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Patented May 6, 1902.

E. KEMPSHALL.  
MANUFACTURE OF GOLF BALLS.

(Application filed Mar. 12, 1902.)

(No Model.)

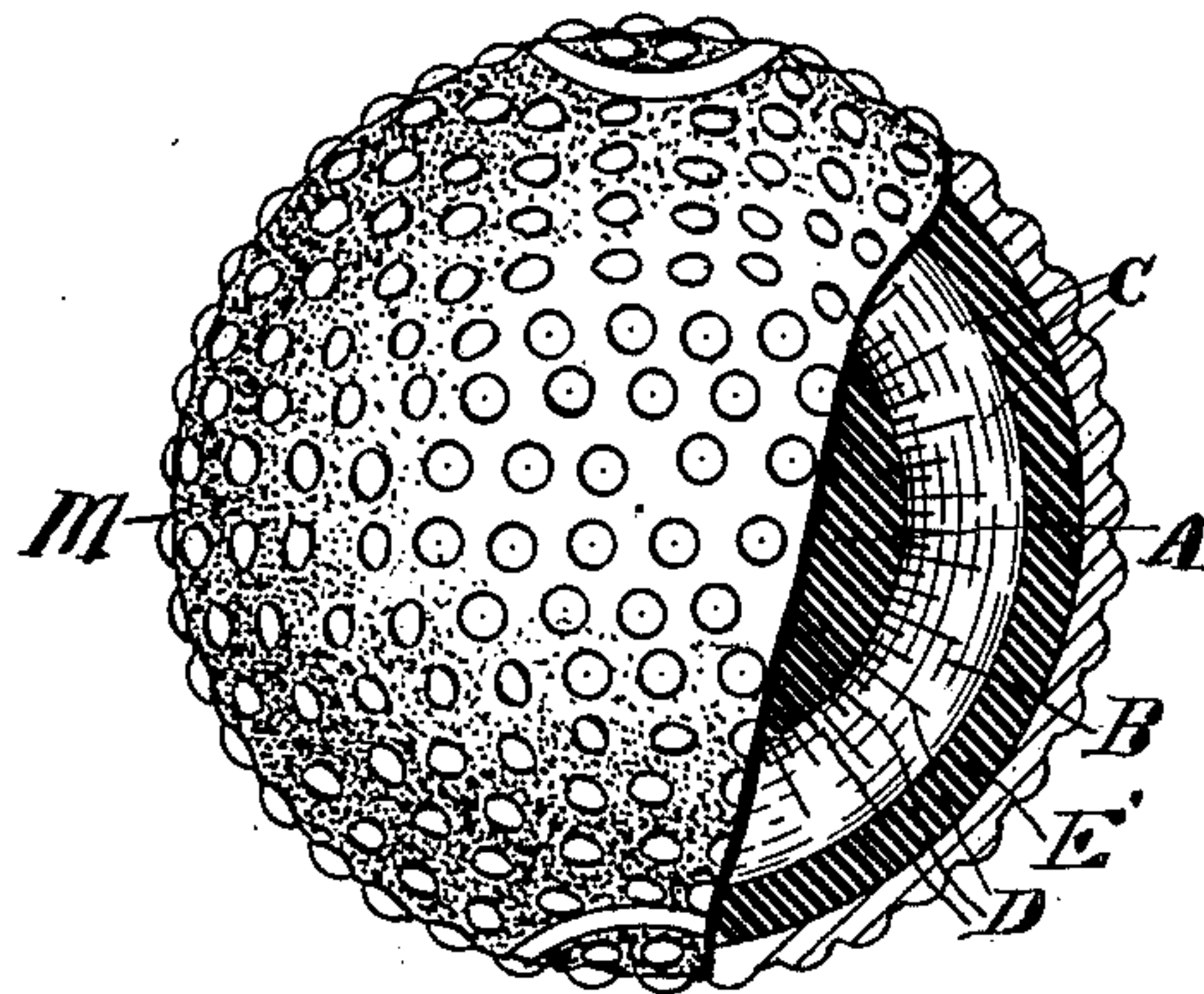


Fig. 1.

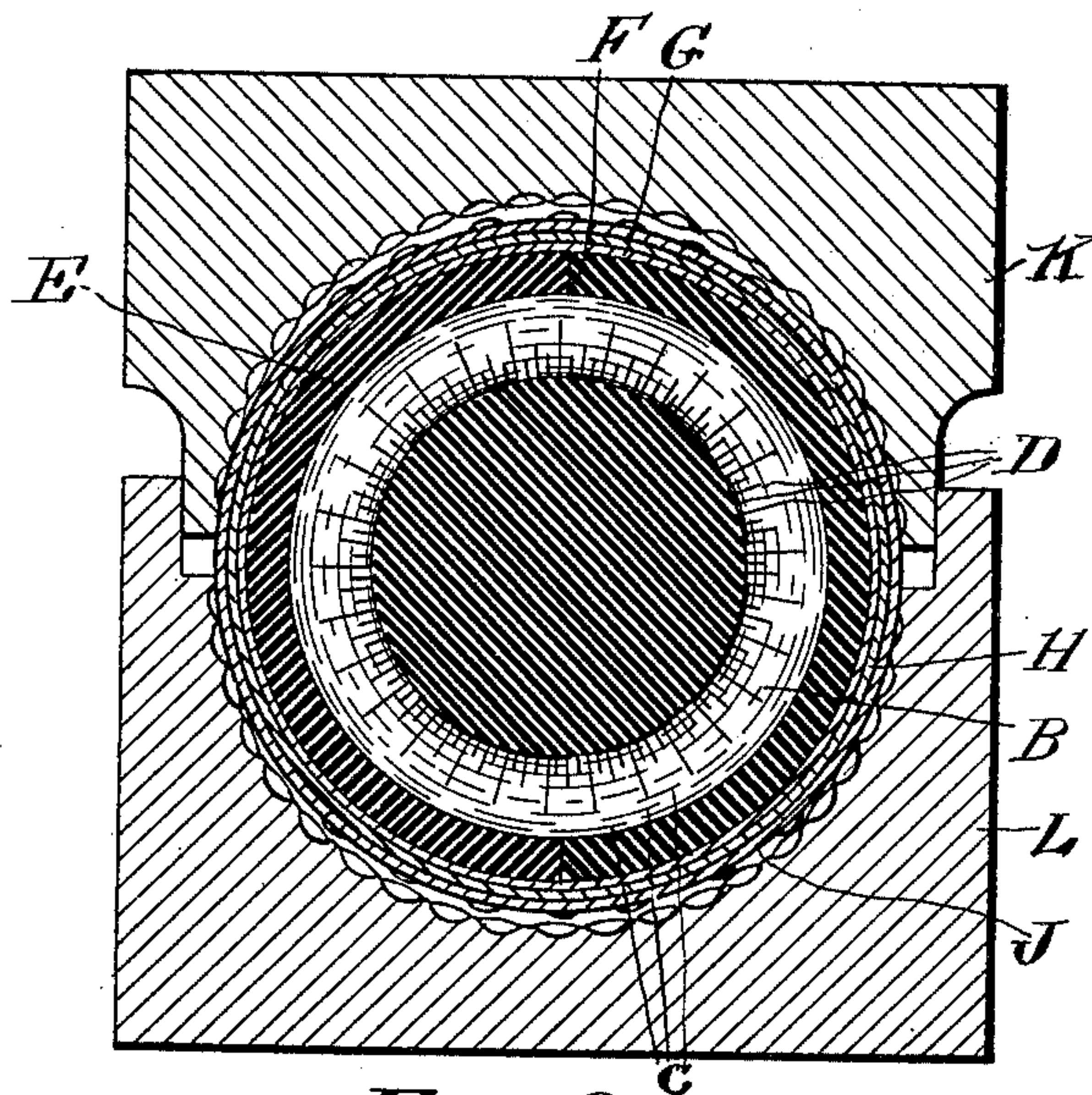


Fig. 2.

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## MANUFACTURE OF GOLF-BALLS.

SPECIFICATION forming part of Letters Patent No. 699,623, dated May 6, 1902.

Application filed March 12, 1902. Serial No. 97,888. (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 Manufacture of Golf-Balls, of which the following is a specification.

This invention relates to the process of manufacturing playing-balls such as used in the game of golf and other games. Its object is to produce at low cost an efficient ball having the quality of being "dead" when given a light blow and exceedingly lively when struck a sharp blow.

In the drawings forming a part of this specification, Figure 1 is a view of a ball made according to my improvements, being partly broken away so as to exhibit its construction, and Fig. 2 illustrates a stage in the process of completing the ball.

I make a spherical core A, of gutta-percha, which is preferably introduced in a fluid condition and hardened within a suitable rubber envelop B, and I force the gutta-percha into said envelop to such an extent as to materially expand said envelop, as set forth in a patent granted to Francis H. Richards, March 25, 1902, No. 696,351, whereby the envelop, especially the exterior portion thereof, is put under a state of high longitudinal tension, as indicated by broken curved lines C. The interior portion of the envelop is then compressed by the exterior portion, as indicated by the radial lines D, so that the core is held constantly under compression by said envelop. The combination of compressed core and distended envelop enhances the efficiency of the ball when struck a heavy blow. However, if desired, soft rubber may be otherwise employed for inclosing a core.

Upon the compound core of rubber and gutta-percha thus formed I place a shell or sphere E, of gutta-percha, preferably in the form of hollow hemispheres, the joint between them being indicated at F. Upon this shell I apply a coating of material G, said coating completely enveloping the gutta-percha sphere and consisting of a thick or dense solution of celluloid, or composition thereof, which is in such a plastic or fluid condition

that it may be spread in a substantially even and somewhat thin layer. In practice I find that if this coating is one one-hundredth of an inch, more or less, in thickness it may answer the purpose. The coating is then allowed to dry to a sufficient extent so that it can be handled safely. This drying effects a preliminary seasoning of the coating material. It will be understood that the material dried out or evaporated from this coating cannot at the subsequent heating and finishing operation work into the interior of the ball, to the detriment thereof. When said coating G has become sufficiently hardened, I apply a second coating H over the ball, which in turn is allowed to dry until it attains the required firmness. I then apply a third coating J, which is likewise allowed to dry. In this manner one or more additional layers may be successively applied, according to the style of ball in hand. In practice I find that three layers, or at the most four layers, produce a casing of satisfactory qualities when the ball is intended for use in the game of golf, provided that the casing so built up is supported upon a filling of suitable material and having the proper firmness. The ball thus built up is placed in finishing-dies K and L and subjected to both heat and compression. In practice I prefer that the ball when placed in the dies shall be somewhat oversize, so that as the die-sections are brought together they compress the ball, thereby effecting a twofold purpose—first, to compress the core, so that it may always exert an outward elastic pressure upon the finished shell, and, second, to subject the material of the casing to compression as well as heat, thereby solidifying the material of the casing itself, so that it may have the qualities of resistance, firmness, indestructibility, and springiness, which are desirable in a golf-ball. The heat and pressure may be applied for a considerable period, so that the ball may be well seasoned.

The heating of the dies by softening the coatings G, H, and J not only insures the kneading or welding of such coating into one integral casing M, but also facilitates the flowing of the material, so that the shape of



the dies is imparted to the finished ball. The ball may be allowed to cool while under compression, so that the gutta-percha shell and the celluloid casing thereon when removed  
 5 are sufficiently hardened to retain their shape. Thus it will be seen that the casing is made without any seam or joint, and hence it will be adapted at all points to withstand shocks from the blow of an implement or from being  
 10 driven against a stone. At the same time the ball is not subject to internal deterioration from the presence of gas or other matter escaping from the celluloid into the interior of the ball during the heating. Moreover, the  
 15 necessity for first rolling the celluloid into sheets and then cutting the sheets into disks and cupping them is avoided, and the trouble and expense of securing a perfect weld between the shell joints is also avoided.

20 Preferably the heat is sufficient to also soften the gutta-percha shell E and enable it to weld at the joint F. I thus form a double shell upon the compound rubber and gutta-percha core, which possesses great strength  
 25 and durability. The gutta-percha is thus caused to form one complete sphere, as at E', and the celluloid another complete covering, as at M.

30 The pressure of the dies compacts and solidifies both the celluloid and gutta-percha components of the shell, the confined rubber and gutta-percha being sufficiently resisting to support the comparatively weak material of the shell under any desired degree of pressure of the forming-dies.  
 35

By providing a backing of gutta-percha in the shell I am enabled to employ a relatively thin compound plate of celluloid for the outer covering, thereby not only reducing the expense, but also making it possible to use celluloid in its most effective form, since a thin plate of this material possesses valuable characteristics not found, or at least imperfectly developed, in a thick plate. For one  
 40 thing, a thin cover of celluloid may be better seasoned than a thick or massive cover, and it is more springy and pliant, while possessing the same wear-resisting, smooth, waterproof, and other qualities which render the  
 50 ball desirable in the game of golf. At the same time I am enabled to use in the shell a large mass of gutta-percha, which possesses to a superlative degree the quality of storing up force from a blow, which is necessary in a  
 55 golf-ball. It will be understood that it is important in view of the small size of the ball used in this game and the necessity of its carrying or flying a great distance to use in its construction such a combination of materials  
 60 as will utilize to advantage every portion of the mass of the ball, or, in other words, it is important to eliminate all dead weight therefrom. Hence it is desirable not only to provide a core or filling having the desired qualities, but also to provide therefor a shell  
 65 which not only protects said filling, but also itself contributes in a large degree to the fly-

ing power or efficiency of the ball, while preventing a light blow from affecting the highly elastic interior. This desideratum is obtained in this instance by reducing the thickness of the celluloid cover, so as to retain only enough thereof to provide a wear-resisting, waterproof, and otherwise satisfactory exterior for the balls, and lining such cover  
 75 with a relatively thick mass of gutta-percha, which not only has great carrying power, but is tough. The celluloid overcomes the objections to the use of a plain gutta-percha exterior, while all the advantages of the  
 80 gutta-percha are retained.

One important advantage of my celluloid casing or cover resides in its quality of retaining its original color throughout all the severe usage which it receives in a game.  
 85 The compressed compound core gives the entire shell a good backing at all points and tends to prevent such indentations of the shell by an implement as would cause the shell to crack. The celluloid casing is not  
 90 only practically indestructible, but it is at the same time so smooth that it offers little resistance to the air in its flight. It drives farther than any ball heretofore produced, while on account of its slipperiness it easily  
 95 travels through grass and is hence excellently adapted to the game. It overcomes the defect of prior golf-balls of being easily cut out by a blow from an implement.

In using the term "celluloid" I refer to celluloid compounds generally and do not limit myself to any particular variety of such compound nor to any particular grade or mixture of pyroxylin composition.  
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Variations in construction, material, method, and other particulars may be resorted to within the scope of my present improvements. A gutta-percha and celluloid shell may be otherwise formed within the scope of my improvements and may be used with other fillings than those herein specifically mentioned.  
 105 110

Having described my invention, I claim—

1. A process in producing a playing-ball, consisting in forming a rubber sphere, covering said sphere with a gutta-percha shell, applying plastic or fluid coating to said shell, and hardening said coating so as to form a casing upon said shell.  
 115

2. A process in making a playing-ball, consisting in forming a yielding core, covering said core with hemispherical segments of gutta-percha, covering the latter with a plastic or fluid coating, hardening said coating so as to form a casing, and compressing said casing upon the ball.  
 120 125

3. A process in making a playing-ball, consisting in placing a yielding core within a gutta-percha shell, covering the whole with a celluloid solution, and effecting a hardening and compression of said coating under heat, so as to form a casing upon the shell.  
 130

4. A process in making a playing-ball, consisting in covering a soft core with a gutta-percha shell, covering the shell with succes-



sive layers of celluloid, hardening one layer before the next is applied, and applying thereto simultaneously heat and compression, so as to compact the same into a stiff, springy casing.

5 5. A process in making a playing-ball, consisting in applying a gutta-percha shell to a rubber core, covering said shell with successive layers of plastic or fluid material, and  
10 hardening each layer before the casing is applied, then subjecting the whole to heat and compression and maintaining the compression while the ball cools.

15 6. A process in making a playing-ball, consisting in applying upon a compound core

whereof the outer portion consists of a distended rubber envelop, a shell consisting at least partially of compressed gutta-percha, adding a plurality of layers, one after another, of fluid or plastic material, drying or partially curing one layer before another is applied, and  
20 subjecting the whole to heat and compression to an extent to weld said layers and place said rubber envelop under compression, and maintaining the compression while the ball  
25 cools.

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