(No Model.)

# J. E. LEE.

## METHOD OF AND APPARATUS FOR MAKING CATHETER OR OTHER TUBES.

No. 533,303. Patented Jan. 29, 1895.

FIG. 1.

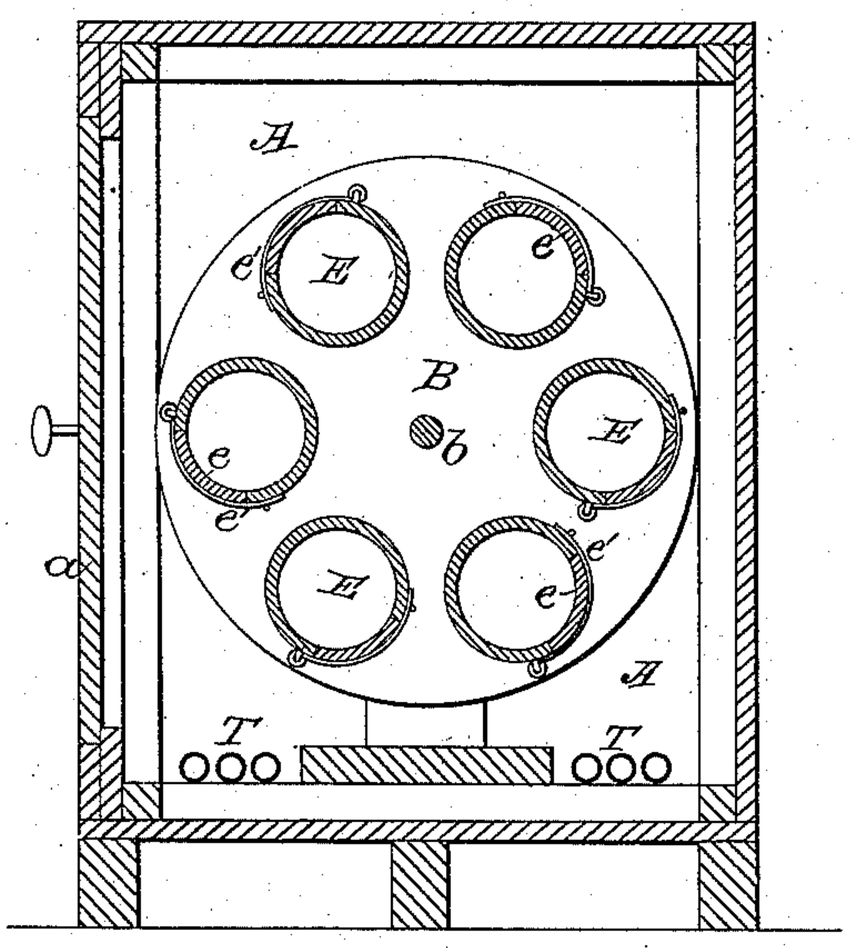
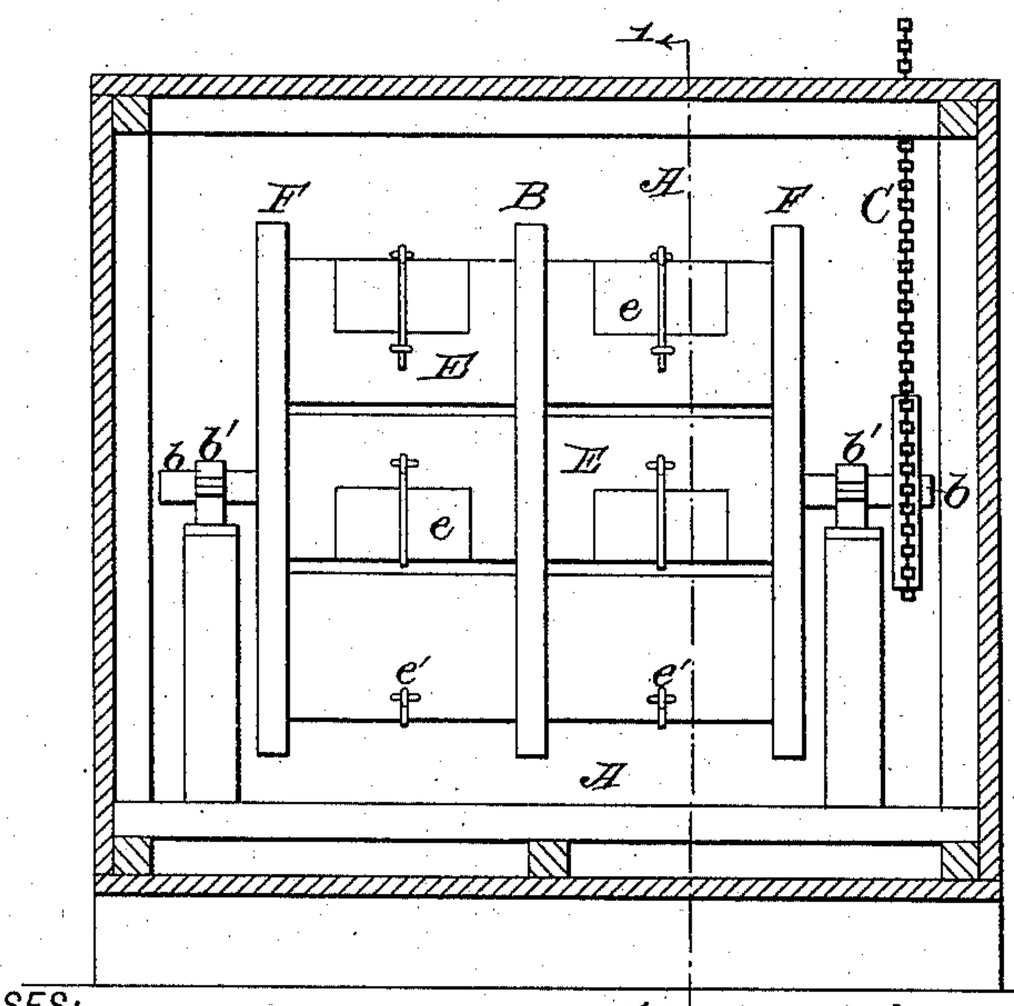



FIG. 3.

FIG. 2.

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# UNITED STATES PATENT OFFICE.

JOHN ELLWOOD LEE, OF CONSHOHOCKEN, PENNSYLVANIA.

## METHOD OF AND APPARATUS FOR MAKING CATHETER OR OTHER TUBES.

SPECIFICATION forming part of Letters Patent No. 533,303, dated January 29, 1895.

Application filed June 2, 1894. Serial No. 513,316. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN ELLWOOD LEE, a citizen of the United States of America, and a resident of Conshohocken, Montgomery county, Pennsylvania, have invented an Improvement in Methods of and Apparatus for Making Catheter or other Tubes, of which the following is a specification.

My invention consists of an improved method of and apparatus for varnishing fibrous tubes for catheters and similar articles.

In the accompanying drawings Figure 1 is a transverse vertical section on the line 1—1, Fig. 2, of the apparatus which I employ in carrying out my invention, and Fig. 2 is a longitudinal section, but showing the tumbler barrels in elevation. Fig. 3 is a view to a considerably larger scale, of a braided tube upon a former rod.

My invention has more particular reference to the manufacture of that class of surgical catheters which are composed of tubular bodies of braided material impregnated and coated with a substance in the nature of a varnish.

The main object of my invention is to effect a thorough union of the varnish-like material with the fibers of the tube, so as to produce a liquid-proof coating both inside and outside the tube and to give the tube the necessary strength with smoothness and flexibility.

The braided tubes V after coming from the braiding machine, are mounted upon rods or wires R (Fig. 3) acting as formers or supports, and while still thereon, receive a preliminary coating of stiffening material such as a preparation of varnish of such a character that when this preliminary coat has stiffened, the tubes will have sufficient strength for the subsequent treatment, which forms the main feature of my process. This treatment consists essentially in beating, driving or forcing the varnish material into and causing it to adhere to the braided tubes by impact by tumbling the tubes over each other in the presence of a small quantity of varnish, and under heat. I prefer to use a barrel-like cylinder a little longer inside than the length of the tubes, and after laying the latter into the cylinder, I pour in a small quantity of the varnish material, close the cylinder and rotate it, while subjected to heat.

In carrying out my invention in practice, I prefer to employ the apparatus illustrated in the accompanying drawings. This consists of a rectangular or other shaped chamber A with suitable closing doors *a*. Within this chamber, on suitable supports, there is mounted a system B of tumbler cylinders on a shaft *b*, turning in bearings *b'* on supports and provided with means, such as a chain C, by which the system of cylinders may be turned, as desired. Each system of tumbler cylinders comprises a number of small cylinders E suitably supported or mounted between heads F on the shaft *b*. In the drawings I have illustrated two sets of these cylinders, six in each set. Each cylinder is about the length (interior measurement) of the braided catheter or other tubes to be treated, and of a suitable diameter and each cylinder is provided with a door *e* through which access may be had to the interior. In the present instance I have illustrated the doors as removable, but adapted to be held in place by means of suitable latches *e'*. The braided tubes which have had the preliminary stiffening heretofore referred to, are laid lengthwise in these cylinders in such number as to not quite fill the cylinder, say about two-thirds full, so that as the tumbler system rotates the tubes will continually be falling over and upon each other with impact sufficient to cause the small amount of varnish which has been put into the cylinder with the braided tubes to thoroughly impregnate and coat them. In some cases sufficient varnish may be provided for the tumbling operation by dipping the tubes into varnish before they are laid in the cylinder. The chamber A is provided with steam tubes T, or other suitable means of heating may be provided to assist the operation. This treatment of the braided tubes with slow rotary motion in the tumbler system is continued for a number of hours, say six to ten, by which time the prepared tubes have become more or less impregnated, coated and stiffened with the varnish material. The braided tubes thus treated are taken out of the cylinders and laid out on shelves for several hours, say over night, to allow the varnish-like material to

become more or less dry or set. By rolling or tumbling the tubes in tumbler cylinders, or barrels, the fibers of the tubes are laid down and the outer surfaces are made smooth. These steps of varnishing by tumbling, and then drying or setting are repeated as often as may be found necessary to give a sufficiently thick coating of varnish to the tubes. Then the tubes are finally dipped into a finishing varnish which will dry hard without any tackiness so that when this has dried, the outer coating is smooth, and it only remains to give the catheters thus prepared a final polish to make them perfectly smooth and ready for use.

I claim as my invention—

1. The mode herein described of preparing fibrous catheter or other tubes, consisting in first subjecting the fibrous tubes to a preliminary stiffening coating while held in form, then driving or packing soft gummy varnish into the fibers of the tubes by tumbling them over each other in the presence of the varnish, and then putting on a final coat of a finishing varnish.

2. The mode herein described of preparing fibrous catheter or other tubes, consisting in first subjecting the fibrous tubes to a preliminary stiffening coating while held in form, then driving or packing soft gummy varnish into the fibers of the tubes by tumbling them over each other in the presence of the varnish, allowing the varnish to set, repeating these tumbling and setting operations, and finally applying a finishing coat of varnish.

3. The mode herein described of making fibrous catheter or other tubes, consisting in first making braided tubes and subjecting them while mounted on formers to a preliminary stiffening coating, then removing the formers, then tumbling such tubes over each other in the presence of varnish and under heat, and giving the tubes the final hard coating and polishing, all substantially as set forth.

4. The herein described varnishing apparatus for catheter or other tubes, consisting of a closed chamber, heating appliances and a tumbler system, comprising a shaft with heads and a series of cylinders mounted between said heads and provided with doors, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN ELLWOOD LEE.

Witnesses:
C. D. WYNKOOP,
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