No. 713,168. Patented Nov. 11, 1902.

J. H. STEVENS & C. H. THURBER.

PYROXYLIN ARTICLE.

(Application filed July 18, 1902.)

(No Model.) 2 Sheets—Sheet 1.

Fig: 1

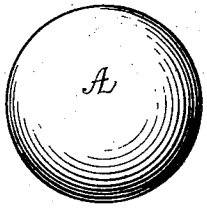


Fig: 2

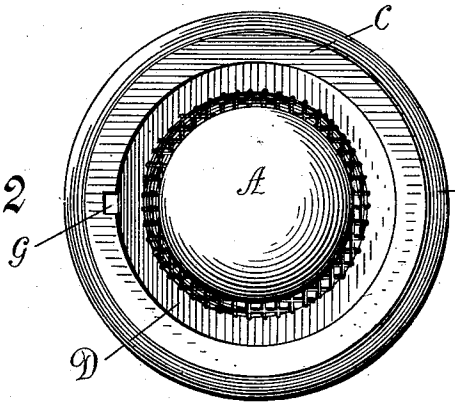
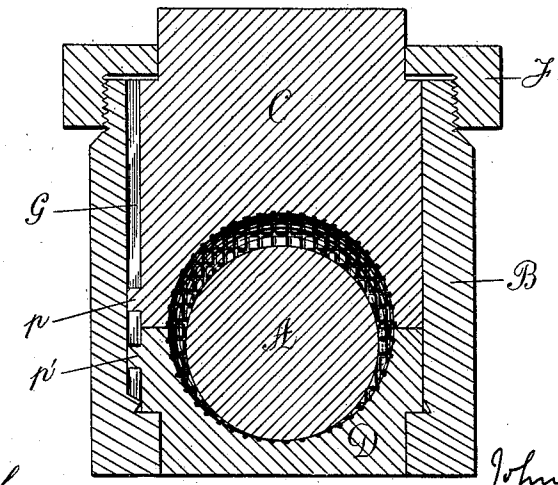


Fig: 3



WITNESSES:

F. N. Roehrich

James M. Stewart

INVENTORS

John H. Stevens,

Charles H. Thurber,

BY

J. Hinton Hyde

ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 713,168. Patented Nov. 11, 1902.

J. H. STEVENS & C. H. THURBER.

PYROXYLIN ARTICLE.

(Application filed July 18, 1902.)

(No Model.) 2 Sheets—Sheet 2.

Fig: 4

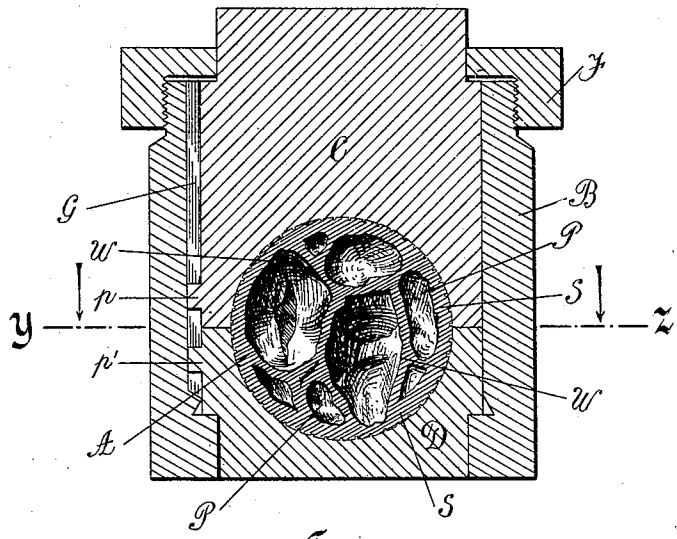


Fig: 5

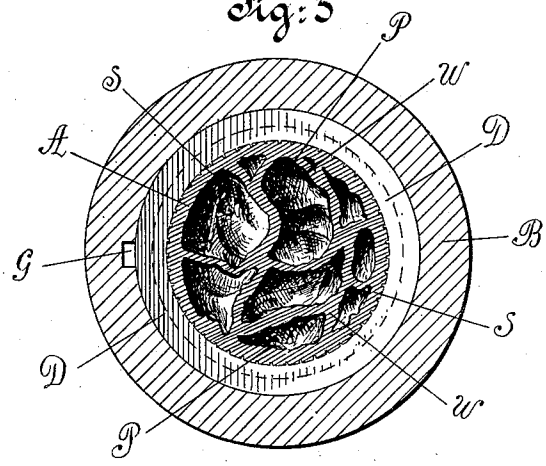
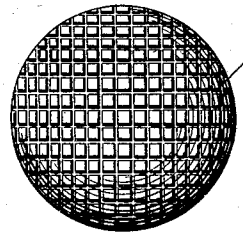


Fig: 6



WITNESSES:
F. N. Roehrich
James M. Stewart.

INVENTORS
John H. Stevens,
Charles H. Thurber,
BY
J. Hindon Hyde
ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN H. STEVENS, OF SOUTH ORANGE, AND CHARLES H. THURBER, OF EAST ORANGE, NEW JERSEY, ASSIGNORS TO THE CELLULOID COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

PYROXYLIN ARTICLE.

SPECIFICATION forming part of Letters Patent No. 713,168, dated November 11, 1902.

Application filed July 18, 1902. Serial No. 116,023. (No model.)

To all whom it may concern:

Be it known that we, JOHN H. STEVENS, residing at South Orange, and CHARLES H. THURBER, residing at East Orange, county of Essex, and State of New Jersey, citizens of the United States, have invented certain new and useful Improvements in Pyroxylin Articles, of which the following is a specification.

Our principal object is the production of a golf-ball of the proper weight, color, and elasticity.

We manufacture our articles from any suitable pyroxylin compound, the best and best known being the material called "celluloid."

Various attempts have been made to make golf-balls from celluloid and similar compounds owing to the inherent objections to golf-balls made from gutta-percha and similar substances. These objections to gutta-percha are due to the naturally dark color of such balls, which limits their whiteness to the paint on their surface, and also to a natural softness, which causes them to become marred or dented by a blow. Celluloid can be made in a permanent and brilliant solid white or in different colors, and this imparts an additional value to our invention, for in place of the dull white gutta-percha ball now commonly used we enable the player to substitute colors which will give an individual character to the different balls in play; but while attempts have been made, as stated, to use celluloid and similar compounds for golf-balls it has been found that the specific gravity of a solid pyroxylin ball is too great, as it interferes with its carrying properties and presents too wide a variation from the lighter-weight balls to which players have become accustomed. In order to overcome this objection, attempts have been made to combine celluloid with other substances—such as rubber, sawdust, &c.—but so far as we are aware no one has ever made golf-balls which are wholly made of celluloid or similar pyroxylin compounds, and it is the object of our invention to make such a ball. As a result of our experiments we find that this can be accomplished in the following manner: We take celluloid or a similar pyroxylin compound in a soft or uncured state and roughly form it into a ball of about the weight desired in the finished product. We then preferably season this soft ball—that is, allow the solvents to evaporate—until it has an outer skin or rind of fairly hard material of about one-eighth of an inch or more in thickness, while the interior or core of the ball still remains in a soft condition. The ball is then locked in a die or chamber, the interior of which may be roughened or be made in any suitable pattern, and the die is heated by any suitable means, but preferably in an atmosphere of steam and preferably in such manner that the heating is rapid and uniform. The effect of this treatment is to vaporize, and therefore expand, the liquid solvents in the interior of the ball, and by this means create an internal pressure which swells the mass of material, so that it fills and takes the impression of the die and at the same time creates a porous interior in the ball or other article. The seasoned rind or shell on the exterior of the ball prevents the escape of most of the solvent and the formation of blisters on the surface. Plastic celluloid should be used, which does not depend on the liquid solvent for its moldable properties. The pyroxylin compound containing camphor is best, since it will readily soften and swell under heat and the expansive pressure of its internal gases, no matter how hard the outer shell or rind of the ball is dried. The period of drying and formation of this hard exterior shell can be varied according to the softness of the material or the amount of liquid solvent it is desired to retain and utilize in the interior of the ball. As the non-shrinkable condition of the ball is improved by this preliminary hardening, it should be carried as far as possible without interfering with the subsequent expansion of the liquid solvents contained in the interior of the ball. It will be also understood that by holding the ball under heat for a sufficient length of time a large part of the expanded solvent will gradually find its way through the celluloid and escape by means of vents in the die, because celluloid under pressure will permit the passage of a moderate amount of solvent without blistering.

After taking the ball from the die it is still further seasoned by exposure to the atmosphere. In cases where the operator through lack of judgment in the preliminary formation of the outer hardened shell cannot be depended on to make a ball which will remain round after leaving the die we recommend the formation of a ball a trifle larger than the size required, as such ball can be thereafter turned or molded to the right size after it is seasoned.

By means of our invention we are enabled to control the specific gravity of the ball, so that we can make it light enough to float on water or as heavy or heavier than the popular gutta-percha ball.

Our invention is illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of the article with its exterior seasoned surface before it is introduced into the die. Fig. 2 is a plan view of the article when placed in the die. Fig. 3 is a longitudinal sectional view of the article and die after the article has been placed in the die and before heat has been applied. Fig. 4 is a longitudinal sectional view of the die and article after heat has been applied to expand the interior solvents contained in the article. Fig. 5 is a horizontal section of the article and die on the line Y Z of Fig. 4. Fig. 6 is a perspective view of the finished article.

Similar letters of reference relate to similar parts throughout the several views.

Referring to the figures, A, Figs. 1, 2, and 3, represents the article with its outer shell seasoned and its interior in a green or unseasoned condition.

B, Figs. 2, 3, 4, and 5, represents the exterior casing, which contains the two parts of the die C and D, respectively.

F, Figs. 3 and 4, represents the cap or collar secured to the outer casing after the article has been placed in the die and by which the two parts of the die are held rigidly in place before being placed in a steam-heated gun or chamber, in which the heat (preferably steam heat) is supplied to the die with its contents.

E, Fig. 6, is the finished article.

g, Figs. 2, 3, 4, and 5, is the channel or guide in the outer casing for retaining the pins *p* and *p'* on the two parts of the die, respectively, and thus hold them without displacement.

Figs. 4 and 5 show the interior of the article A after the pores or spaces P have been formed in its interior by the expansion of the gases, W representing the walls between these pores or spaces, and S representing the outer hardened porous exterior or shell, Figs. 4 and 5.

It will be understood that the particular form of apparatus illustrated is not an essential part of our invention and may be varied to suit the different articles without departing from the spirit of our invention.

We are aware that hollow articles—such as doll-heads, parasol-handles, &c.—have heretofore been made of celluloid by "blowing up" a celluloid tube with steam; but we are not aware that any one has heretofore utilized the expansive power of the solvent or solvents in the interior of the mass of celluloid to form a playing-ball or other article, nor are we aware that such expansive power has been controlled and put to practical use by confining its forces to the interior of the mass through the preliminary hardening of the surface in the formation of a hard outer shell.

In regard to the kind of celluloid or pyroxylin compound employed we prefer the material of medium elasticity and one in which the liquid solvents are easily volatilized by heat. Sulfuric ether is an ideal solvent for the purposes, as it volatilizes at comparatively low temperatures; but in practice we prefer to use wood-spirit, as it is cheaper and is also more readily controlled.

Although the outer shell is preferably made non-porous and without blisters, it may happen that there may be some porosity therein and some blisters thereon without departing from the spirit of our invention.

Although the production of a golf-ball has been the chief object of our experiments, our invention is not confined to the production of such balls, as other articles—such as doll-heads, parasol-handles, &c.—may be made by the same process, in which it is desired to produce a hard compact outer shell or surface with a less dense and more porous interior. We therefore include such articles within our invention.

We do not in the present application claim the process of producing these articles, as such process forms the subject-matter of another application filed simultaneously herewith, Serial No. 116,024; but

What we do claim in the present application, and desire to secure by Letters Patent, is—

An article formed of a pyroxylin compound, such as "celluloid" or similar pyroxylin compound, having a substantially solid outer shell and a porous interior, substantially as described.

JOHN H. STEVENS.
CHARLES H. THURBER.

Witnesses:
JAMES M. STEWART,
J. E. HINDON HYDE.