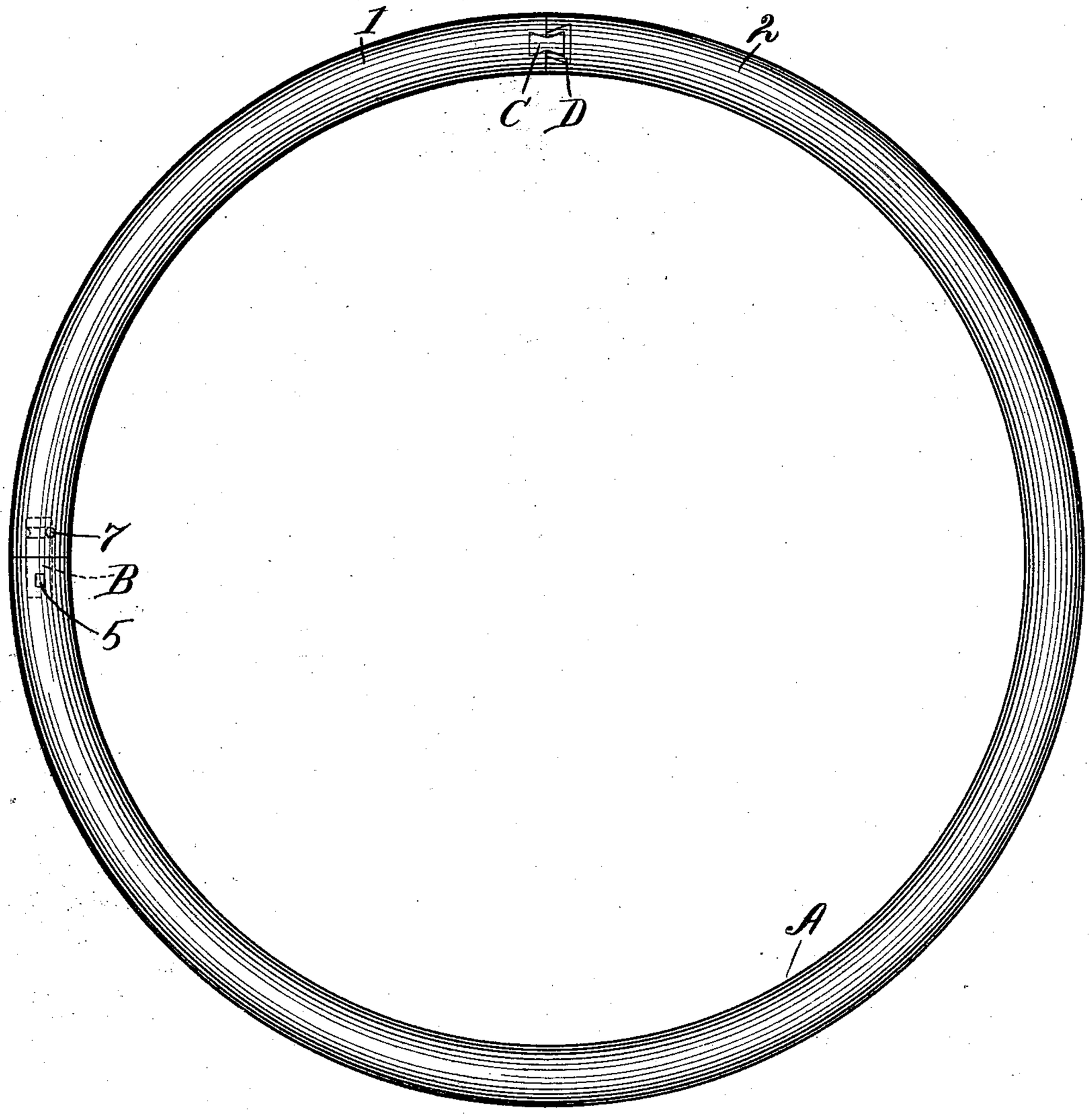
(No Model.) 4 Sheets—Sheet 1.

W. HOLMES.

MANDREL FOR FORMING PNEUMATIC TIRES.

No. 543,093. Patented July 23, 1895.

Fig. 1.



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W. HOLMES.

MANDREL FOR FORMING PNEUMATIC TIRES.

No. 543,093. Patented July 23, 1895.

Fig. 2.

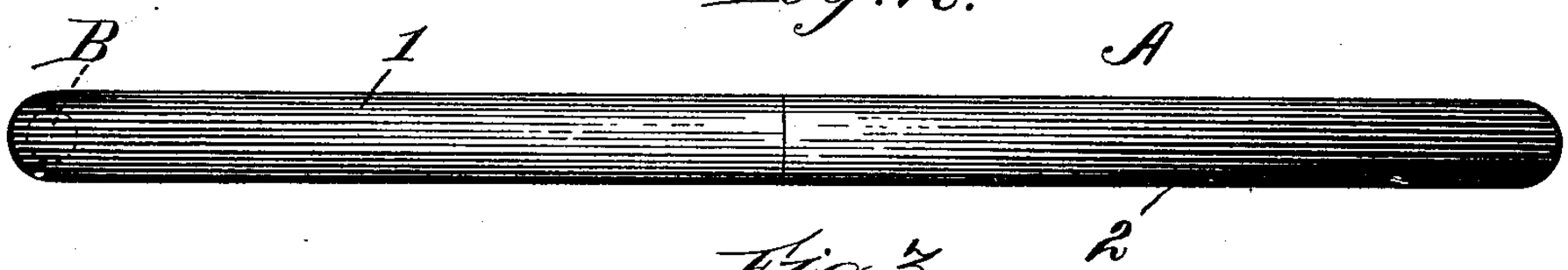


Fig. 3.

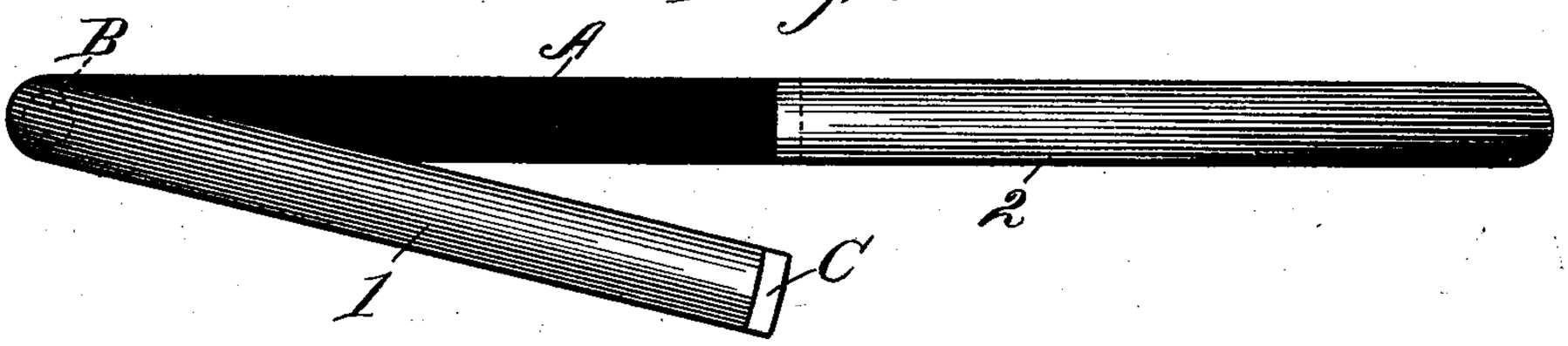


Fig. 4.

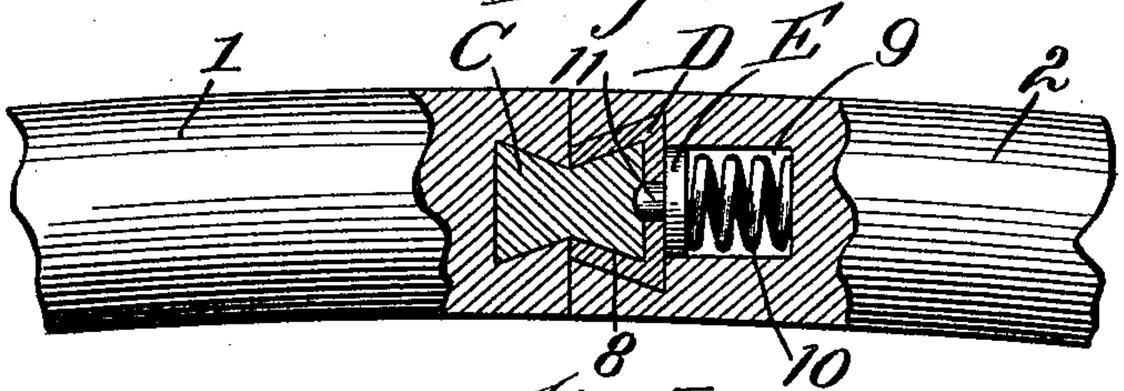


Fig. 5.

Fig. 6.

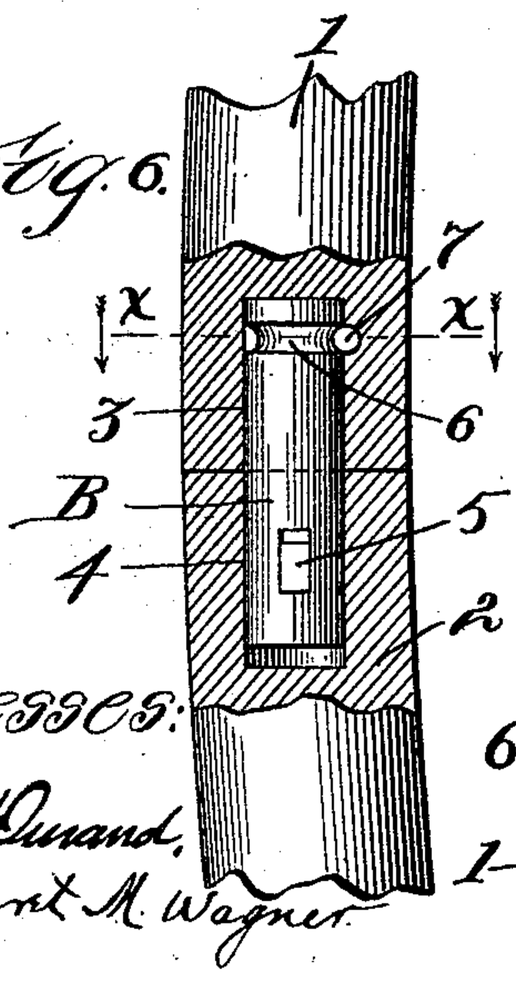


Fig. 7.

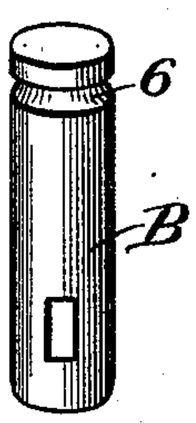


Fig. 8.

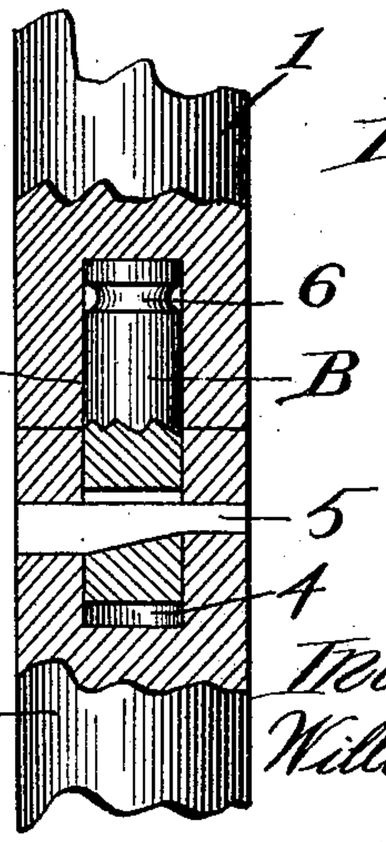
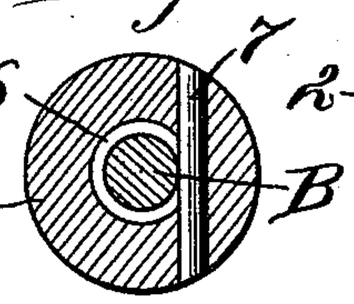


Fig. 9.



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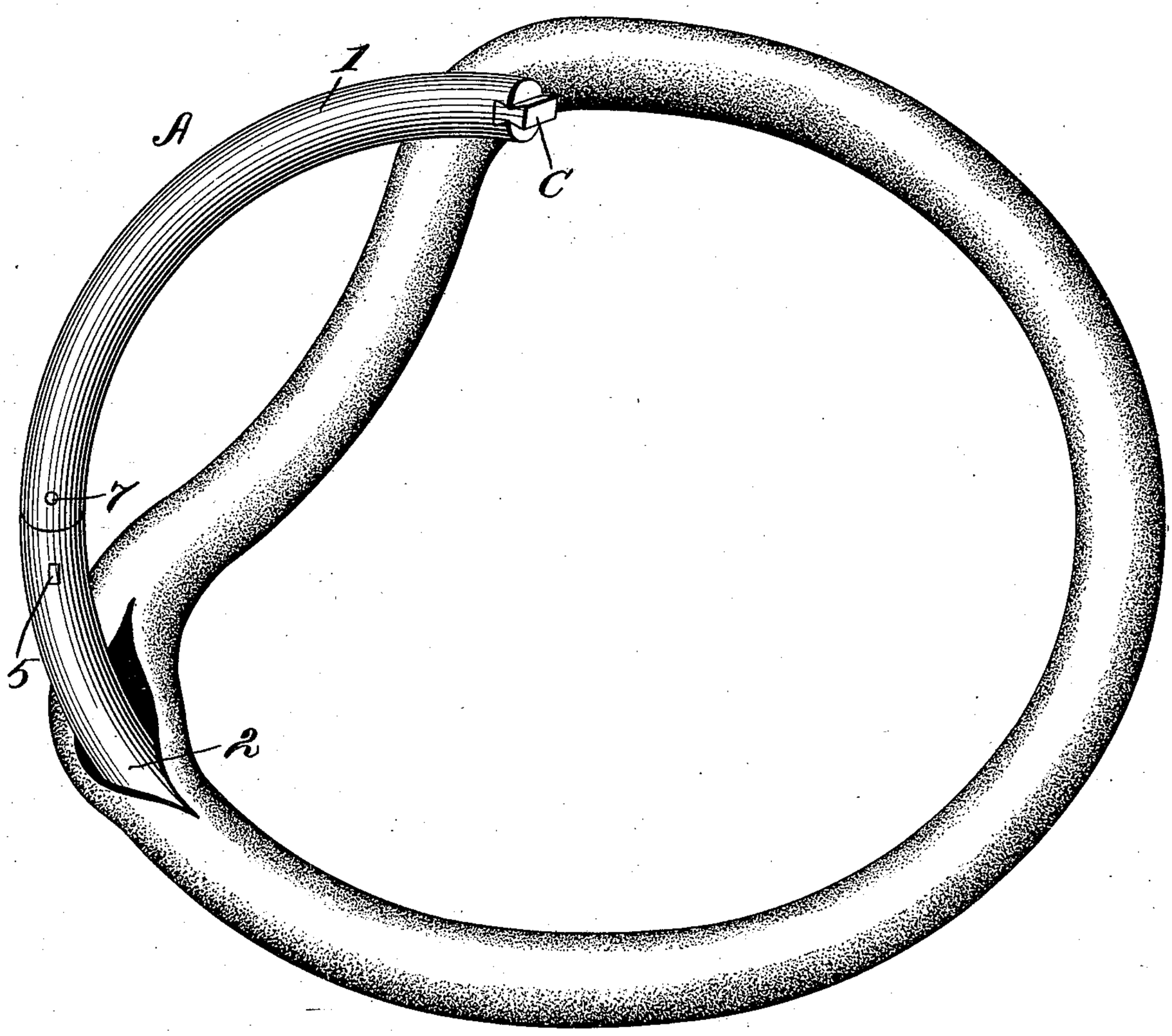
W. HOLMES.

MANDREL FOR FORMING PNEUMATIC TIRES.

No. 543,093. Patented July 23, 1895.

Fig. 10.



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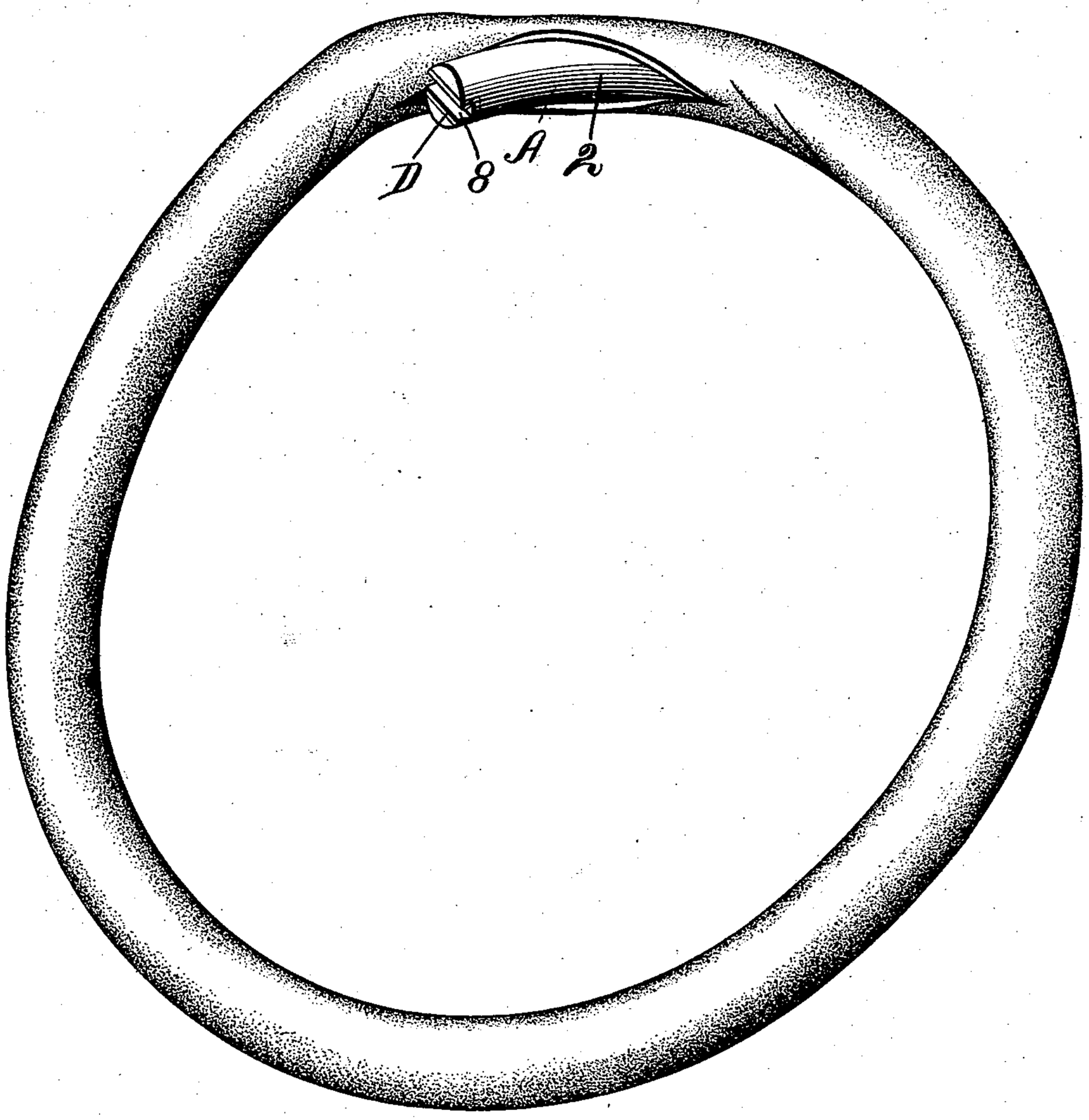
MANDREL FOR FORMING PNEUMATIC TIRES.

No. 543,093. Patented July 23, 1895.

Fig. 11.



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UNITED STATES PATENT OFFICE.

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MANDREL FOR FORMING PNEUMATIC TIRES.

SPECIFICATION forming part of Letters Patent No. 543,093, dated July 23, 1895.

Application filed April 2, 1895. Serial No. 544,130. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HOLMES, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Mandrels for Forming Pneumatic-Tire Sheaths, of which the following is a specification.

My invention consists in an improvement upon the mandrels described in Letters Patent of the United States Nos. 490,035 and 496,321, granted and issued to Fred W. Morgan and Rufus Wright. In practice these annular mandrels have been made of metal, and in order to permit the removal of the removable section it has been customary to spring the mandrel by means of a lever, as described in said patents; but in time the mandrel frequently becomes sprung as a result of the thus repeatedly springing it for the foregoing described purpose. This is objectionable, since it is highly desirable that the mandrel should preserve a perfectly-true circular form, for if sprung or bent out of a true circle the sheath after having been molded upon the mandrel will be thicker in some portions than other portions, which will be pinched too closely between the mandrel and the wall of the mold.

The object of my invention is to overcome such objectionable feature; to economize in the time and labor employed in removing the sheath from the mandrel; to save time in handling and manipulating the mandrel, and to temporarily lock together the movable mandrel-section and the remaining portion of the mandrel, so as to practically form a solid ring, and to avoid gaps between the ends of the section and the ends of the remaining portion of the mandrel.

To the attainment of the foregoing and other useful ends, I construct the mandrel as hereinafter set forth.

In the accompanying drawings, Figure 1 represents in side elevation an annular mandrel provided with a swiveled section in accordance with my invention, the swivel-pin at one end of such section and a tongue at the opposite end of the same being indicated in dotted lines. Fig. 2 is a plan view of the mandrel shown in Fig. 1. Fig. 3 is a like view showing the swiveled section turned to one side. Fig. 4 shows, on a larger scale, the free end of the section and adjacent end of the main portion of the mandrel, partly in section, so as to expose the tongue and latch, which are understood to be concealed when the section is locked in place. Fig. 5 is a like view with the section on a different plane. Fig. 6 is a like view showing the opposite end of the swiveled section. Fig. 7 shows the swivel-pin. Fig. 8 is a view similar to Fig. 6 with the section taken on a different plane. Fig. 9 is a cross-section on line *x x* in Fig. 6. Fig. 10 is a perspective view showing the swiveled section turned to one side and illustrating a pneumatic-tire sheath having a short split and partially removed from the mandrel. Fig. 11 is a similar view illustrating one end of the main portion of the mandrel emerging from the short split in the sheath.

The annular mandrel A is preferably made of metal, so as to insure durability and sufficient rigidity to permit a pneumatic-tire sheath to be accurately formed upon it. Material having substantially the foregoing-mentioned properties of metal could be employed, it being observed, however, that since no elasticity need be present in the mandrel it is preferably rigid, and that such rigidity is desirable, since it insures the accurate formation of the annular chamber within the sheath of a pneumatic tire and also insures uniformity in the sheath.

The annular cylindric mandrel shown is in transverse sectional area adapted to the required form and size of the annular bore or chamber in a pneumatic-tire sheath, and by forming it of metal it can have a hard and smooth surface, whereby the sheath can be stripped off with comparative ease.

The swiveled section 1 of the mandrel forms, when locked in place, a practically solid portion of the mandrel, as in Fig. 1. One end of this section is connected with the remaining portion or body 2 of the mandrel by a swivel-joint. The swivel-joint between the section and body of the mandrel can be variously constructed; but as a simple and highly efficient arrangement I provide a swivel-pin B, having one portion fitted within a socket 3 in the section and its remaining portion

fitted within a socket 4 in the body or remaining portion 2 of the mandrel. The swivel-pin is desirably locked in the body of the mandrel, and to such end it can be fastened by a key 5. As a means for holding the pin in connection with the section and at the same time permitting the section to turn about the pin the latter is provided with an annular groove 6, which receives a portion of a transversely-arranged stop 7. The key illustrated in Figs. 6 and 8 is wedge-shaped, so that in case of wear between the abutting ends of the section and mandrel at the swivel-joint an adjustment can be made by slightly driving the key.

The opposite end of the swiveled section is provided with a dovetailed block C, preferably of hardened steel, which is fitted within a dovetailed mortise in the section. A portion of this block projects from the end of the section and engages in a dovetailed mortise 8 in the main portion or body of the mandrel, and as a preferred way this mortise is provided by a recessed block or bearing-piece D of hardened metal, which is countersunk in the mandrel. I also desirably provide a latch for temporarily locking the section in place, and to such end the mandrel is provided with a recess 9, arranged in rear of the bearing D, so as to provide space for a spring-latch E. As a simple construction, the latch E is backed by a spring 10 and has its engaging portion 11 arranged to work through an opening in the base of the bearing D, so as to normally project from such base, as in Figs. 4 and 5. Said engaging portion 11 engages in a recess 12 in the section and can be rounded, so that when suitable force is directed laterally against the section it will force back the latch and turn upon its swivel-joint.

When the swiveled section is locked in place, as illustrated in Fig. 4, with its dovetailed block or tongue C engaging in a dovetailed recess in the body of the mandrel, it will be rigid with the mandrel and the latter will as a whole be positively held against spread or enlargement.

The sheath is formed or molded upon the mandrel when the section is locked in place, and to such end the endless tubular sheath is built or formed upon the mandrel by applying the layers of canvas and rubber thereon, and the whole then subjected to the operation of vulcanization. Preferably the mandrel with the material thereon is confined within a mold during vulcanization, and, furthermore, the parts of the mold are desirably brought together with suitable pressure. The mandrel is adapted in cross-section to form the bore of the pneumatic-tire sheath. After vulcanization a short split is cut in the sheath adjacent to the locked end of the swiveled section and the latter is then turned to one side, so as to emerge through such split. The end of the mandrel adjacent to the latch can be held by a vise or clamp, and the sheath can then be stripped from the mandrel.

In Fig. 10 the sheath is shown slipped back upon the swiveled section, so as to more clearly illustrate the fact that such section when swung to one side still forms a regular continuation of the mandrel, and that the only gap which occurs is between the body of the mandrel and the free end of the swiveled section. In other words the result is as though a heavy metal mandrel, transversely divided at one point, should be deflected laterally, so as to open it at such point. Such deflection by bending a metal mandrel suitable for forming a pneumatic-tire sheath would be impracticable, but by providing the swiveled section I can in effect attain such end. The sheath could be removed by continuing the movement begun in Fig. 10; but in practice it is desirable to remove the sheath, as in Fig. 11, whereby the end of the body or main portion of the mandrel shown can be held by a clamp or vise, thus relieving the swiveled section from the weight which it would have to sustain if it were held by the clamp or vise. When the swiveled section is turned so as to open the mandrel, as in Figs. 3, 11, and 12, its swiveled end will continue to abut squarely against the adjacent end of the main portion of the mandrel, and no objectionable gap or angle, tending to prevent the ready slip of the sheath, will be formed; also, when the swiveled section is in place its ends will abut closely and squarely against the ends of the main portion or body of the mandrel, whereby no objectionable gaps will occur.

What I claim as my invention is—

1. An annular mandrel having a swiveled section and adapted for the formation of an annular pneumatic tire-sheath, whereby the bore is determined by the transverse sectional area of the mandrel, substantially as described.

2. An annular, cylindric, metal mandrel having a swiveled section, and adapted for the formation of an annular, tubular pneumatic tire-sheath whereof the bore is determined by the transverse sectional area of the mandrel, substantially as described.

3. The annular mandrel A for the purpose described, having a swiveled section connected with the main portion of the mandrel by a swivel joint comprising a swivel pin engaging in recesses in the section and main portion of the mandrel and having a groove which receives a stop, substantially as set forth.

4. The annular mandrel A for the purpose described, having a section which is swiveled at one end, the opposite end of the swiveled section and the adjacent end of the main portion of the mandrel being provided with latching means, substantially as set forth.

5. The annular mandrel A for the purpose set forth, having a swiveled section, and means for connecting the free end of the swiveled section with the remaining portion of the mandrel, consisting of a dovetailed tongue and groove, substantially as set forth.

6. The annular mandrel A for the purpose

set forth, having a section which is swiveled at one end, and means for holding and locking together the free end of the section and the adjacent end of the main portion of the mandrel, comprising a dovetailed tongue and groove and a latch, said tongue and latch being concealed when the swiveled section is held and locked in place, substantially as described.

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