No. 791,648. PATENTED JUNE 6, 1905.

F. H. RICHARDS.

APPARATUS FOR MAKING GOLF BALLS.

APPLICATION FILED JUNE 12, 1902.

4 SHEETS—SHEET 1.

Fig. 1.

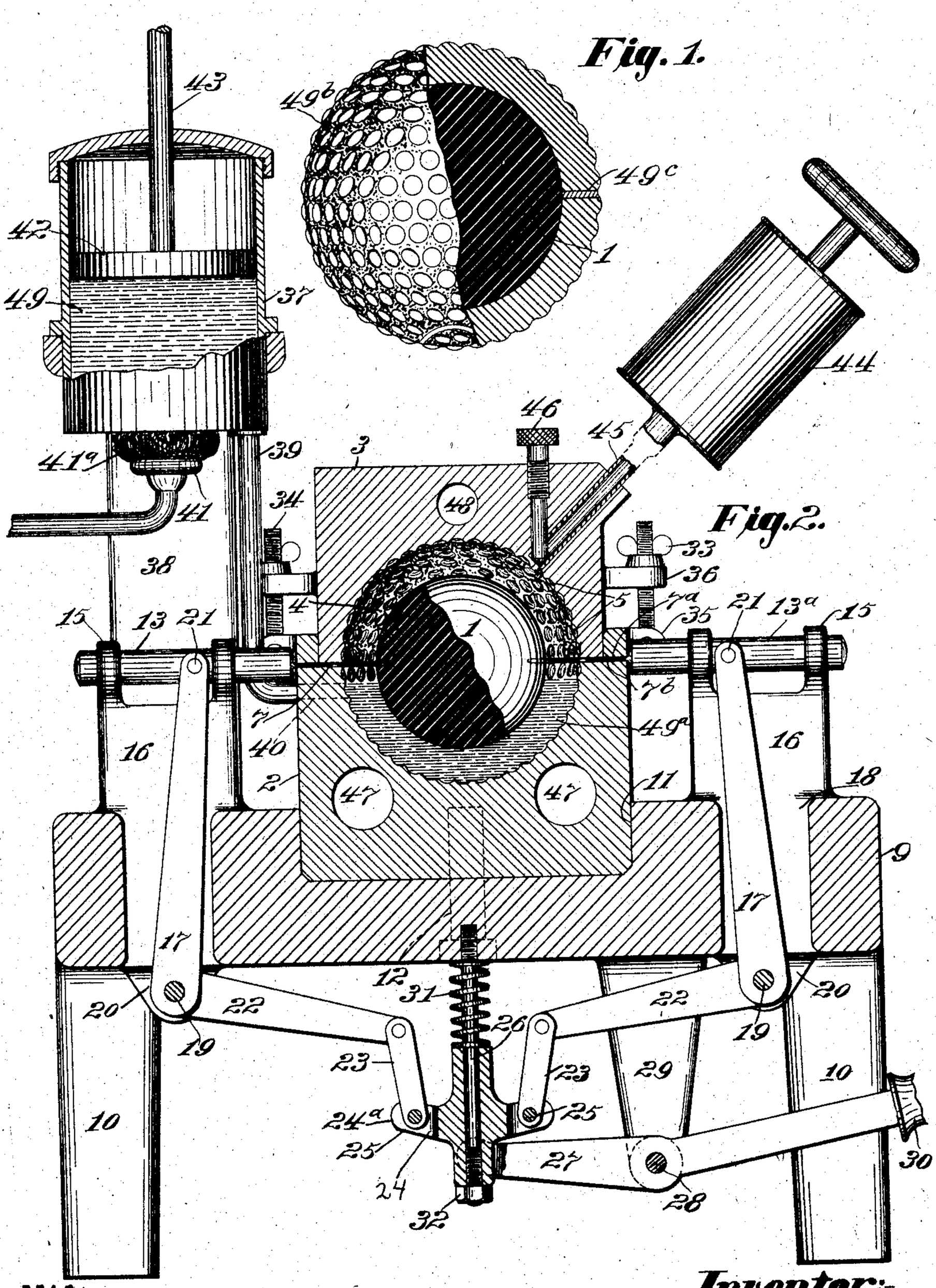

Fig. 2.

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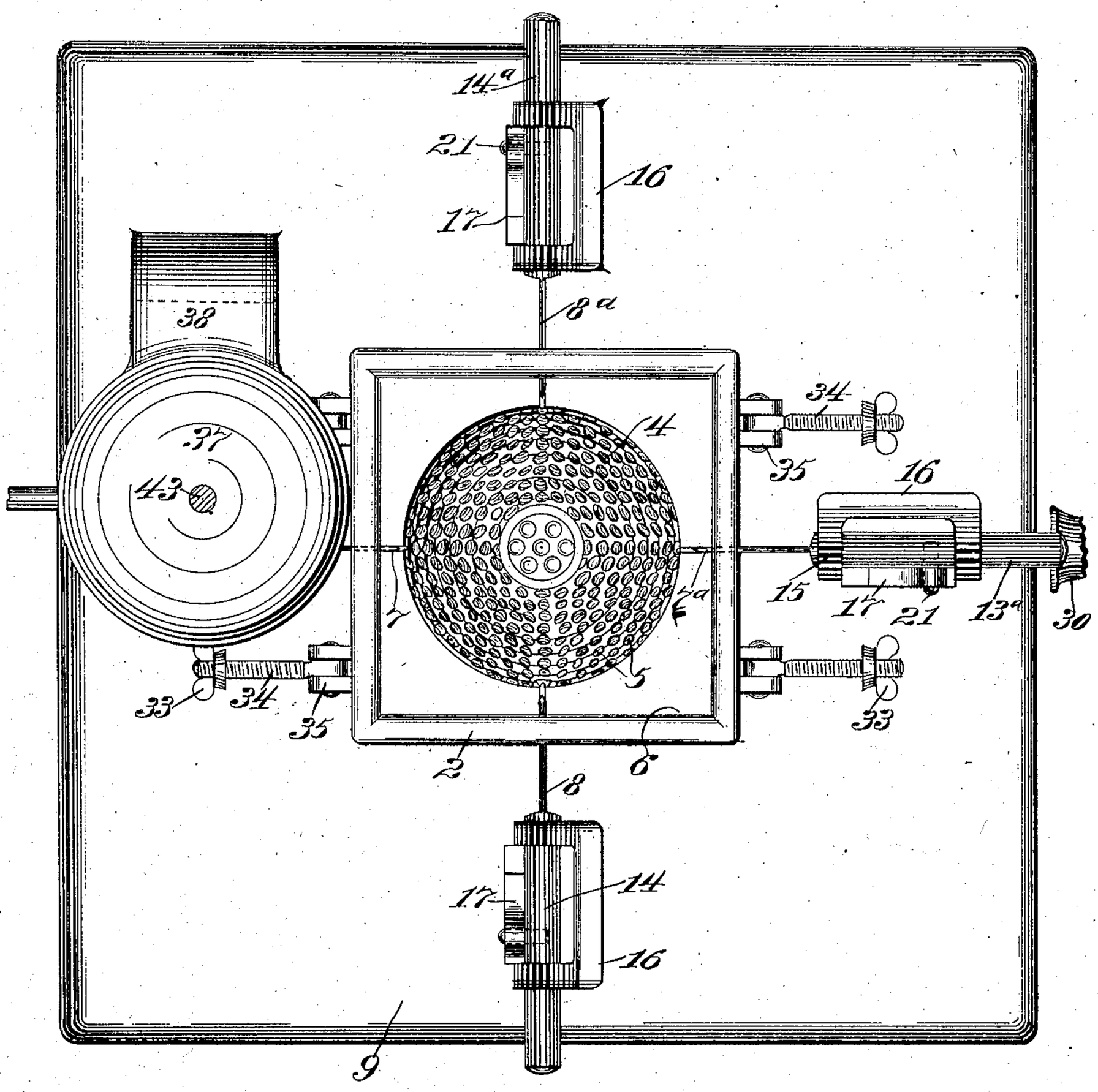
4 SHEETS—SHEET 2.

Fig. 3.



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4 SHEETS—SHEET 3.

Fig. 4.

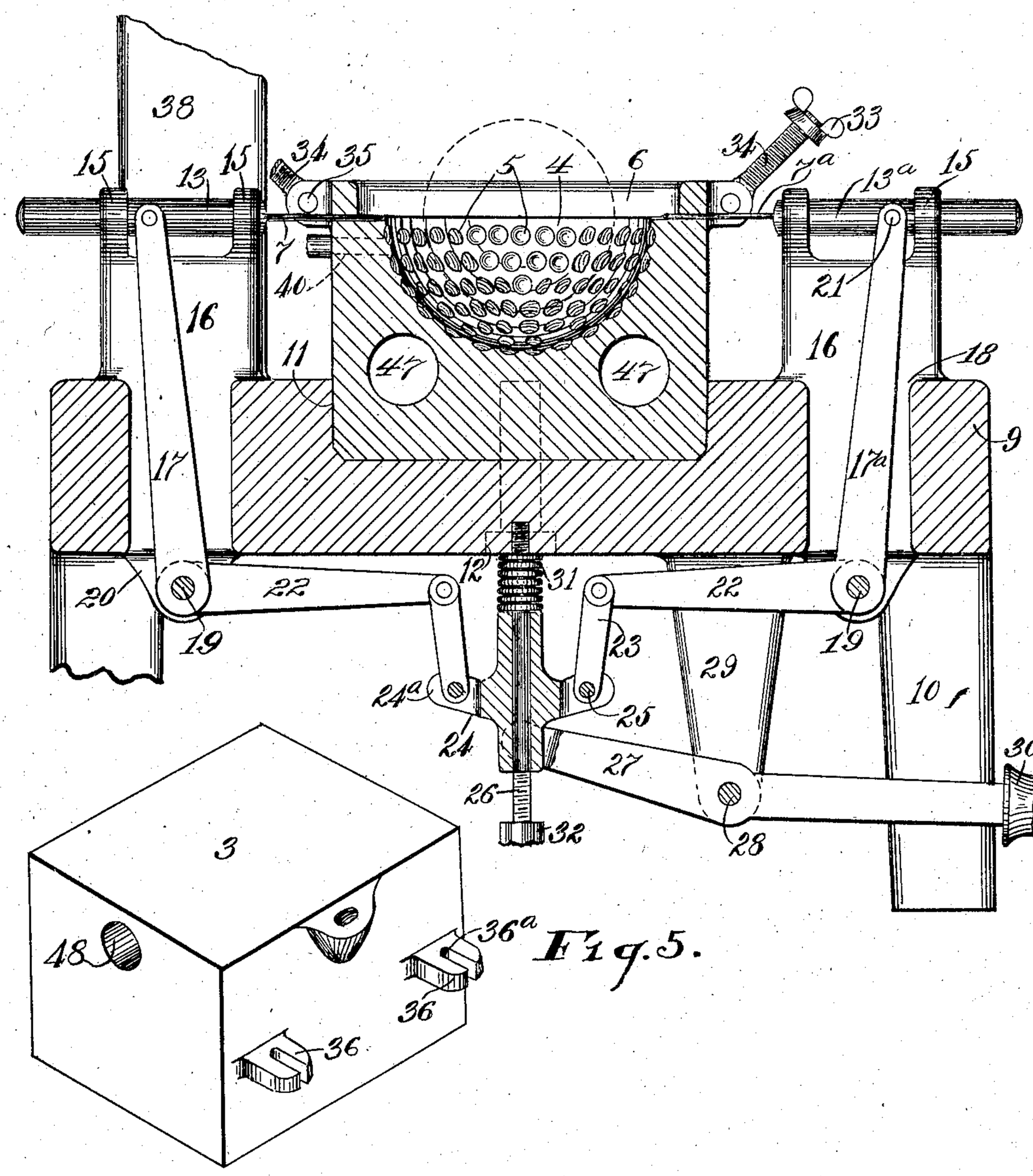

Fig. 5.

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4 SHEETS—SHEET 4.

Fig. 6.

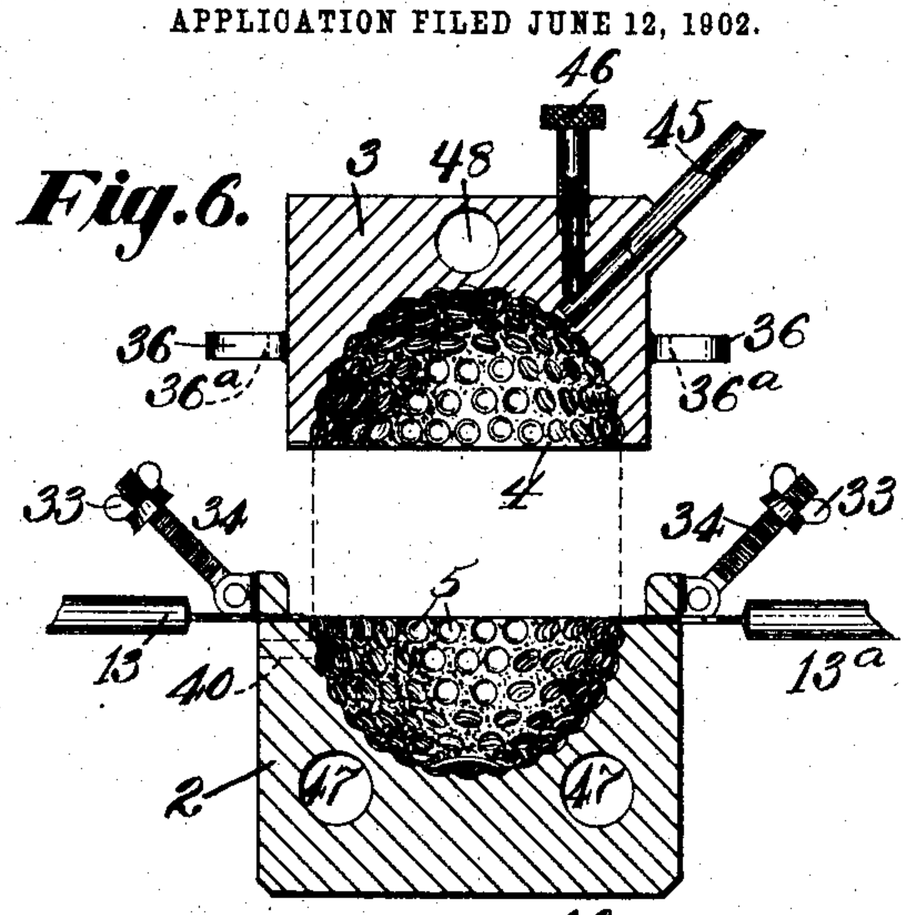


Fig. 7.

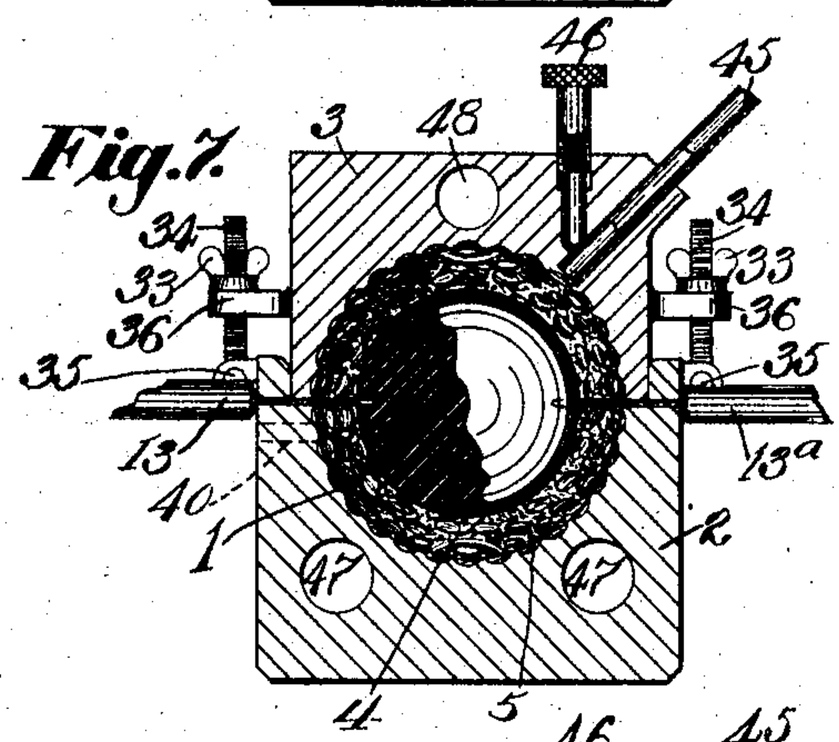
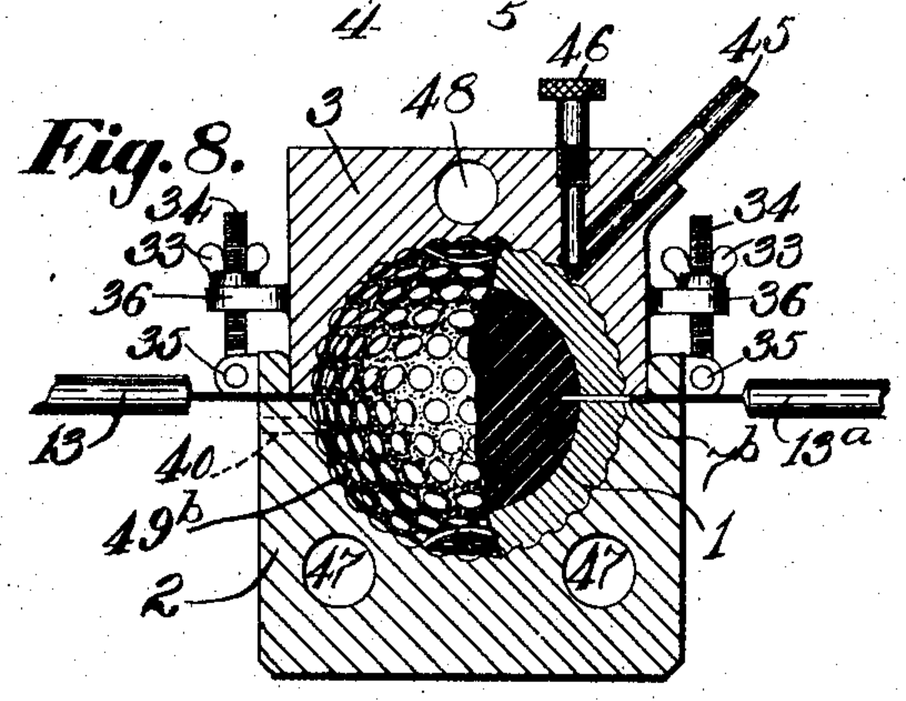


Fig. 8.



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No. 791,648. Patented June 6, 1905.

UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

APPARATUS FOR MAKING GOLF-BALLS.

SPECIFICATION forming part of Letters Patent No. 791,648, dated June 6, 1905.

Application filed June 12, 1902. Serial No. 111,264.

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Apparatus for Making Golf-Balls, of which the following is a specification.

This invention relates to an apparatus for manufacturing golf or other playing balls, and especially to producing shells or covers upon cores or fillings.

Certain features of the invention may be employed also in producing solid balls from gutta-percha or from other plastic material.

Some difficulty is experienced in making cored balls in causing the core to occupy a position exactly central of the finished ball, especially when there is used for the shell gutta-percha or other material which is softened or rendered plastic when compressed upon the core. It is necessary to regulate the heat within narrow limits, since it must sufficiently soften the shell, while if it is too great the shell material is liquefied, so that the core is apt to float out of its central position and become fixed in an eccentric position upon the hardening of the shell.

One object of my invention is to overcome these difficulties.

A further object is to avoid the necessity of constructing a shell by welding segments together, since unless care is taken in the welding the ball is liable when struck a severe blow to burst at the weld.

Other objects are to eliminate irregular air-bubbles from the ball and also to produce a uniformly compact texture all over the shell and also to make the shell of uniform thickness, thereby producing a ball which gives a uniform response upon whatever part of the ball the blow is received, which is a feature of importance in balls intended for use in the game of golf.

A further object is to simplify the operation and cost of making the balls, and other objects will hereinafter appear.

In the accompanying drawings, Figure 1 is a part-sectional view of one of the several kinds of golf-balls which may be made by my improved process. Fig. 2 is a sectional view of one form of apparatus for practicing my invention and is illustrative of the process of forming a shell. Fig. 3 is a plan of the apparatus shown at Fig. 2, but omitting the upper half of the ball-mold and its accessories. Fig. 4 is a view similar to Fig. 2, but showing only the lower part of the apparatus and illustrating the method of setting a core within the ball-mold. Fig. 5 is a perspective of the uper part of the ball-mold. Figs. 6, 7, and 8 are views, upon a smaller scale, of the ball-mold and accessories, the first figure showing the separation of the mold parts prior to the insertion of a core or after the removal of the finished ball, Fig. 7 showing the core in position prior to the injection of the shell material, and Fig. 8 showing the ball completed in the mold.

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

For the core or filling of the ball it is preferred to employ a soft-rubber sphere 1, preferably solid, although the invention contemplates the employment of any other suitable filling. Such filling is suspended within a mold, which may consist, preferably, of a lower section 2 and an upper section 3, each section having a hemispherical depression or cup, which depressions together form a spherical chamber or cavity 4. This chamber may be provided with brambling-pits 5 for embossing the shell with brambles. The lower mold-section 2 may have a recess 6, preferably rectangular, forming a seat for the upper section 3, thereby securing a perfect match of the sections. The core may be suspended within the relatively large mold-chamber 4 by means of needles or points, which are preferably arranged in opposite pairs, as indicated at 7 and 7^a, 8 and 8^a, Fig. 3, the needles in each pair being on a single diametrical line and substantially at right angles to the needles in the other pair and all of the needles being level with the center of the ball. Any other arrangement of points or equivalent devices may be adopted, or the ball may be otherwise suspended or maintained centrally within the chamber.

One method of setting the core is seen at

Fig. 4, in which the ball is held by the attendant centrally in the lower half of the mold, the needles being temporarily withdrawn. Any suitable gage or gages may be employed for aiding the accurate positioning of the core. While the ball is held in the Fig. 4 position the four needles are driven into its face, as at Fig. 2, thereby to suspend the core centrally of the mold with the requisite stability during the subsequent casting of a shell thereon, the needles being firmly supported in bearing-holes in the lower mold-section 2, as indicated at 7^b.

I preferably employ mechanism for introducing into and withdrawing the needles from the ball, which mechanism may be supported upon a framework, consisting in this instance of a bed 9, having legs 10, and also having a depressed seat 11 for the lower mold-section 2, said section being held to said seat by one (may be more) screw 12. The needles are provided with horizontal shanks (may be slides) 13, 13^a, 14, and 14^a, which are mounted in ears 15, provided upon the tops of standards 16, erected upon the bed 9. Each of said needle-slides may be rigidly guided in its supports and is capable of horizontal movement toward and from the center of the ball-mold. The needle-operating mechanism also includes four driving-arms 17, each extending down through an opening 18 in the bed and being mounted at its lower end upon a shaft or pivot 19, mounted in lugs 20, depending from the bed. Each of said driving-arms has a pin or connection at 21 to the needle, so that by vibrating said arms the needle-slides and needles may be driven to and fro. Rearwardly-extending arms 22, coöperating with the vertical arms 17, are connected, for instance, by drop-links 23 to a central vertically-sliding driver 24, said links working in radial slots 24^a, formed on said driver and being pivoted thereto at 25. Said driver 24 may be mounted to slide upon a vertical stem 26, depending from the bed 9 at the center of the system of operating-levers, and is driven upwardly by means of a lever 27, pivoted between its ends at 28 to a hanger 29, depending from the bed, and carrying at its outer end a handle 30, whereby the needles may be operated in unison. Preferably a spring 31, coiled about the upper end of stem 26 and compressed between the driver 24 and the lower surface of the bed 9, acts constantly upon the driver in a direction to press the needles inwardly or toward the center of the ball-mold, and the lower end of stem 26 is threaded and provided with a nut 32 to limit the movement of the levers effected by said spring.

I preferably clamp the mold-sections 2 and 3 together by means of wing-nuts 33, working on the upper ends of vertically-threaded rods 34, which are pivoted at their lower ends in lugs 35, provided upon the lower mold-section 2, said nuts 33 bearing upon ears 36, which are provided upon the upper mold-section 3, and said ears being slotted at their outer ends at 36^a, Fig. 6, so as to permit the clamping-rods to be cast off, thereby to release and permit removal of the upper mold-section.

The shell material may be supplied to the mold-chamber in a mobile or fluent condition by any suitable means, that illustrated herein consisting of a vertical cylindrical vessel 37, set upon a pedestal 38, erected upon the bed 9 and connected by a pipe 39 to the half of the ball-chamber 4 which is contained in the lower mold-section 2, said section having an inlet 40, which connects the lower end of said pipe 39 with said chamber. The shell material (such as gutta-percha or celluloid) may be kept hot and fluent by means of any suitable heating device—such, for instance, as a gas-burner 41—placed beneath said vessel 37, the flame being indicated at 41^a. In the vessel 37 is fitted a piston 42, operated by a rod 43 or otherwise, for forcing the fluent material from the vessel through the pipe 39 into the mold at 40, one of the principal functions of the piston being to apply pressure to the fluent material after the mold is filled and maintain such pressure during the subsequent hardening of the shell.

At Fig. 2 is indicated a vacuum-pump 44, which may be connected to a nozzle 45, inserted in the upper mold-section 3 and opening into the top of the mold-chamber, the opening being provided with a valve 46, whereby communication between the vacuum-pump and the mold-chamber may be opened or closed. Any suitable air-exhausting apparatus may be employed, and I recommend an apparatus which includes a chamber in which a good vacuum is constantly maintained, which chamber may be put into communication with the mold-chamber at will by means of the valve 46.

In operation the clamping-rods 34 are cast off and the upper mold-section 3 is lifted or removed, as at Fig. 6, and by depression of the handle 30 the sliding driver 24 is forced up, thrusting up all of the links 23 and arms 22 and swinging outwardly the vertical arms 17, thereby withdrawing the needles, as at Figs. 3, 4, and 6. Thereupon the rubber or other core 1 is inserted in the mold-chamber, as indicated at Fig. 4, and while it is held centrally of the chamber the handle 30 is released, and the needle mechanism is forced by the spring 31 to normal position, the points of the needles preferably being caused to penetrate the core, as at Fig. 2. The four needles maintain the core immovably in the mold. The upper mold-section 3 is then replaced and by means of the rods 34 and nuts 33 is clamped firmly to the lower mold-section 2, forming a tight joint, Fig. 7. Steam or hot water is caused to circulate through one or more suitable channels 47 in the lower mold-

section and 48 in the upper mold-section, so as to heat the same, although in some cases my invention may be practiced without previous heating of the mold. The valve 46 is opened, and by means of the pump 44 or other apparatus air is exhausted from the mold-chamber. Then by means of the piston 42 the fluent shell material 49 is forced down through the pipe 39 and inlet 40 into the mold-chamber 4, as at 49[a], Fig. 2. When sufficient material is forced in to completely fill the chamber 4, the valve 46 is closed and escape of the material 49[a] is prevented, whereupon by means of the piston 42 great pressure is applied to the material 49 and 49[a], so as to compact the latter and also put the core 1 under great compression. While this compression is maintained cold water or other fluid is circulated through the channels 47 and 48, thereby cooling the shell material 49[a] to an extent to harden said shell, as at 49[b], Figs. 1 and 8. When the shell is sufficiently hardened to enable it to retain the core in a state of compression, the handle 30 is depressed, causing the needles to be withdrawn. The clamping-rods 34 are cast off, the upper mold-section 3 is removed, and the ball withdrawn from the lower section. If desired, the holes left by the needles may be plugged, as at 49[c], Fig. 1. This operation may be repeated indefinitely, the reheating of the mold at each operation through the channels 47 and 48 having the effect of reducing to a fluent condition any hardened portions of gutta-percha which may be left in the passages from the previous operation.

It will be seen that by means of my improvements either ball-shells or complete balls may be cast in rapid succession at very low cost; that the operation is simple and the apparatus is inexpensive; that the core is accurately centered within the shell; that the liability of forming irregular air bubbles or pockets is wholly avoided; that the material of the shell is highly compacted, owing particularly to the exclusion of minute air-bubbles, which is due in a large degree to the process of casting the shell in a vacuum, the completed shell consisting of a single homogeneous mass instead of a mixed mass of plastic material and air; that the liability is avoided of either the displacement of the core or the undue thinning of the shell at any point by reason of the existence of a large air-bubble between the core and the shell; that the liability present in welded balls of bursting of the ball at the weld is wholly avoided; that the expense of making separate half-shells and welding them together is avoided; that the liability sometimes present in laminated shells of cracking or peeling off is also avoided, and that the core is held under powerful compression by a shell which is practically unbreakable, and hence an efficient and durable ball is produced at very low cost. The cores are accurately centered within the shells, while an indefinite quantity of balls may be produced all exact duplicates in structure and quality.

It will be observed that my ball-casting apparatus comprises a spherical mold and a set of core-supports, and it will be understood that although I prefer the supports to form a permanent part of the apparatus, so as to be used in forming successive balls, still this permanency is not essential in all cases. It will also be seen that the needles or slides are mounted for endwise movement, that they project into the mold from different sides thereof, that they have a common central actuator 24, which is operated by a handle or lever 27 and effects simultaneous movement of the needles, and that each pair of needles is in a single radial line and at right angles with the other pair.

Many variations may be resorted to within the scope of my improvements, portions whereof may be employed in producing solid balls of gutta-percha or other plastic material, if desired. In some instances the exhaust apparatus 44 may be omitted, especially when forming shells upon cores.

Having described my invention, I claim—

1. An apparatus for casting playing-balls, comprising a spherical mold made in sections, a vessel for holding ball material, a passage from said vessel to said mold, means for heating the material in said vessel, means for subjecting said material to pressure, means for exhausting air from said mold, and means for cutting off communication between said air-exhausting means and said mold.

2. An apparatus for casting playing-balls, comprising a spherical mold made in sections, a vessel for holding ball material, a passage from said vessel to said mold, means for heating the material in said vessel, means for exhausting the air from said mold, and means for cutting off communication between said air-exhausting means and said mold.

3. An apparatus for casting playing-balls, comprising a spherical mold made in sections, means for clamping said sections together, a vessel for holding ball material, a passage from said vessel to said mold, means for heating the material in said vessel, means for subjecting said material to pressure, means for exhausting air from said mold, and means for cutting off communication between said air-exhausting means and said mold.

4. An apparatus for casting playing-balls, comprising a spherical mold made in sections, a vessel for holding ball material, a passage from said vessel to said mold, means for heating the material in said vessel, means for subjecting said material to pressure, means for exhausting air from said mold, said vessel being in communication with one of said mold-sections, said air-exhausting means being in communication with another of said sections,

and means for cutting off communication between said air-exhausting means and said mold.

5. A ball-casting apparatus comprising a mold, core-supporting devices movable therein and adapted to operate in unison, mechanism for operating said devices, stops for limiting the movement of said devices, and means for injecting material into the mold.

6. A ball-casting apparatus comprising a mold, core-supporting devices movable therein and adapted to operate in unison, mechanism for operating said devices, means for limiting the movement of said devices, means for injecting material into the mold, and means for extracting the air from the mold.

7. A ball-casting apparatus comprising a spherical mold, movable core-supporting devices adapted to operate therein, and spring-actuated mechanism for operating said devices.

8. In a ball-casting apparatus, the combination with a spherical mold, of reciprocating means projecting thereinto for supporting a core, and means to reciprocate said means into and out of the mold.

9. An apparatus for casting playing-balls comprising a spherical mold made in sections, means for holding said sections together, a vessel for holding ball material, means for heating the material in said vessel, means for subjecting the material to pressure, means for exhausting air from the mold, to-and-fro movable core-supporting devices mounted for movement into and out of working position, and mechanism connected with said devices whereby to operate the same in unison.

10. In a ball-casting apparatus, the combination with a spherical mold, of to-and-fro movably-mounted core-supporting devices mounted to reciprocate into and out of the mold, and means to reciprocate the same.

11. A ball-casting apparatus, comprising a mold, a plurality of to-and-fro movably-mounted core-supporting devices arranged at different points and working in different directions, all of which are adapted to move into and out of the mold, a handle, and communications from said supporting devices to said handle.

12. An apparatus for casting playing-balls comprising a spherical mold made in sections, a vessel for holding ball material, means for heating the material in said vessel, means for subjecting said material to pressure, a plurality of oppositely-disposed to-and-fro movable core-supporting devices adapted to be projected into and withdrawn from said mold, and mechanism for simultaneously operating said devices.

13. A ball-casting apparatus comprising a spherical mold, a movable core-supporting device, and a spring tending to maintain said supporting device in working position.

14. A ball-casting machine comprising a spherical mold, means for injecting material into said mold, a plurality of core-supporting devices projecting into said mold, means tending to maintain said supporting devices in working position, and a lever connected to said supporting devices.

15. In a ball-casting machine, the combination with a spherical mold, of core-supporting devices projecting thereinto, levers connected to said devices, and a single actuator connected to said levers.

16. In a ball-casting machine, the combination with a spherical mold, of at least three horizontal core-supporting devices whose points project into the mold from different sides, and a common actuator for said devices.

17. In a ball-casting machine, the combination of a frame or support, a spherical mold thereon, bearings mounted upon said frame at different sides of said mold, horizontal core-supporting devices working in said bearings and projecting within the mold, levers connected to said devices and having inwardly-extending arms, and a central actuator connected to all of said arms.

18. In a ball-casting machine, the combination of a frame or support, a spherical mold thereon, bearings mounted upon said frame at different sides of said mold, horizontal core-supporting devices working to and fro in said bearings and projecting within the mold, levers connected to said devices and having inwardly-extending arms, a central actuator connected to all of said arms, and a returning-spring for said actuator.

19. In a ball-casting machine, the combination with a frame or support, of a spherical mold, bearings at four sides of said mold, horizontal core-supporting device working in said bearings, levers connected to said device, and a common actuator for said levers.

20. An apparatus for casting playing-balls comprising a spherical mold made in sections, means for injecting ball material into said mold, means for exhausting air from said mold, means for cutting off communication between said air-exhausting means and the mold, whereby to maintain a vacuum at will, oppositely-pointed to-and-fro movable core-supporting devices mounted for movement into and out of working position, and mechanism for operating all of said devices simultaneously.

21. An apparatus for casting playing-balls, comprising a spherical mold made in sections, a vessel for holding ball material, means for heating the material in said vessel, means for subjecting said material to pressure, means for cooling said mold, a set of to-and-fro movable supports, and mechanism for operating said supports.

22. An apparatus for casting playing-balls, comprising a spherical mold made in sections, a vessel for holding ball material, means for heating material in said vessel, means for sub

jecting said material to pressure, means for exhausting air from said molds, oppositely-disposed to-and-fro movable devices for supporting a core within said mold, and mechanism for giving such devices a to-and-fro movement in said mold.

23. An apparatus for casting playing-balls, comprising a spherical mold made in sections, a vessel for holding ball material, means for heating the material in said vessel, means for exhausting air from said mold, means for cutting off communication between said air-exhausting means and said mold, and to-and-fro movable means for supporting a core within said mold, said supporting means and said mold being relatively movable.

24. An apparatus for casting playing-balls comprising a spherical mold made in sections, means for clamping said sections together, means for exhausting air from the mold, a device operating between said air-exhausting means and said mold whereby to maintain a vacuum in the mold at will, means for supplying ball material to the mold, means for cooling the mold, means for compressing the ball material as it cools and hardens, a plurality of core-supporting devices projecting into said mold and each mounted for movement into and out of working position, and lever mechanism connected with said devices whereby they may be operated simultaneously.

25. A ball-casting apparatus comprising a spherical mold made in sections, oppositely-pointed core-supporting devices projecting into said mold, a train of mechanism connected with said devices and adapted to move them simultaneously into and out of working position, means for exhausting air from the mold, a valve for cutting off communication between said air-exhausting means and said mold whereby to maintain a vacuum in the mold, means for injecting material into the mold, and means for cooling said mold.

26. In a ball-casting apparatus, the combination with a sectional mold, of means for clamping the same together; core-supporting means; means for actuating said core-supporting means; a holder for ball material; heating means for said ball material; a connection between said holder and the mold; means for forcing ball material into the mold; means for exhausting air from the mold; and means for cutting off communication between the air-exhausting means and the mold.

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