No. 697,924. Patented Apr. 15, 1902.

# E. KEMPSHALL.

## GOLF BALL.

(Application filed Mar. 19, 1902.)

(No Model.)

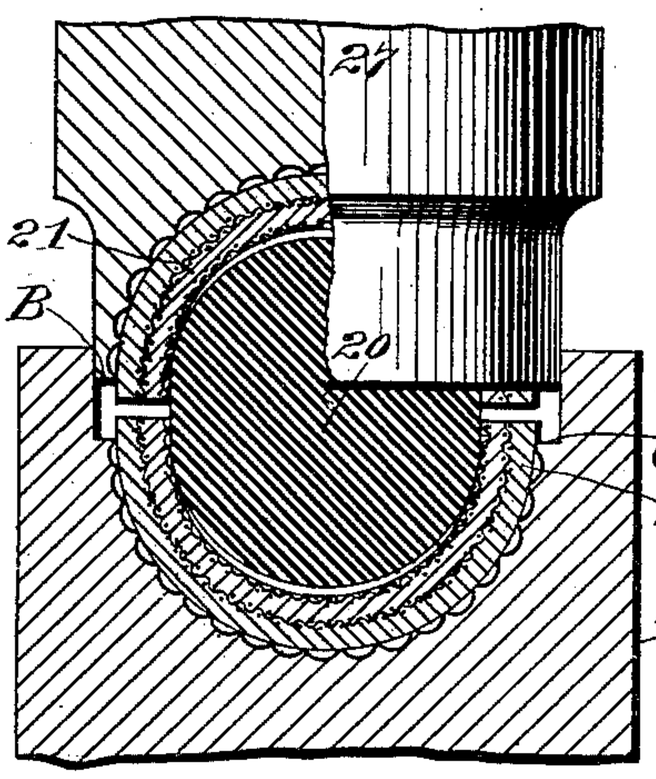


Fig. 1.

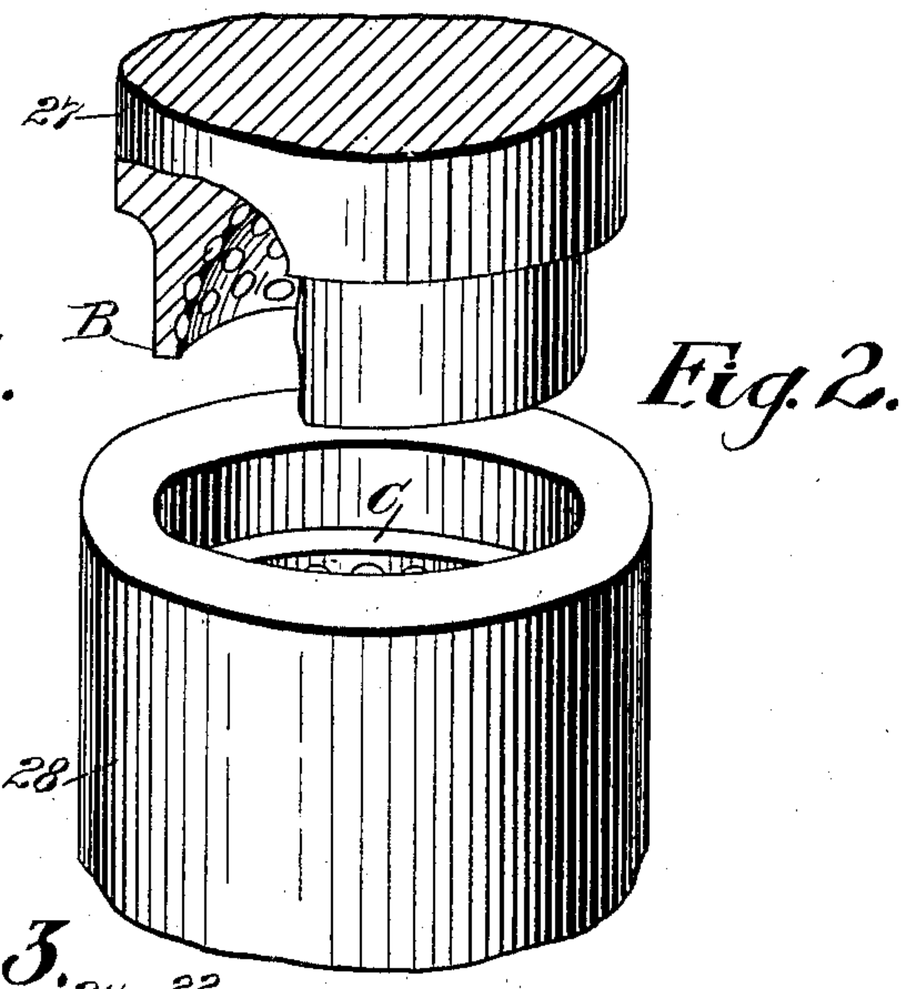


Fig. 2.

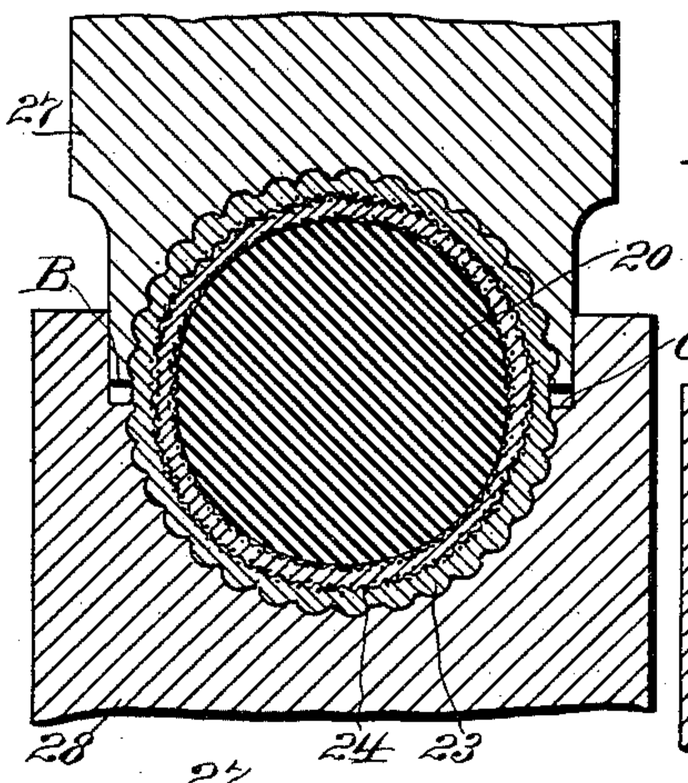


Fig. 3.

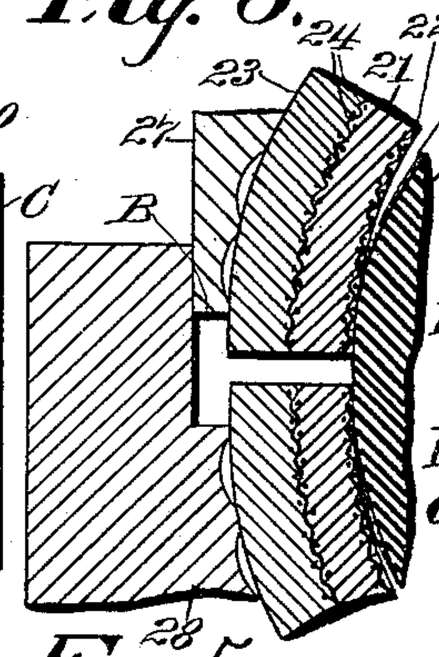


Fig. 5

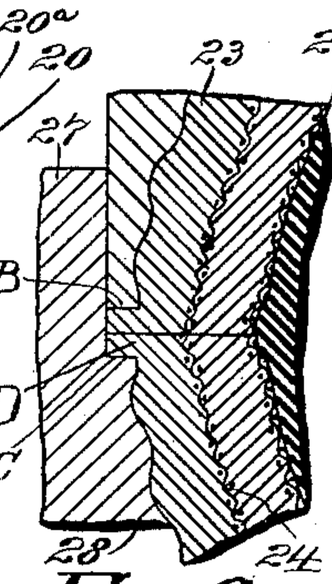


Fig. 6.

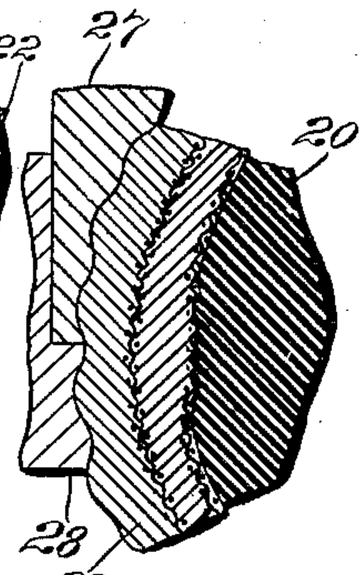


Fig. 7.

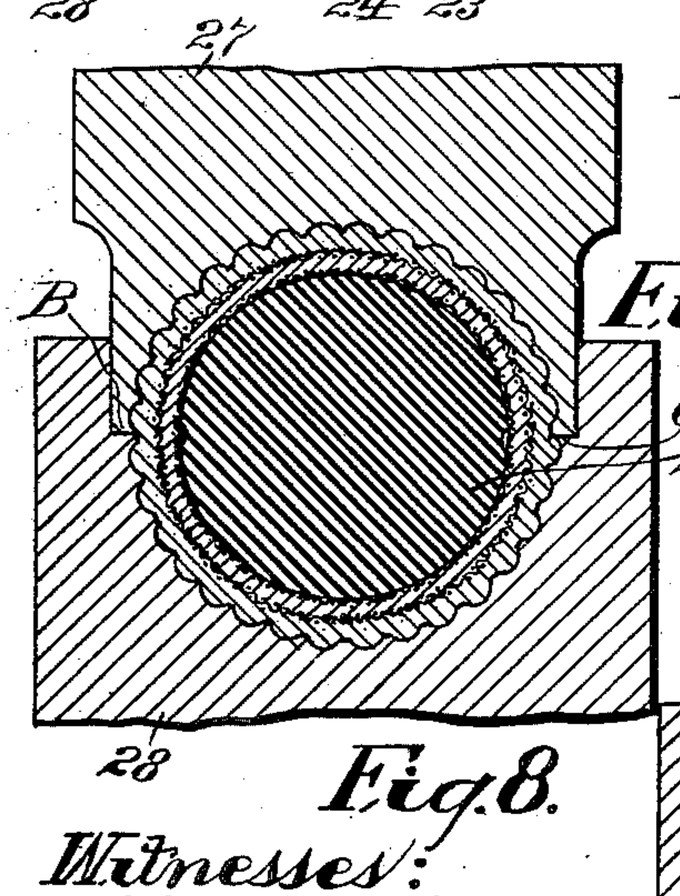


Fig. 4.

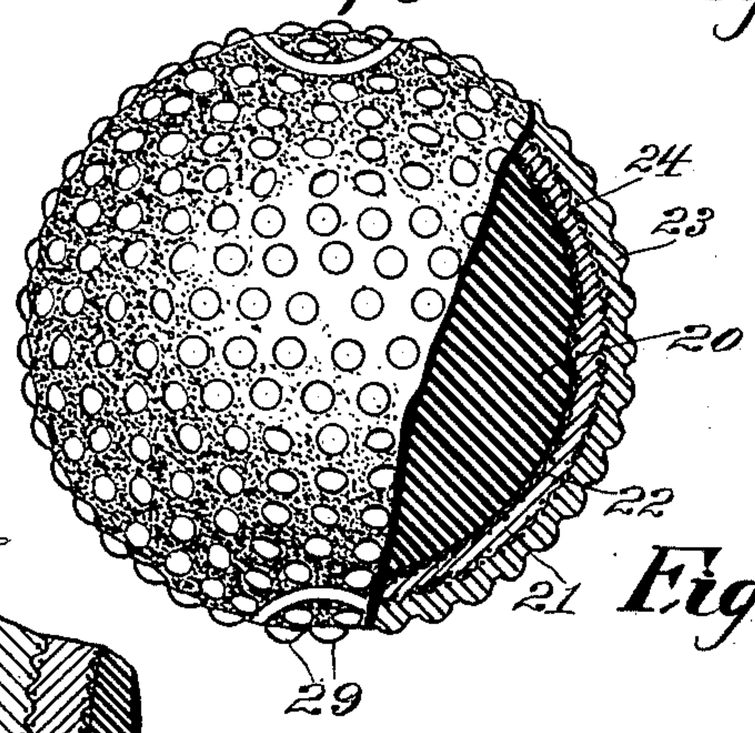


Fig. 9.

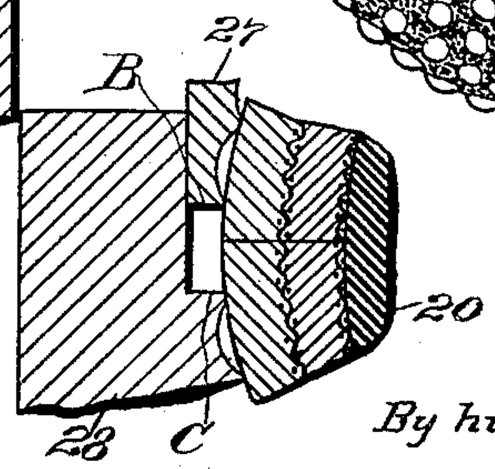


Fig. 8.

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# UNITED STATES PATENT OFFICE.

ELEAZER KEMPSHALL, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE KEMPSHALL MANUFACTURING COMPANY, A CORPORATION OF NEW JERSEY.

## GOLF-BALL.

SPECIFICATION forming part of Letters Patent No. 697,924, dated April 15, 1902.

Application filed March 19, 1902. Serial No. 98,974. (No model.)

*To all whom it may concern:*

Be it known that I, ELEAZER KEMPSHALL, a citizen of the United States, residing in Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Golf-Balls, of which the following is a specification.

This invention relates to playing-balls; and its chief object is to improve the shell of the ball. I render the shell extremely tough and otherwise superior to a simple celluloid shell of the same thickness and compress the shell upon the core, so as to place the latter under permanent compression by the improved shell.

In the drawings forming part of this specification, Figure 1 shows the ball parts placed in a telescoping die. Fig. 2 is a perspective view of the die members. Fig. 3 is similar to Fig. 1, but illustrates a later stage in the process. Fig. 4 is a view similar to Fig. 3, but showing the ball completed. Figs. 5, 6, and 7 are sectional fragmentary views drawn upon a larger scale, so as to illustrate the action of the dies upon the shell and filling. Fig. 8 illustrates a stage in the process between the Fig. 5 and Fig. 6 operations. Fig. 9 is a completed ball shown partly in section.

In the several views similar parts are designated by similar characters of reference.

I form a center piece 20, which may be either a solid sphere or built up of different materials, such as soft rubber. To this filling or core I apply cement, as at $20^a$, and then cover with a shell layer composed of an outer ply of celluloid and an inner ply or facing of fabric, preferably woven, the cement joining the fabric to the rubber core. This two-ply shell may be formed of hemispherical segments, the celluloid being indicated at 21, the fabric at 22. In forming the original shell segments or blanks I preferably combine the celluloid and fabric under heat and pressure, so that the celluloid permeates the meshes of the fabric, thereby making a very firm and tough blank. This shell of celluloid-treated fabric I preferably incase in hemispherical segments compounded of celluloid 23 and woven fabric 24. The layers 23 and 24 are preferably compacted with the layers 21 and 22 before the segments are placed upon the ball 20. The ball thus assembled is placed between forming and heating dies 27 and 28. The original shell-blanks are preferably somewhat too bulky to fit in the closed dies, so that when the latter are brought together the shell is compressed. All of the celluloid used in the shell may be in such a condition of seasoning that by the action of heat it may be rendered sufficiently plastic to enable it to mold under the pressure of the dies and also to enable the several layers to weld to one another, the presence of celluloid in the meshes of the fabric contributing to this effect.

The mass 20, forming the body of the ball, is highly resisting and prevents the composite shell from collapsing under the great pressure of the dies. By reason of the compression of the shell between said dies and said resisting mass the celluloid of the shell is further hardened or tempered and toughened. The bulk of the elastic filling 20 is also preferably somewhat reduced, said filling being placed under permanent compression by the shell, which is retained in the dies until sufficiently cool to hold its shape in spite of the expansive tendency of the core.

Upon the closing action of the dies the material of the plastic shell is squeezed out between the approaching edges or steps B and C of the dies, as at D, Fig. 6, completely filling the annular space between said steps. It will be understood that said material is urged outwardly, not only by the forcing action of the dies directly upon the shell itself, but also by reason of the compression of the core 20, which tends also to expand and force the material of the shell edges outwardly, as at E, Fig. 3. Preferably the edges contact before much, if any, compression of the core is effected, so as to avoid undue squeezing out of the rubber between the edges. The inner member of the telescoping die at the edge portion B is thin, and the annular open space surrounding the ball at Fig. 8 is preferably thinner than said shell, so as to prevent too much outflow of shell material. Upon the further closing of the dies the shell material at D, being unable to escape between the closely-fitting die-sections, is forced or squeezed by the approaching steps B and C back toward the interior of the ball. After the shells meet, as at Fig. 8, the edges thereof tend to break and flow outward until finally the space between the die edges B and C becomes filled with the mate-

rial which has been so dislodged or broken away, breaking up and destroying the continuity of the shell edges and causing an intermingling or mixing of the material of the edge portions of the two half-shells, with the result of producing an integrality of the entire shell of the ball. It will be observed that the process of breaking down the edges of the shell, whereby some of the material is driven outward, is reversed by the further advance of the dies or molds toward each other, whereby the said outflowing material flows back into the shell itself, thus restoring to its approximately original position that portion of the substance of the shell first subjected to the outward flow. Thus by first forcing the material outward and then reversing the action and forcing the same material inwardly the two half-shells become a complete perfectly-welded shell.

It will be understood that the invention is of value in cases where the center and shell have been previously completely formed, since the dies now operate further to solidify the material of the shell and also compress the filling. The shell being of hard wear-resisting springy celluloid combined with fabric and the core being of elastic material held under compression by the shell and the shell being thus solidified and strengthened or reinforced a ball of exceptionally effective and durable quality is produced.

In the case heating-dies are used they may be allowed to cool and harden while the compression is maintained, so that the shell may hold the core under compression.

In practice the balls made by the present process are found to have a high degree of uniformity, and by reason of the dense and uniform character of the material in the different parts of the completed shell the ball is able to withstand the heavy blows to which it is subjected with substantial equality wherever it may be struck. The original half-shells may be made very dense or compact.

By building up a shell by means of thin layers of celluloid alternating with fabric and also causing the celluloid to permeate the fabric I obtain the advantage of a simple celluloid shell, which possesses the advantages of thin plates as to temper, toughness, durability, &c. The layers of fabric, especially when woven, compensate for or overcome the usual brittleness of the celluloid, a composite shell of the kind herein described not being easily cracked or chipped. The presence of the fabric conduces to the springiness of the shell, since it tends to prevent the latter from being indented sharply at any point, so that when the ball is struck by an implement not only the point of contact, but also the portion of the shell surrounding said point, is flexed, thereby affecting a large area of the resisting springy mass within the shell. Hence neither the shell nor the inner mass is unduly distorted by a blow, so that little force is absorbed in changing and restoring the shape of the ball, while owing to the large proportion of the core affected great energy is brought to bear in restoring the shape of the ball, thereby causing it to spring from the implement with phenomenal speed. Cementing the shell to the core conduces to this result, it being highly desirable that the shell and core be inseparable under ordinary usage. It is not essential in all cases that three layers be employed in the shell so long as the inner layer is faced upon its concave side with fabric, which enables the layer to be cemented to the core.

My improvements may be applied in building up a shell of other material than celluloid in combination with a ply or plies of tough material, especially where one or more of the layers or blanks consist of joined segments.

I usually make the surface of golf-balls pebbled or brambled, as at 29, Fig. 1, although balls intended for other games may be otherwise finished.

In using herein the term "celluloid" I do not limit myself to any particular compound of the celluloid or pyroxylin class.

It will be seen that the edges of the fabric are brought into intimate relation at the welding process, thus making, in effect, two complete spheres of fabric embedded in complete spheres of celluloid, the shell thus formed being phenomenally strong and durable and the ball meeting the requirements of the game to a remarkable degree.

Having described my invention, I claim—

1. In a playing-ball, the combination with a springy core of a shell cemented thereto and formed of a single pair of welded segments each consisting of two layers, each of said layers consisting of hard, springy material reinforced by tough material.

2. In a playing-ball, the combination with a sphere of rubber of a shell consisting of a single pair of hemispherical segments each consisting of two layers of celluloid interiorly faced with cloth, the inner layer being cemented to said rubber sphere, and the latter being held under compression by said shell.

3. A playing-ball consisting of a yielding core upon which is cemented a closely-compacted thin shell consisting of a single pair of multiple-ply celluloid and fabric segments, each faced upon its inner side with fabric.

4. In a playing-ball, the combination with a core of springy material of a single pair of hemispherical cover-segments welded at their edges and holding said core under compression; each segment comprising an inner layer of woven fabric, a layer of celluloid, as 21, a second layer of woven fabric, and a second layer of celluloid.

5. In a playing-ball, the combination with a core of a single pair of spherical segments, each comprising two layers of woven fabric, as 22, and two layers of celluloid, as 21; said segments being welded at their edges and cemented upon the core.

6. In a playing-ball, the combination of a core and a shell compressed thereon and consisting of an outer ply of well-cured celluloid, then a ply of fabric, then a second ply of celluloid, and then a second ply of fabric, the latter being cemented to said core.

7. In a playing-ball, the combination with a spherical core consisting at least partially of soft rubber of a shell thereon consisting of a ply of woven fabric next to said core, a ply of celluloid, a second ply of woven fabric, and a second ply of celluloid, the latter forming the outer surface of the ball.

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