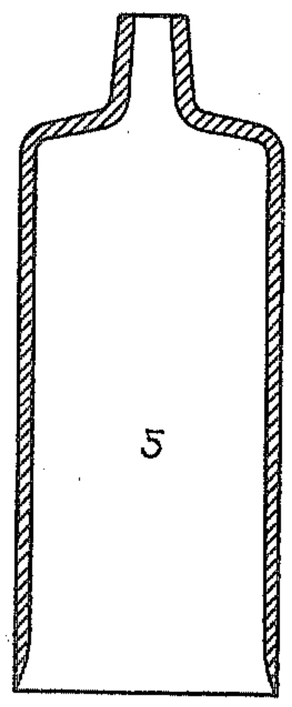

FIG 4

WITNESSES.

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CAP FOR CAP SPINNING AND TWISTING.

No. 817,167. Specification of Letters Patent. Patented April 10, 1906.

Application filed May 27, 1905. Serial No. 262,553.

To all whom it may concern:

Be it known that I, FREDERICK ARTHUR FLATHER, of Lowell, in the county of Middlesex and the Commonwealth of Massachusetts, have invented certain new and useful Improvements in Caps for Cap Spinning and Twisting, of which the following description, with the accompanying drawings, is a specification.

Like characters on the drawings denote like parts.

My improvements consist in a new article of manufacture, a particularly strong, light, durable, superior cap for cap spinning and twisting.

Prior to my invention caps for spinning and twisting had sometimes been made wholly of cast metal. One may assume that, among many others, the caps of the patents indicated next below were all of cast-iron or other cast metal: The United States patents to Thorpe, June 13, 1829; Wardman, No. 328,733, October 20, 1885, and Milson, No. 387,245, August 7, 1888, and the British patents to Hutchison, No. 5,822, July 30, 1829, and Craven and Craven, No. 4,406, October 28, 1880. All such caps were thicker, heavier, clumsier, and more quickly deformed by ordinary usage than those of my invention. In their preferred, most common, and more recent form cast-metal caps were sharp at their thread-guiding edges, as in the United States patent to Stell, No. 133,065, November 12, 1872. To doff these heavier caps was more tiresome to the young girls, some of whom were mere children, who were and still are employed in that work. The greater inertia of such caps made it more difficult for them to follow the vibrations of their supporting-spindles and they were more liable to be rattled slightly upward out of close contact with their supporting-spindles and made to dance and turn thereon. They were of cast metal soft enough to be machined. Their soft sharp thread-guiding edges became accidentally nicked by contacting with sharp-edged parts of the spinning-frame and the nicks promoted the breaking down of the yarn which was being spun. Their tapering soft cast-metal sockets gradually but irregularly enlarged with use, irregularly dropping the different caps of the same frame with respect to their bobbins and causing defective winding of the yarn upon bobbins which varied their diameter with their height, and especially upon flanged bobbins or upon filling-bobbins, having a conical portion upon which the first part of the thread or yarn was wound. When such a socket became dented from collision with the tip of its spindle, it would not fit properly upon the upper portion thereof.

In the British patent to Kean, No. 6,856, dated July 3, 1835, there is shown and described a "throstle-flier," said to be preferably of thin sheet brass, iron, or tin-plate, intended to be stiff, smooth, light, and truly cylindrical, conical, spheroidal, or of any other figure of revolution; but there is nothing in this British patent to suggest that the flier was seamless or that it had or could have a hardened or tempered edge, and said device for other reasons is not even suggestive of the present invention.

Prior to my invention there was upon the market a cap composed of a cast-iron thimble at the top, a cast-iron ring at the bottom, and a connecting-tube of tin-plate bent into cylindrcal form, soldered at its top to the thimble, at its bottom to the ring, and along its longitudinal joint. This cap rattled apart at any of the soldered joints and was subject to continual repairs. The cap of the United States patent to Danforth, No. 2,575, April 21, 1842, may have been of this construction. This composite cap was an improvement upon the cast-metal cap as to lightness, but it had the disadvantages of that cap as to its lack of hardness where that quality was desirable, and the additional disadvantage of frequently breaking apart.

Prior to my invention there was issued the United States patent to Weiler, No. 185,807, December 26, 1876, wherein it was proposed to make caps of glass pressed into the desired shape, with perhaps metallic thimbles having projections upon their exteriors, embedded in the glass and adapted to the spindles. These caps were too fragile for continued usefulness; but their invention led the way to the construction of all metal caps of analogous design.

At the time of my invention the best commercially successful caps which could be purchased were composite caps made from steel tubing with heavy thick iron thimbles burned and cast into their upper ends. Such a thimble was provided with the usual spindle-

socket. After the tube and the thimble had been united the cap was machined. Finally, its thin sharp-edged thread-guiding end was tempered and made so hard that it would resist the usual accidental nicking. If its lower end cracked ever so slightly in being tempered or if its cast-iron thimble contained small blow-holes which intersected the polished outer surface of the cap, more or less of the barbed worsted fibers which were being twisted or spun were sure to catch in such cracks or blow-holes and to be torn out of the yarn which was in process of manufacture and added to the flyings and waste. Figure 1 of the British patent to Butterfield, No. 1,075, March 12, 1881, in its general features represents these best caps; but it does not show the projections from the cast-thimbles which were more or less perfectly embedded in the metal of the tubes, and the lower edges of the tubes were shaped more like the showing of Fig. 3 than like that of Fig. 1 of the Butterfield patent. The flange G of the said Fig. 3 was not to be found in these best caps. The specification of this patent, page 2, lines 14 to 23, says: "For this purpose I make the body of the cap of cast-iron and the end where the thread passes to the bobbin with a steel hoop; but the great difficulty has been to join the iron with the steel on account of the cap having to be made with very thin metal to make them light, and to allow of making sound caps I form on the end of the cast-iron cap a rim or projecting circle, which gives the required strength, besides assisting the spinning. I construct my caps as follows: I cut the hoops the required length and cut a screw or grooves on the top and of the width required to be inserted in the cap. I then take the hoop and place it in a mold previously prepared to cast the cap and then run in the cast-iron and burn the metals in." On lines 41 to 45 of the same page is further described one form of the joint between the tube and the thimble, as follows: "The ordinary cap, Figs. 1 and 2, may be described as being made with a steel tube A cut the length of the required cap and having an iron top or plug B, or the cap may be cast entirely of iron. It follows, therefore, that the excess of the steel tube is not necessary, the bottom of the tube being the only part required for the thread to pass from the cap to the bobbin." On page 2, lines 48 to 50, is described in very short terms, easily understood by one skilled in the art and quoted below, the approved process of running and burning in the melted metal by which the tube was so heated, softened, and expanded that upon the cooling of the thimble within the tube the tube would shrink upon the thimble. "The hoops thus prepared are placed in a mold previously prepared to cast the cap. The metal is then run in the mold, and the metals are burned in." Many variations of the form of this joint had been designed prior to my invention; but none of its forms had been found to be satisfactory, or was being manufactured, sold, or used as satisfactory at the time of my invention. The rapid and forceful vibration of the spindles when in use destroyed at this joint a percentage of the caps which were delivered to the yarn-spinners apparently in good condition. Moreover, caps made in this way were heavier than those of my invention, and therefore less well adapted for use under the conditions already detailed, which prevail in modern spinning-rooms. They also had the defect that the tapered sockets in the soft cast-iron thimbles gradually became deformed with use, as was the case with the sockets of the caps which were wholly of cast-iron. Such a cap as is designed for spinning or twisting yarn that is to be wound upon bobbins which have top and bottom flanges that nearly or quite fill the interior diameter of the cap and is of the best type that had been manufactured prior to my invention may have an interior diameter of two inches or more, and the height of the joint of the thimble with the tube is seldom less than one-half an inch in the smallest cap to three-fourths of an inch or more in the largest. It will be perceived that the exterior height of the cylindrical part of the composite cap is greater by about one-half to three-fourths of an inch than would be the case if the cap was made in accordance with my invention and if the two caps in comparison had like interiors. My invention thus enables me to reduce the exterior height of the cylindrical part of the cap. As the bobbin ascends into the cap it preferably reaches as nearly as is practicable to the bottom of the joint of the thimble with the tube. It can rise no higher, because of the liability of a collision between the bobbin-flange and the thimble of the cap. Such a movement of the bobbin with respect to the cap permits the use of the shortest practicable tubular portion of the cap. In order to reduce the liability of breakage of the ballooning-yarn between the guide-eye above the cap and the bobbin, it is, as is well known, desirable to reduce as much as is practicable the distance between the guide-eye and the sharp-edged thread-guiding end of the cap. It is also desirable that the ballooning-yarn shall not contact with the upper portion of the cap. My invention by shortening the necessary exterior height of the cylindrical part of the cap, correspondingly shortens the length of the ballooning-yarn and lessens its liability of breakage.

Modern requirements have created a demand for bobbins containing the largest possible quantities of yarn upon a single bobbin. As a consequence the yarn-load is lengthened and thickened as much as is possible. The longer the tubular portion of the cap the greater the liability of destruction of a cap at

a defective joint between the tube and the thimble. Moreover, the class of workmen in the foundry has deteriorated in recent years, and this has increased the difficulty of obtaining good joints between the tubes and the thimbles in such caps as were the best prior to my invention.

While engaged in the manufacture and sale of such composite caps as have been last described just above, and aware of the serious loss and inconvenience to the manufacturers and users thereof which grew out of the failure of these best caps at their defective joints, in the endeavor to prevent such loss and inconvenience I conceived of the idea of making a satisfactory cap without a seam. It occurred to me that if I could find a mild steel soft enough to be commercially cold-squirted or swaged or hot-forged into shape without a seam, capable of being sufficiently hardened in the spindle-sockets and at the sharp-edged thread-guiding ends after having been shaped and of being satisfactorily machined to dimensions, I should be able to produce a light, strong, durable cap of graceful shape, well calculated to meet the needs of the spinners. There was no considerable difficulty in finding a steel so mild that it could be cold-squirted or swaged, but which was incapable of being hardened. The attempt to case-harden tubes of such steel failed, because of the deformation of the tubes which occurred during the use of that process. There was no difficulty in finding a steel which could be hardened, but which was incapable of being cold-squirted or swaged; but the removal of the scale which was produced by the forging heat increased the cost of production. The real difficulty was to find a steel which could commercially be both cold-squirted or swaged and hardened. Fortunately, nickel-steel had been invented and found to be peculiarly ductile and capable of being hardened, but only a small number of manufacturers of steel tubing in this country had supplied themselves with the costly appliances which were necessary for the production of seamless drawn-tubing, and, so far as I could learn, no manufacturers of steel tubing anywhere were endeavoring to produce such tubing as would be best adapted for use in manufacturing such caps as are shown in the drawings prior to my conception of this new article of manufacture. By an experimental investigation into the properties of the different varieties of seamless drawn-steel tubing which were being produced by various manufacturers in America and abroad, and by persuading such manufacturers to produce especially for my purpose tubing of peculiar alloys of steel which were not a part of their ordinary manufacture, but which seemed to promise to serve my purpose, I discovered that what was commercially known as "five per cent. (5%) nickel-steel" was, when made into seamless drawn-tubing, the best steel for the purpose of making caps which was, at the time of my experiments, commercially obtainable by me. I found also that steel containing fifty to sixty one-hundredths of one per cent. (.50% to .60%) carbon, not containing nickel, but containing about twenty-five one-thousandths of one per cent. (.025%) of phosphorus, from about twenty to forty one-hundredths of one per cent. (.20% to .40%) of manganese, and not exceeding about two one-hundredths or one per cent. (.02%) of sulfur, was the second best for the purpose—seamless drawn-tubing commercially obtainable by me, and I had tubing of the nickel-steel cold-swaged and of the carbon steel containing no nickel hot-forged into the desired caps. In order that the caps might be at once strong and light, it was found to be advisable to so swage them that they would have their greatest thickness at the spindle-sockets and be thinner and thinner as they receded therefrom. When the tubes of fifty to sixty one-hundredths of one per cent. (.50% to .60%) carbon-steel were swaged at a cherry-red heat, the capacity of the metal for being hardened after swaging was not injured; but the surface of the tubing became badly scaled and roughened in the process, and the later process of smooth-polishing became comparatively costly. When, however, the tubes, preferably of the five one-hundredths of one per cent. (.05%) nickel-steel, were cold-swaged, their surfaces were made very smooth and brought quite exactly to the desired dimensions by the swaging process, and they required comparatively little machining and polishing to complete them for the market, even in the caps of the greatest diameter, which were the most difficult to produce. The toughness and durability of the cap was increased when it had an annealed portion intermediate its hardened surface for contacting with the spindle and its hardened thread-guiding edge.

In the drawings, Fig. 1 represents a spindle with its whirl, tube, bobbin, and cap in operative position thereon. Figs. 2, 3, and 4 represent modified forms of caps.

In the figures, 1 represents the spindle; 2, the whirl; 3, the tube; 4, the bobbin, and 5 the cap. The parts numbered 1 to 4, inclusive, form no part of my invention.

The caps 5 are produced, preferably, from five per cent. (5%) nickel-steel tubing and are preferably shaped while cold into the forms shown. Each cap is preferably made thicker near its contact with the spindle for strength and is made thinner as it recedes from the spindle for lightness.

The cap of Fig. 1 is designed for use in spinning filling where after a cone has been formed at the base of the bobbin the yarn is laid on in conical layers.

The cap shown in Fig. 2 is for the spinning

of warp when the yarn is laid upon the bobbin in cylindrical layers. The large curves, which connect the body of the cap with the portion that contacts with the spindle, render this form of cap peculiarly easy and inexpensive of manufacture.

The cap shown in Fig. 3 has its body shaped like the frustum of a cone to meet the views of some manufacturers of filling.

The cap shown in Fig. 4 is also for use when spinning warp when the yarn is laid upon the bobbin in cylindrical layers, and the bobbin terminates in large top and bottom flanges. It is shaped as shown between its body and its connection piece in order to reduce the height of the cap as much as possible.

I claim—

1. As a new article of manufacture: a cap adapted for spinning or twisting and of a single piece of metal, whereby it is prevented from being shaken apart or broken by ordinary usage; and having a socket whereby it is supported upon the spindle, the socket having a surface for contact with the spindle that is hard, whereby that surface is prevented from becoming materially deformed through use.

2. As a new article of manufacture: a cap adapted for spinning or twisting and of a single piece of metal, whereby it is prevented from being shaken apart or broken by ordinary usage; and having a socket whereby it is supported upon the spindle, the socket having a surface for contact with the spindle that is hard, whereby the surface is prevented from becoming materially deformed through use; and having a tougher body portion contiguous to the surface or socket.

3. As a new article of manufacture: a cap adapted for spinning or twisting and of a single piece of metal, whereby it is prevented from being shaken apart or broken by ordinary usage; having a part whereby it is supported upon the spindle; and having a thread-guiding edge which is hard, whereby it is prevented from becoming accidentally nicked.

4. As a new article of manufacture: a cap adapted for spinning or twisting and of a single piece of metal, whereby it is prevented from becoming shaken apart or broken by ordinary usage; having a socket whereby it is supported upon the spindle; and having a thread-guiding edge which is hard, whereby it is prevented from becoming accidentally nicked.

5. As a new article of manufacture: a cap adapted for spinning or twisting and of a single piece of metal whereby it is prevented from being shaken apart or broken by ordinary usage; having a socket whereby it is supported upon the spindle; having a thread-guiding edge that is hard, whereby it is prevented from being deformed with ease; and having a tougher portion between the thread-guiding edge and the socket.

6. As a new article of manufacture: a cap adapted for cap-spinning and of a single piece of metal, whereby it is prevented from being shaken apart or broken by ordinary usage; having a socket whereby it is supported upon the spindle, the socket having a surface of contact with the spindle that is hard, whereby that surface is prevented from becoming materially deformed through such contact and having a thread-guiding edge which is hard, whereby it is prevented from becoming accidentally nicked.

7. As a new article of manufacture: a cap adapted for spinning or twisting and of a single piece of metal, whereby it is prevented from being shaken apart or broken by ordinary usage; having a part whereby it is supported upon the spindle, that part having a surface for contact with the spindle that is hard whereby that surface is prevented from being deformed with ease; and having a tougher portion between the thread-guiding edge and that part.

8. As a new article of manufacture: a seamless cap for spinning or twisting, made of a single piece of wrought-steel, having a part whereby it is supported upon the spindle, and having a hardened thread-guiding edge.

9. As a new article of manufacture: a cap adapted for spinning or twisting and of a single piece of metal, whereby it is prevented from being shaken apart or broken by ordinary usage; having a socket whereby it is supported upon the spindle, the socket having a surface for contact with the spindle that is hard, whereby that surface is prevented from becoming materially deformed through such contact; having a thread-guiding edge that is hard, whereby it is prevented from being deformed with ease; and having a tougher part between the thread-guiding edge and the socket.

10. As a new article of manufacture: a cold-swaged cap adapted for spinning and twisting, made of five per cent. (5%) nickel-steel; having a part by which it is supported upon the spindle, and having hardened, both its surface for contacting with the spindle and its thread-guiding edge.

11. As a new article of manufacture: a cold-swaged cap adapted for spinning and twisting, made of five per cent. (5%) nickel-steel; having a socket by which it is supported upon the spindle, having hardened both its surface for contacting with the spindle and its thread-guiding edge; and having a tougher portion between that surface and that edge.

In testimony whereof I affix my signature in the presence of two witnesses.

FREDERICK A. FLATHER.

Witnesses:

CHANNING WHITAKER,

J. C. DEAN.