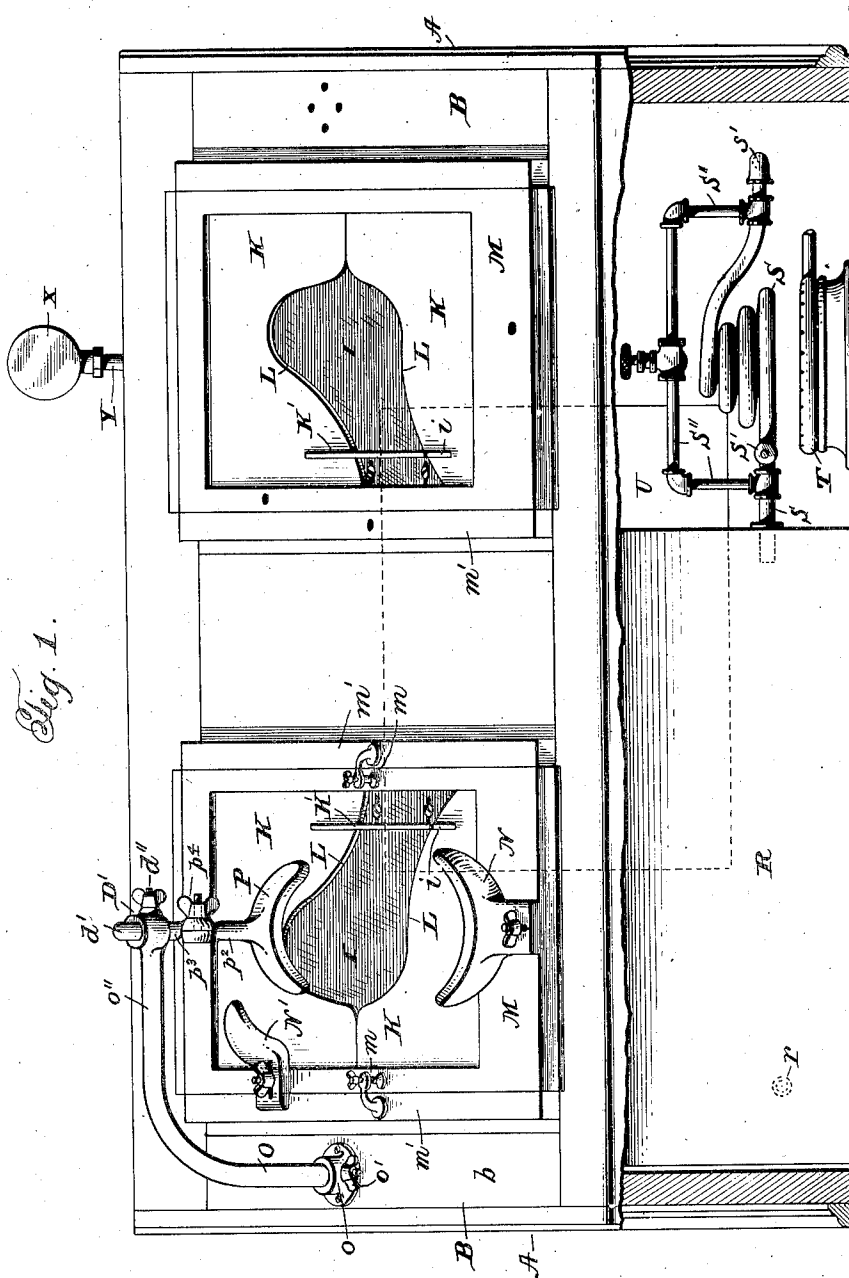


APPARATUS FOR FORMING ARCH SUPPORTS OR PATTERNS THEREFOR.

Patented Nov. 12, 1912.

6 SHEETS—SHEET 1.

1,044,170.



William C. J. Guilford,

By Thos. Means Attorneys:

Witnesses:

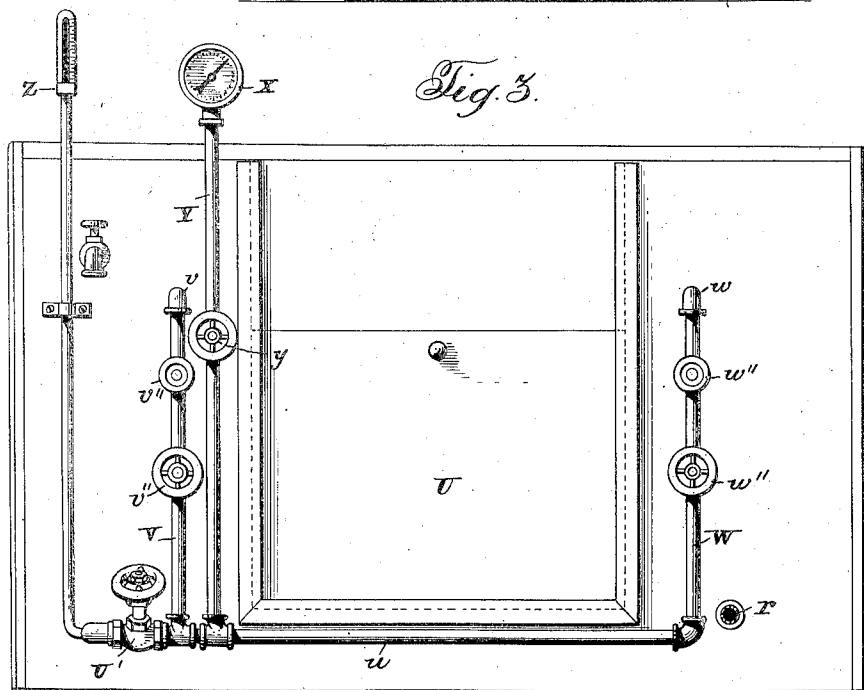
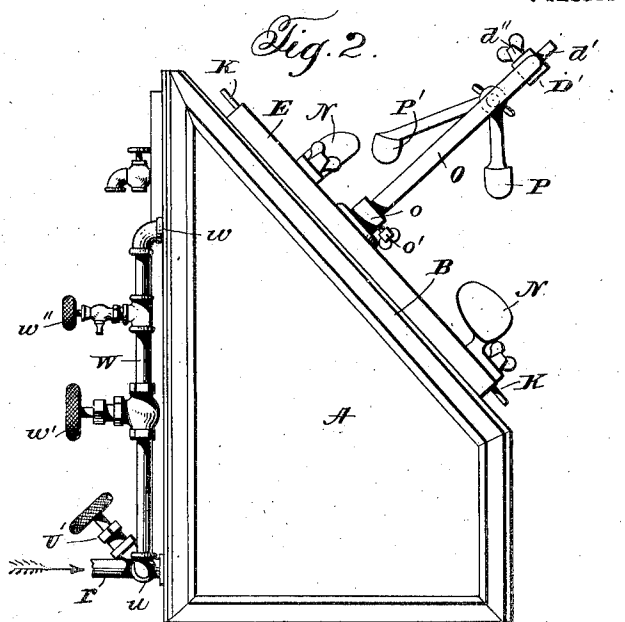
Jas. E. Hutchinson:
Calvin T. Milam.

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 APPARATUS FOR FORMING ARCH SUPPORTS OR PATTERNS THEREFOR.
 APPLICATION FILED JAN. 7, 1910.

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5 SHEETS—SHEET 2.



Witnesses:

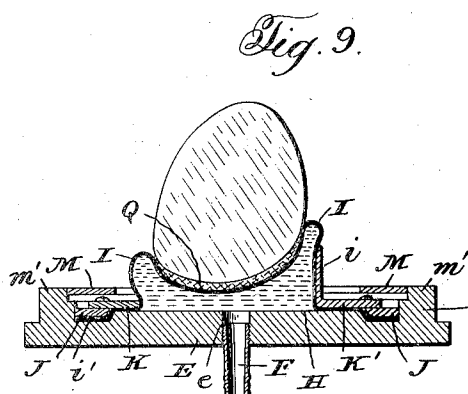
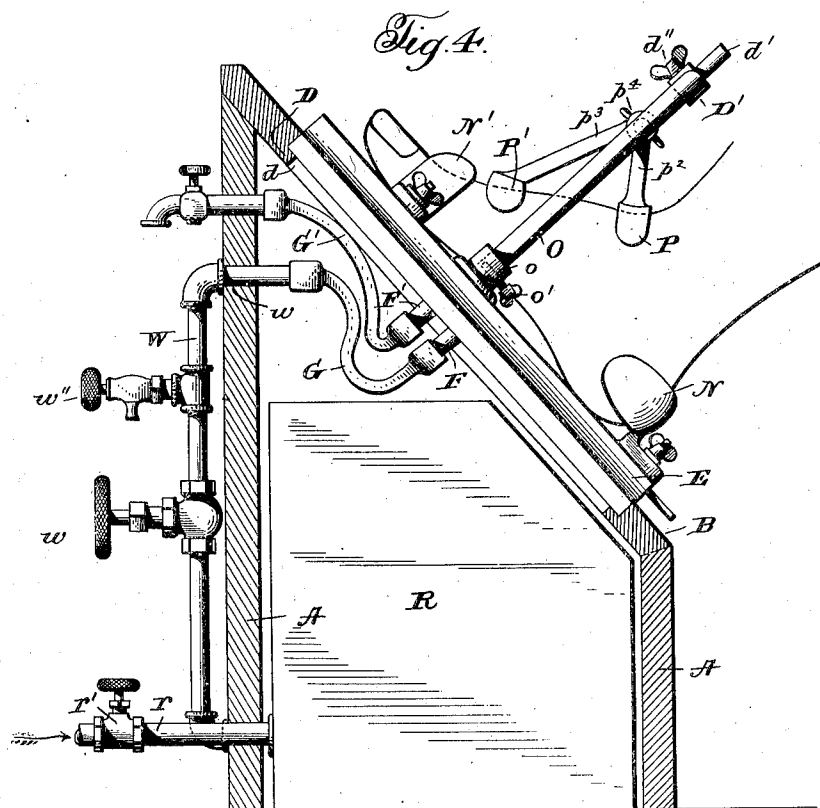
James Hutchinson
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Inventor:

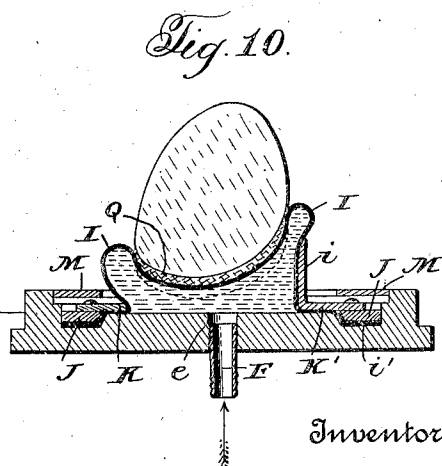
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5 SHEETS—SHEET 3.



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5 SHEETS-SHEET 4.

Fig. 5.

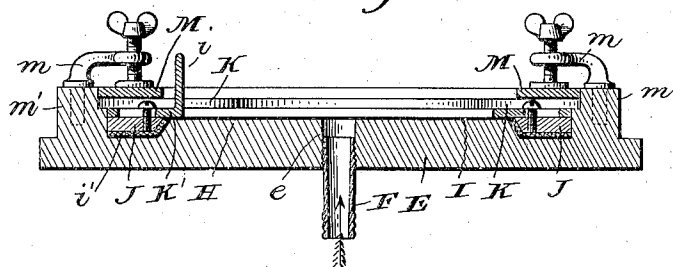
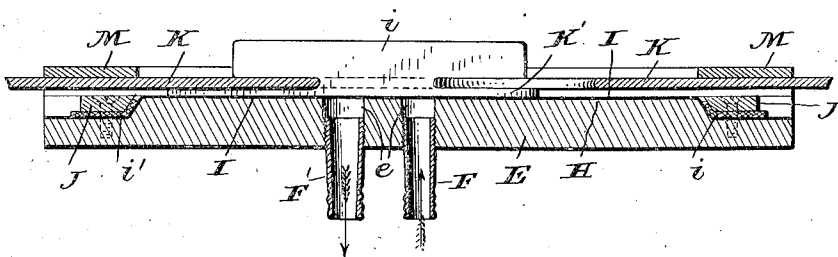


Fig. 6.



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1,044,170.

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5 SHEETS—SHEET 5.

Fig. 7.

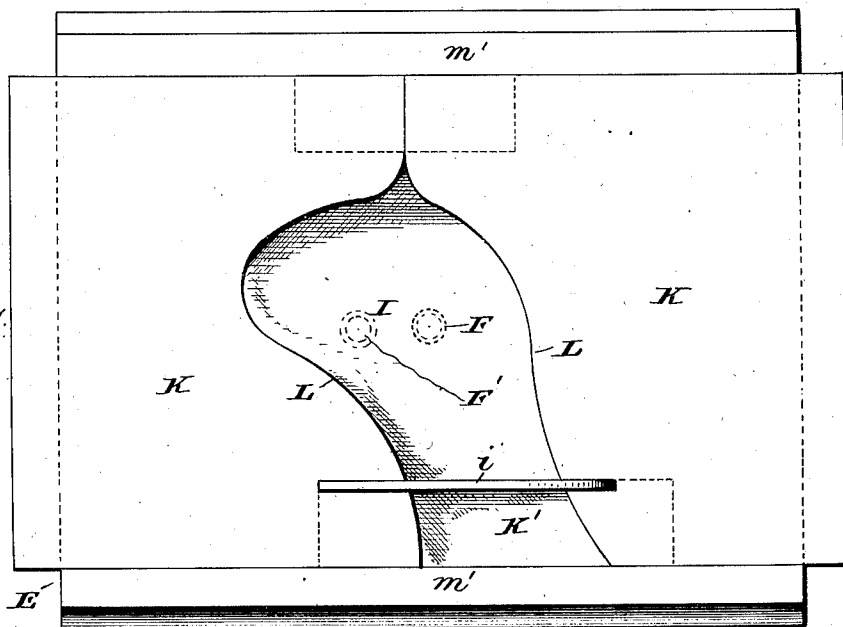
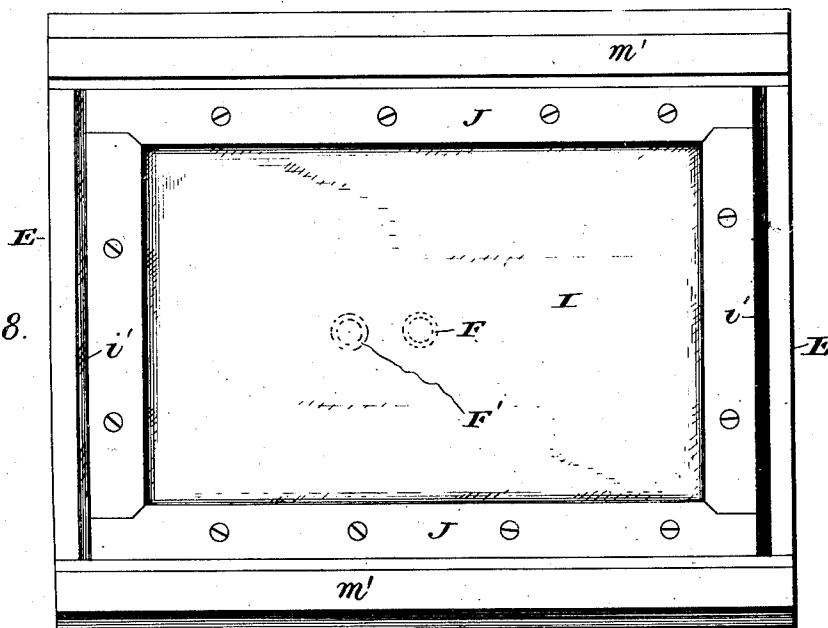


Fig. 8.



Witnesses:

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR FORMING ARCH-SUPPORTS OR PATTERNS THEREFOR.

1,044,170.

Specification of Letters Patent.

Patented Nov. 12, 1912.

Application filed January 7, 1910. Serial No. 536,909.

To all whom it may concern:

Be it known that I, WILLIAM C. J. GUILFORD, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Apparatus for Forming Arch-Supports or Patterns Therefor, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to an apparatus, which, while possibly capable of use for other purposes, is primarily designed to form or facilitate the formation of arch supports or props.

It is a matter of common knowledge that possibly innumerable ailments of the human body are to be attributed either directly or indirectly to abnormal conditions created by fallen or impaired arches of the foot. The treatment of damaged arches of this character has therefore become a matter of special study and treatment along medicinal and surgical lines. The more usual expedient resorted to in alleviating the discomfort or pain of the disabled foot is the use of arch supports or props to be found on the market in what may be designated standard sizes, that is, of contours generally conforming to the average shape of a foot having a fallen arch, the shoe dealer or maker in turn fashioning as best he can by manual manipulation said standard device to fit the particular case under treatment. This method is unsatisfactory, in that accurate conformity of the device to the foot is practically impossible.

The present invention overcomes the disadvantages noted, in that it enables the furnishing of a device particularly serviceable in hospitals where it is capable of professional operation, and also capable of satisfactory use by less experienced persons, said device comprising a combination of parts enabling the individual absolutely accurate treatment of a foot to form therefrom either the arch prop or support, as desired to be used, or a pattern for the formation of said prop or support.

Another important advantage of the present invention resides in the utilization of means for forming a pattern or support not only conforming in accurate detail measurement to the formation of the arch of the foot, but further, when desired, the forma-

tion, from the foot itself, of the support or pattern for the support, so that the same will exert a correcting or curing influence upon the arch.

A practical apparatus constituting a convenient embodiment of the invention comprises a support provided with a rest for the heel and toe portions of the foot; a fluid pressure controlled former adapted to occupy a position beneath the arch of the foot to press a sheet of conformable substance with equal pressure throughout the surface thereof against the arch of the foot to conform the sheet in the minutest detail to the actual conditions of the arch; adjustment instrumentalities operating in conjunction with the fluid pressure former to restrict the operating area or field of movement of the same; adjustable means for clamping the foot in position whereby to occupy an unyielding relation to the former as the latter is forcibly pressed against the foot; means whereby fluid pressure, such as compressed air may be obtained from a storage tank within the apparatus for emergency or other purposes; and means whereby hot and cold fluid may be alternately or successively applied to the forming device in a way to exert the influence of the varying temperature to the substance being treated to facilitate, first, the desired ready shaping or forming of the same, and second, to facilitate the setting of the formed device.

The method embodying the use of a hot fluid to conform the arch support or pattern therefor, and the cold fluid for setting the device thus formed, and also the employment of the excess pressure of the former against the blank and under the arch of the foot to secure a correcting formation of the arch, as distinguished from a mere surface contacting or formation of the same, I will not claim herein, inasmuch as this method more properly constitutes the subject matter for a companion application.

While the present invention is susceptible of embodiment in many practical forms and styles of apparatus, I have, for the sake of imparting a full understanding of the invention, disclosed in the accompanying drawings, a convenient embodiment of the same, and the before stated features of the invention, together with many other details in the construction and arrangement of parts, will be apparent from the detail de-

scription hereinafter contained when read in connection with the said drawings.

In the drawings, Figure 1 is a front view of my improved apparatus, parts being broken away, Fig. 2 is an end view of the same, Fig. 3 is a rear elevation, Fig. 4 is a section showing the interior storage tank and pipe couplings, Fig. 5 is a transverse sectional view through one of the forming devices, Fig. 6 is a longitudinal sectional view through the same, Fig. 7 is an elevation of one of the forming devices with the front plate removed, Fig. 8 is a similar view with the front plate and adjustable slides removed, Fig. 9 is a sectional view illustrating the operation of the fluid pressure former upon the blank against the arch of the foot, and Fig. 10 is a similar view showing the desired excess pressure to overcome the surface or fleshy formation of the arch to slightly elevate the bony structure of the foot, to give the blank or arch support as ultimately formed an elevating corrective or restoring influence on the arch.

Referring more specifically to the drawings, A represents a casing or support adapted to rest upon the floor the same having an inclined face B arranged at an angle but comfortable to the feet of the patient when seated. As a part of this face B, a pair of formers are provided, it being understood that simply one former might be employed when desired or even a greater number than two, as is obvious.

A specific definition of one of the forming devices will suffice for both, and with this understanding I would state that the manner of fashioning or assembling, and of mounting the same on the base structure, is as follows, to wit: D is a ledge surrounding an opening d in the inclined face B of the base adapted to support a removable plate E adapted to rest upon said ledge and of a thickness to bring its upper surface flush with the inclined face of the base. The plate E is imperforate throughout save at its center e , where it is provided with apertures for the accommodation of nipples F, F' connected to flexible pipes G, G' to be hereinafter referred to. The central portion of the plate E has a rectangular or other shaped panel H, also through which the nipples pass to communicate thereabove. Overlying the face of this panel and incidentally covering the open ends of the nipples is a layer of expansible material adapted to constitute the former, said material being indicated at I, and being conveniently formed of rubber. The edges of this rubber layer are secured in place against the escape of air by having the margins thereof seated in the depressed portions of the plate A surrounding the panel, a rectangular frame J screwed to the plate E with an interposed packing strip of felt i therebetween constituting the fas-

tening. Fluid pressure, such as water or air, being admitted through the nipple F, as will be hereinafter apparent, will force the rubber former upwardly against the foot or against any opposition presented to its expansion. I find it is quite desirable to limit the area or field of expansion of the former and for that purpose provide an adjustable slide or slides K for regulating the length of the opening L above the rubber sheet, and an adjustable plate K' arranged at right angles to the slides K for regulating the width of said opening. A cover plate or foot rest M overlies the slides K and the whole is secured in adjusted position by means of thumb clamps m carried by flanges m' secured to the base plate E. An adjustable heel engaging part N is carried by this cover plate, and an adjustable lateral bearing N' is provided for the edge of the foot, as these parts will steady the foot during the operation of forming the arch or pattern there-to. To form a wall above the lateral guide K', the same is extended upwardly as at i . This wall serves as an abutment to force the former inwardly against the arch and prevents lateral and useless swelling of the rubber former. Adjacent to the margin of the base A approximately centrally of the end members b of the inclined face B, I provide brackets O pivoted at o to swing outwardly away from the former and inwardly to a position centrally thereabove, each bracket being secured in either of these positions by means of the thumb screw o' . The overhanging or horizontal portion of the bracket represented at o'' carries a vertically adjustable clamping device D' having a vertical suspending shank d' fastened in adjusted positions by a binding screw d'' . This clamp is composed of oppositely disposed similarly curved bearing pieces P and P', the first mentioned adapted to bear over the ball portion of the foot and the latter against the instep to firmly clamp the foot against the face or bearing plate. The two bearing members are adjustably connected through the medium of pivoted shanks p^2 , p^3 and a clamping device p^4 .

The blank from which the pattern or arch support is formed is represented at Q, the same being adapted to be inserted in the space between the slides and to rest upon the rubber forming sheet. This blank is made of a wax or similar composition capable of quick and easy molding, when it is simply desired to form a pattern, but when the arch support or prop is to be initially formed, the material employed will be of a more durable and lasting consistency, such as a treated fabric, metal or wood, adapted to be readily shaped as desired, and which will retain its desired formed condition after its preparatory treatment.

The means through which the uniform

pressure or expanding action is imparted to the rubber former and therethrough to the blank, resisted by the foot being treated, may now be followed.

5 R represents a storage tank within the interior of the casing or base A, adapted to contain air or water under pressure, said tank receiving its supply from a pipe *r* communicating with a suitable source and provided with a controlling valve *r'*. Running from the tank R is a pipe *s* communicating with a coil S, valved as at S', in turn feeding to a pipe *s'* leading through the back of the casing A. The purpose of the coil is to enable the heating of the air or water, as desired, when passing therethrough, a suitable gas burner or heater T being arranged beneath the coil, access to which is had through a door U slidably mounted at the back of the base A.

S'' is a valved by-pass around the heating coil.

On the back of the base A, I arrange the pipes leading to the different formers, a main valve U' opening or closing the communication with the pipe *s'* before referred to, which runs from the storage tank R. A horizontal pipe *u* opens to vertical branches V, W at points beyond the main valve U to furnish the fluid medium to the respective formers, the upper ends of these pipes V and W extending through the back wall into the interior thereof, as at *v*, *w*, where the flexible detachable pipe connections G hereinbefore mentioned couple the same with the nipples F, discharging into the space between the back plate E and the rubber forming sheet, as previously pointed out. Valves *v'*, *w'* control the inlet of the fluid and when the formers have been pressed upwardly the desired extent, these valves are closed, permitting the blanks to become set. Thereafter petcocks *v''*, *w''* may be opened to release the pressure and permit the rubber forming sheets to return to initial flat state when the formed blanks or arch supports are removed. The pressure exerted on the former by the fluid is ascertained through the medium of a pressure gage X carried on an upright pipe Y communicating with the pipe *u*, a controlling valve *y* being interposed in the gage pipe *u*, as shown. I also provide a thermometer Z for indicating the temperature of the fluid in the former.

55 In carrying my method into practical effect, I first supply a hot fluid to the former, the air or water being heated in its passage from the reservoir or tank R or from any other source, by means of the heater T, the hot fluid tending to soften the material of the blank from which the pattern or arch support is formed, and after the blank has been formed under the pressure and influence of such heated medium, I gradually take off the heated medium through the

valved outlet F'' connecting with the pipe G' and supplant the same by a cooling fluid, the change of temperature being a gradual one. The cooler air passes through the by-pass S'' around the heating coil.

Heretofore, to the best of my knowledge and belief, it has been the theory of those workers in this art to provide an arch support or prop conforming to the actual present conditions of the foot, and not to provide what I might style a rectifying arch or support, that is, a support or arch which has been formed to the foot not merely complying with its surface contour, but forced upwardly to an elevated position against the fleshy part of the foot to gradually elevate or restore the bony construction or arch toward its initial or correct position. In this way, by the use of my arch supports, the patient is not only relieved of the disadvantages and pains incident to a fallen arch, but a curing or correcting effect is imparted to the impaired arch, so that in time by more or less gradual steps the arch may be eventually restored to its natural condition.

The formation of the arch support, or the pattern from which the arch support may be formed to accomplish the result last above stated, is, I believe, accomplished for the first time by means of my method and through the instrumentality of my apparatus herein disclosed, it being apparent that the pressure desired may be imparted to the former and through the former to the blank against the resistance of a foot, thus actually conforming under an equal and even pressure to the minutest detail of the parts of the foot, with the arch forced upwardly or elevated, under a correcting or excess pressure of the operating fluid.

Changes in the details or construction and arrangement of parts of the apparatus herein illustrated and described may readily be made without departing from the spirit of the invention to suit the conditions and circumstances surrounding the particular use to which the apparatus is to be put.

I claim:

1. The combination with a base having a foot rest, of an expansible former mounted adjacent to said foot rest and arranged for the engagement of a foot therewith, means for maintaining the foot in operative relation to said former, and means whereby said former may be expanded and contracted.

2. The combination with a base having a foot rest, of a flexible former mounted adjacent to said foot rest and arranged for the engagement of a foot therewith, means for maintaining the foot in operative relation to said former, and means for supplying uniform pressure to all parts of the former.

3. The combination with a base having a foot rest, of a flexible former mounted adjacent to said foot rest and arranged for the

engagement of a foot therewith, means for maintaining the foot in operative relation to said former, and means for supplying fluid pressure to said former.

4. The combination with a base having a foot rest, of a flexible former mounted adjacent to said foot rest and arranged for the engagement of a foot therewith, means for maintaining the foot in operative relation to said former, and means for supplying fluid pressure to said former to cause the former to conform to the arch of the foot and for supplying additional pressure to raise the arch of the foot.

5. The combination with a base having a foot rest, of a flexible former mounted adjacent to said foot rest and arranged for the engagement of a foot therewith, means for maintaining the foot in operative relation to said former, and means for supplying uniform pressure to all parts of the former to cause the former to conform to the arch of the foot and for supplying additional pressure to raise the arch of the foot.

6. The combination with a base having a foot rest, of a flexible former mounted adjacent to said foot rest and arranged for the engagement of a foot therewith, means for maintaining the foot in operative relation to said former, and instrumentalities for supplying a hot fluid pressure to said former and for subsequently applying a cold fluid thereto, substantially as described.

7. The combination with a base having a foot rest, of a flexible former mounted adjacent to said foot rest and arranged for the engagement of a foot therewith, means for maintaining the foot in operative relation to said former, and instrumentalities for gradually supplying a hot fluid pressure to said former and for subsequently applying a cold fluid thereto as the hot fluid is correspondingly withdrawn, substantially as described.

8. The combination with a base having a foot rest, of a flexible former mounted adjacent to said foot rest and arranged for the engagement of a foot therewith, means for maintaining the foot in operative relation to said former, means for supplying fluid pressure to said former, a gage by which the pressure may be determined, and means for regulating said pressure.

9. The combination with a base having a foot rest, of a flexible former mounted adjacent to said foot rest and arranged for the engagement of a foot therewith, means for maintaining the foot in operative relation to said former, means for supplying fluid pressure to said former, and means for indicating the temperature of the fluid within the former.

10. The combination with a base having a foot rest arranged in an inclined position, of a flexible former mounted adjacent to said foot rest, and arranged for the engagement

of a foot therewith, means for maintaining the foot in operative relation to said former, and means whereby said former may be forced against the foot, substantially as described.

11. In an apparatus for forming arch supports or patterns thereto, the combination with a flexible former, of instrumentalities for supplying hot fluid pressure to said former to force the blank against and accurately conform the same to the arch of the foot and for subsequently supplying a cold fluid pressure to the former to set said blank, said instrumentalities including a source of fluid pressure supply, pipe connections between the same and the former, and a heater operatively associated with the pipe connections interposed between the former and the source of supply, substantially as described.

12. In an apparatus for forming arch supports or patterns thereto, the combination with a flexible former, of instrumentalities for supplying hot fluid pressure to said former to force the blank against and accurately conform the same to the arch of the foot and for subsequently supplying a cold fluid pressure to the former to set said blank, said instrumentalities including a source of fluid pressure supply, pipe connections between the same and the former, a heater operatively associated with the pipe connections interposed between the former and the source of supply, the said source of supply comprising a storage tank for the cold fluid, and the heater comprising a coil in the pipe connections and a burner adjacent thereto adapted to exert its heating influence upon said coil and the fluid passing therethrough.

13. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former, of means for supplying fluid pressure to said former to force a blank against and accurately conform the same to the arch of the foot, comprising a source of supply leading to the former, a valve for confining the fluid against the former when the same is expanded as desired, and another valve for relieving the fluid pressure to permit the former to collapse.

14. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former, of means for supplying fluid pressure to said former to force a blank against and accurately conform the same to the arch of the foot, comprising a source of supply leading to the former, a valve for confining the fluid against the former when the same is expanded as desired, and a petcock for relieving the fluid pressure to permit the former to collapse.

15. In an apparatus for forming arch supports or patterns therefor, the combina-

tion with a flexible former, of means for supplying fluid pressure to said former to force a blank against and accurately conform the same to the arch of the foot, and means for clamping the foot in place to resist and be immovable with reference to the former.

16. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former, of means for supplying fluid pressure to said former to force a blank against and accurately conform the same to the arch of the foot, and means for clamping the foot in place to resist and be immovable with reference to the former, said clamping means comprising members adapted to bear against the instep and toe portion of the foot.

17. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former, of means for supplying fluid pressure to said former to force a blank against and accurately conform the same to the arch of the foot, and means for clamping the foot in place to resist and be immovable with reference to the former, said clamping means comprising adjustable members adapted to bear against the instep and toe portion of the foot.

18. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former, of means for supplying fluid pressure to said former to force a blank against and accurately conform the same to the arch of the foot, means for clamping the foot in place to resist and be immovable with reference to the former, said clamping means comprising members adapted to bear against the instep and toe portion of the foot, and a base upon which the former and foot clamping means are mounted.

19. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former, of means for supplying fluid pressure to said former to force a blank against and accurately conform the same to the arch of the foot, means for clamping the foot in place to resist and be immovable with reference to the former, said clamping means comprising adjustable members adapted to bear against the instep and toe portion of the foot, and a base upon which the former and foot clamping means are mounted.

20. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former, of means for supplying fluid pressure to said former to force a blank against and accurately conform the same to the arch of the foot, means for clamping the foot in place to resist and be immovable with reference to the former, said clamping means comprising members adapted to bear against the instep and toe

portions of the foot, and a base upon which the former and foot clamping means are mounted, the means connecting the clamping means to the base being formed to permit said means to be swung over or away from the former.

21. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former, means for supplying fluid pressure to said former to force a blank against and accurately conform the same to the arch of the foot, means for clamping the foot in place to resist and be immovable with reference to the former, said clamping means comprising adjustable members adapted to bear against the instep and toe portions of the foot, and a base upon which the former and foot clamping means are mounted, the means connecting the clamping means to the base being formed to permit said means to be swung over or away from the former.

22. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former comprising a base, an expansible sheet secured to said base, and adjustable means for limiting the expansion area of said sheet, of means for supplying fluid pressure to said former to expand said sheet.

23. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former comprising a base, an expansible sheet secured to said base, and adjustable means for limiting the expansion area of said sheet, the same comprising oppositely slidable members and means for fastening them in place, of means for supplying fluid pressure to said former to expand said sheet.

24. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former comprising a base, an expansible sheet secured to said base, and adjustable means for limiting the expansion area of said sheet, the same comprising slidable plates adjustable longitudinally and laterally of the sheet, of means for supplying fluid pressure to said former to expand said sheet.

25. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former comprising a base and an expansible sheet secured to said base, means for restricting the expansion area of said sheet, of a heel rest operatively associated with the former, and means for supplying fluid pressure to said former to expand the said sheet.

26. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former comprising a base and an expansible sheet secured to said base, means for restricting the expansion area of said sheet, of a heel and a lateral

or edge rest operatively associated with the former, and means for supplying fluid pressure to said former to expand the said sheet.

27. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former comprising a base and an expansible sheet secured to said base, means for restricting the expansion area of said sheet, of an adjustable heel rest operatively associated with the former, and means for supplying fluid pressure to said former to expand the said sheet.

28. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former comprising a base and an expansible sheet secured to said base, means for restricting the expansion area of said sheet, of an adjustable heel and an adjustable lateral or edge rest operatively associated with the former, and means for supplying fluid pressure to said former to expand the said sheet.

29. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former comprising a base, an expansible sheet secured to said base, and means for restricting the expansion area of said sheet, of a foot rest thereabove, and means for supplying fluid pressure to said former to expand the said sheet.

30. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former comprising a base, an expansible sheet secured to said base, means for restricting the expansion area of said sheet, and means for detachably securing the parts in place, of means for supplying fluid pressure to said former to expand the said sheet.

31. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former arranged for the reception of a foot thereabove comprising a base, an expansible sheet arranged thereabove, means for detachably securing the

sheet to the base, and means for supplying fluid pressure to said former to expand the said sheet.

32. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former, of means for supplying fluid pressure to said former to force a blank against and accurately conform the same to the arch of the foot, comprising a source of supply leading to the former, and valve means for confining the fluid against the former when the same is expanded as desired and for relieving the fluid pressure to permit the former to collapse.

33. In an apparatus for forming arch supports or patterns therefor, the combination with a flexible former, of means for supplying fluid pressure to said former to force a blank against and accurately conform the same to the arch of the foot, and an upwardly extending abutment to resist lateral expansion of the former and force the same inwardly against the arch.

34. In an apparatus for forming arch supports or patterns therefor, the combination with a base having an inclined front portion, of an expansible former mounted upon said inclined face arranged for the reception of a foot thereabove, and means for expanding the former.

35. In an apparatus for forming arch supports or patterns therefor, the combination with a base having an inclined front portion, of a flexible former mounted upon said inclined face arranged to receive a foot thereabove, means for fastening the foot in place, and means for actuating the former.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM C. J. GUILFORD.

Witnesses:

CARRIE A. KREY,
THOS. R. HEATH.