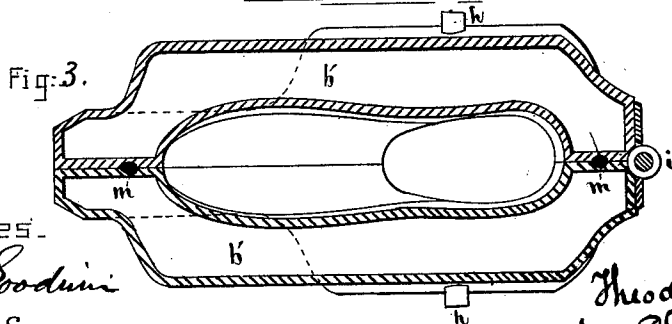
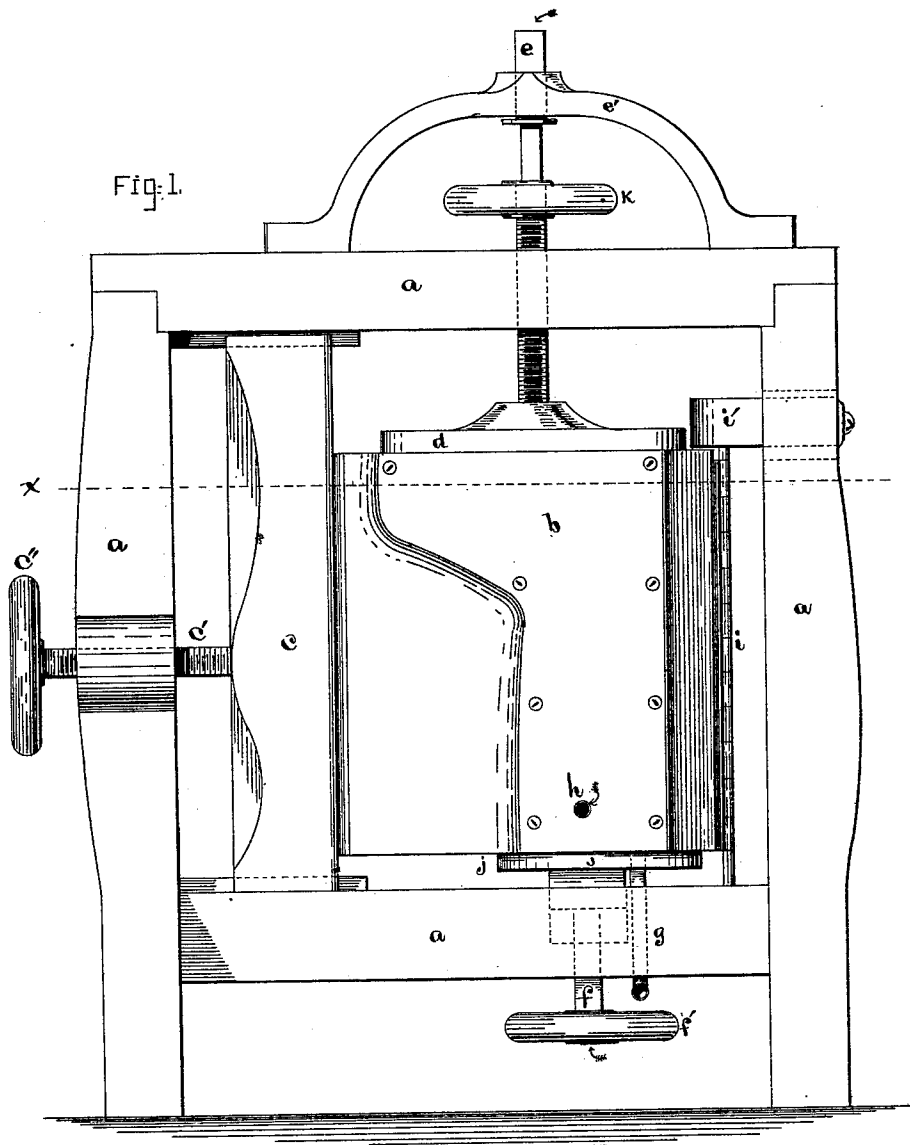


T. C. WEEKS.
Manufacture of Rubber Boots and Shoes.

No. 233,385.

Patented Oct. 19, 1880.



Witnesses.

Frank Goodwin
George A. Sawyer

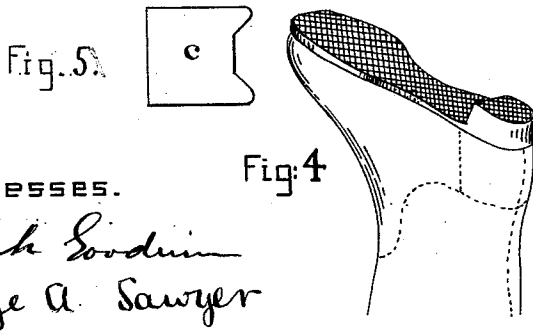
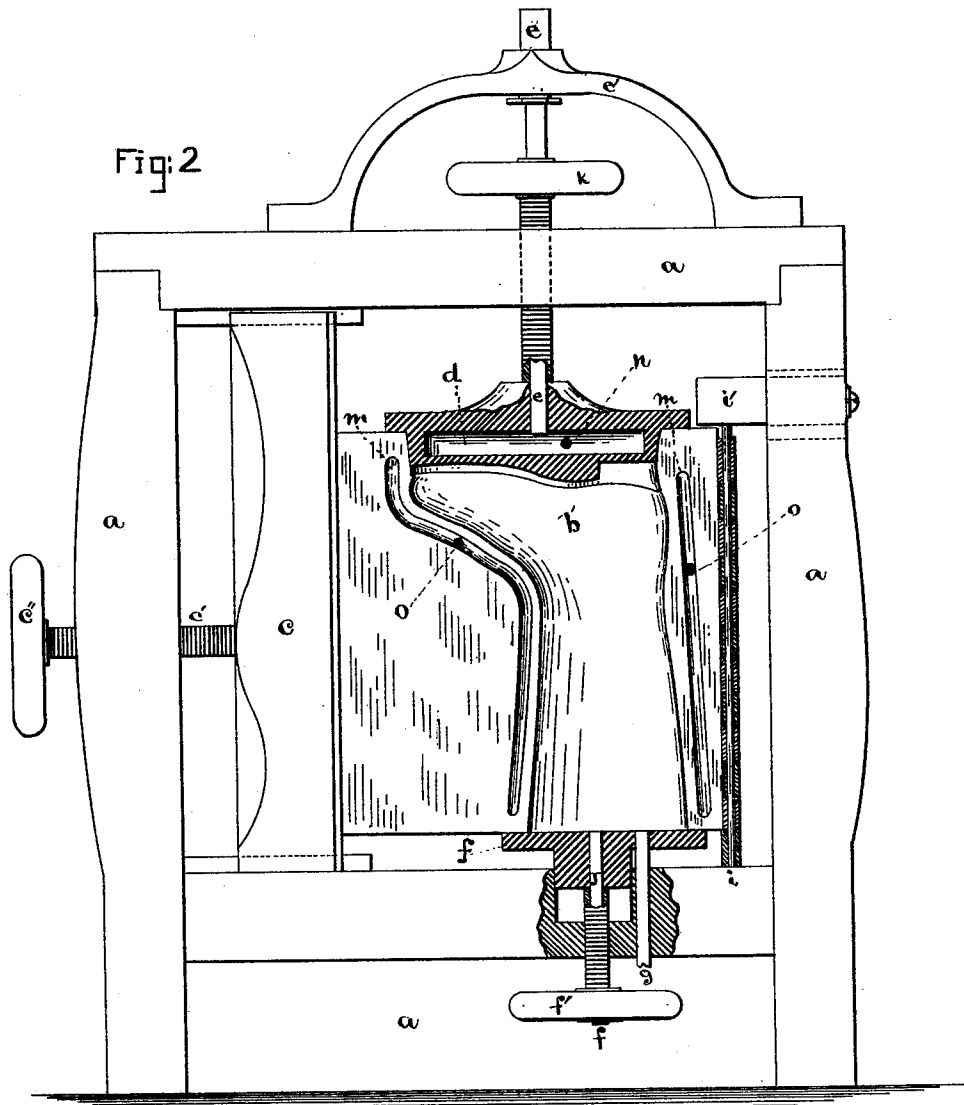
Inventor.

Theodore C. Weeks
by Chas. Houghton
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UNITED STATES PATENT OFFICE.

THEODORE C. WEEKS, OF STONEHAM, MASSACHUSETTS.

MANUFACTURE OF RUBBER BOOTS AND SHOES.

SPECIFICATION forming part of Letters Patent No. 233,385, dated October 19, 1880.

Application filed October 1, 1879.

To all whom it may concern:

Be it known that I, THEODORE C. WEEKS, of Stoneham, in the county of Middlesex and Commonwealth of Massachusetts, have invented a new and useful Improvement in the Manufacture of (so called) India-Rubber Boots and Shoes, of which the following is a specification.

This invention relates to a process of making boots and shoes of india-rubber and cloth or felted fabrics; and it consists in making the outer covering of india-rubber for the boot or shoe of one entire whole having when done no seams or joining of parts perceptible, or which could be opened or separated by heating, dissolving, or in any way, the consistency of the india-rubber being homogeneous throughout the entire surface, and the sole and heel being homogeneous with the vamp or upper.

Heretofore rubber boots (so called) have been made by first preparing a wooden block or last of the exact form and size which the boot will take when finished. A lining, usually of a cotton fabric coated on one side with rubber dissolved and applied to it, is cut in several pieces, so that when all the pieces are laid on the block or last they will completely cover it, the edges abutting each other and secured together, sometimes by sewing and sometimes by overlaying them with a narrow strip of thin cloth coated on the inner side with cement, which will adhere to the outer surface of the lining. Then another layer, covering the whole surface of the block or last, usually of wool fabric felted, or wool and cotton together, coated with rubber on both sides, as before described, is applied, adhering to the lining before mentioned. Next, an outer covering of rubber prepared with suitable chemicals for vulcanizing, and run into sheets of proper thickness, is cut out by patterns—a piece to cover the leg down to the instep and down the back side of the heel, a piece for the front covering of the foot or vamp, a piece for the heel-counter, a piece for the bottom, equivalent to an inner sole, an outer sole, and a heel, all cemented onto the second-mentioned covering, one edge lapping another a half inch, or about that, at the back of the leg, and where the several pieces making up the boot meet

each other, the laps being cemented and rolled down to make the cement adhere. The outer sole and heel is also cemented on and rolled or pressed down to make it adhere. The boot being thus prepared goes into the vulcanizing chamber or oven, where a proper degree of heat is maintained for about seven or eight hours, when it is done and ready for use.

I prepare a rubber boot for vulcanizing precisely as above described and vulcanize it under pressure equal at all points on the inside and on the outside surface of the boot sufficient under the degree of heat maintained to vulcanize the rubber, to perfectly unite the several layers of fibrous material and rubber, and make so thorough and complete a weld or union of the joined edges of the rubber that there is no seam, no increased thickness where the lap was, the edges of the rubber being as completely homogeneous as though it had been melted like wax. This effect is produced alike at all the lines and points of joining, including the joining of the sole and heel. Thus I produce a boot which has no seams or appearance of seams on its outer or inner surface, and in fact has none, the rubber being, when the boot is finished, one united and complete whole, as much so as it would be if the rubber could be melted and poured into a mold. It is obvious that a shoe can be made in the same way.

To vulcanize a boot or shoe under a pressure, as described, I prepare a metal mold, the inside of which, when closed, is smooth and of the form and size the boot is to take when finished, and this is inclosed in another with a space between them of about half an inch, the edges being tightly joined to hold steam, and the whole strong enough to stand a pressure of steam of one hundred and fifty to three hundred pounds without danger of bursting. The boot may be placed in this on the wooden block or last, if the size of it is so near the inside size of the mold that the proper pressure will be obtained when the mold is closed; but I prefer to take out the block or last and place the boot in the mold empty, confining the open end by suitable means, and producing the desired pressure by forcing atmospheric air into it until the whole boot is under a pressure be-

tween the air inside of it and the metallic mold inclosing it of eighty to one hundred pounds to the square inch or greater if necessary to produce the desired result. The air so introduced and condensed into the inside of the boot or shoe may be heated by passing it through pipes coiled in a steam chest or furnace, or in any other practicable manner, to a degree high enough either to aid the heat from the steam in the jackets of the mold in vulcanizing the rubber or to accomplish the vulcanization completely without steam in the jacket, or in a mold having no steam-jacket. I can produce the pressure also by introducing steam instead of air, in which case the heat of the steam will aid the heat from the steam in the jacket of the mold and effect the vulcanization in less time than it would be done in by the steam in the jackets alone; or the steam introduced into the inside of the boot or shoe in the mold may be made to distend and press all parts of the boot or shoe between it and the inner surface of the mold, and to completely vulcanize the rubber without the aid of steam in the jackets of the mold, or in a mold having no jacket. If air is used it may be heated, if that is found desirable. At the same time that the air or steam pressure is introduced into the inside of the boot steam is introduced between the two shells of the mold, carrying sufficient pressure and heat to properly vulcanize the rubber of the boot, which will be accomplished in seven or eight minutes, and the mold will be ready to receive another as soon as the first can be taken out.

Practical working has demonstrated that rubber boots can be made in the manner here described much better and more durable than in the old way, and at much less cost; and that any desirable style or form can be made without additional expense above that of the ordinary coarse forms.

I also produce a rubber boot (so called) in another way. The fibrous body upon which the rubber coating is to be laid is made of wool, felted whole in one homogeneous piece, after the manner described in Patents Nos. 203,148 and 204,668, issued to A. A. Hawley and R. B. Hawley, April 30, 1878, and June 11, 1878. I cover the outer surface of the wool boot so made with rubber. The sole is cut out with a die, and also the heel, and the sole is cemented to the bottom of the boot and the heel to the sole. The boot is then placed in the mold, the pressure of air or steam introduced into the inside of it, and the steam into the jacket of the mold, as before described, and with similar results. This makes a strong and durable boot, with considerable less rubber than is necessary in the boot first described, as in that the strength of the boot depends mainly on the strength of the rubber.

In the boot last described the wool fabric is strong and durable before the rubber is ap-

plied to it, and only needs rubber enough to make it impervious to water and for the sole and heel, and it requires no lining and no inner sole. It is in many respects better than the boot made under the first-described process, and I think its cost will not be greater.

By the same process and with the same mold and appliances I can make a boot or shoe without any cloth or felted lining whatever—a strictly rubber boot or shoe—the sheeted rubber being cut out, lapped, and cemented at the joints, the sole cemented on, and the heel cemented to the sole, the whole placed in the mold, the atmospheric or steam pressure introduced inside, and the steam let into the jacket of the mold. The process is complete in a few minutes.

In the drawings, Figure 1 shows a side view of a mold in which the rubber boot is to be vulcanized in the manner described, together with the frame for holding and supporting the mold, with connections to admit air or steam. Fig. 2 shows a vertical partial sectional view of Fig. 1, showing a boot in the mold. Fig. 3 shows a cross-sectional view of the mold, in which the boot is vulcanized, at the dotted line *x* in Fig. 1. Fig. 4 shows a sketch of a boot as it is made up from pieces ready to be vulcanized in the mold. Fig. 5 shows a cross-section of the wedge-clamp which holds the two parts of the mold together.

a is the frame. *b* is one side of the mold. *b'* is the boot in the mold. *c* is a wedge-clamp holding the two parts of the mold together. *d* is a follower closing the mold over the sole of the boot. *e* is a hollow screw through the frame, connected to the follower *d* to force it into its place for closing the mold, and having an opening through it to admit steam to the chambers in the mold. *e'* is a supporting-brace. *f* is the follower which closes the mold over the top of the boot. *J* is a hollow screw through the frame, connected to the follower *f* to force it into its place for closing the mold, and having an opening through it to allow the passage of air or steam to the inside of the boot. *f'* is a crank-wheel. *k* is a crank-wheel; *m m*, small steam-chambers; *n*, steam-passage from chamber over the sole to chambers at side of mold; *o o*, steam-passages; *g*, passage for condensed water or air; *c'*, screw to force wedge-clamp *c* to place; *c''*, crank-handle. *i* is a hinge extending the whole length of the mold, by which the two parts are connected, and upon which they swing; *i'*, a support for one end of the hinge *i*.

No claim is made for the apparatus used in the process of vulcanizing boots and shoes described and shown in the drawings annexed, that being the subject of a joint application for a patent by applicant and Fisk Russell.

What I claim as new and my invention is—An improved process of making india-rubber boots and shoes, consisting of preparing the rub-

ber and linings in proper form and relation to each other, and vulcanizing the rubber in a mold under pressure between the mold and an elastic force introduced from the outside into the
5 boot or shoe by any suitable means, acting equally against all the inner surface of the boot or shoe with force sufficient, in conjunction with the softening of the rubber by the heat required, to weld the rubber into one homogeneous whole, thus giving proper shape 10 and vulcanization, substantially as described.

THEODORE C. WEEKS.

Witnesses:

CHS. HOUGHTON,
THOMAS LEWIS.