

Oct. 1, 1940.

H. KAPLAN

2,216,533

FOOT ADJUSTING AND GAUGING APPARATUS

Filed March 6, 1940

3 Sheets-Sheet 1

Fig. 1.

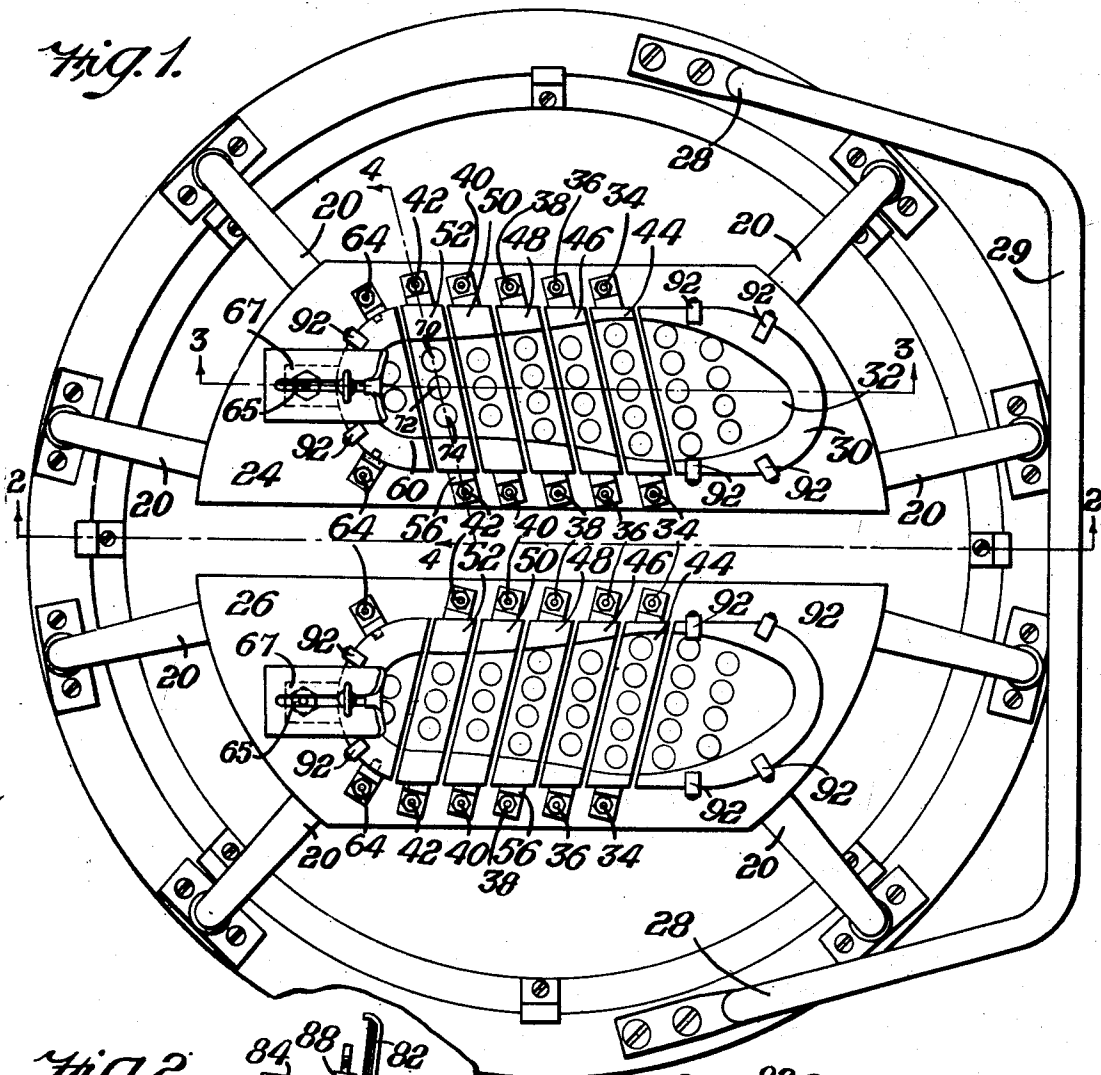
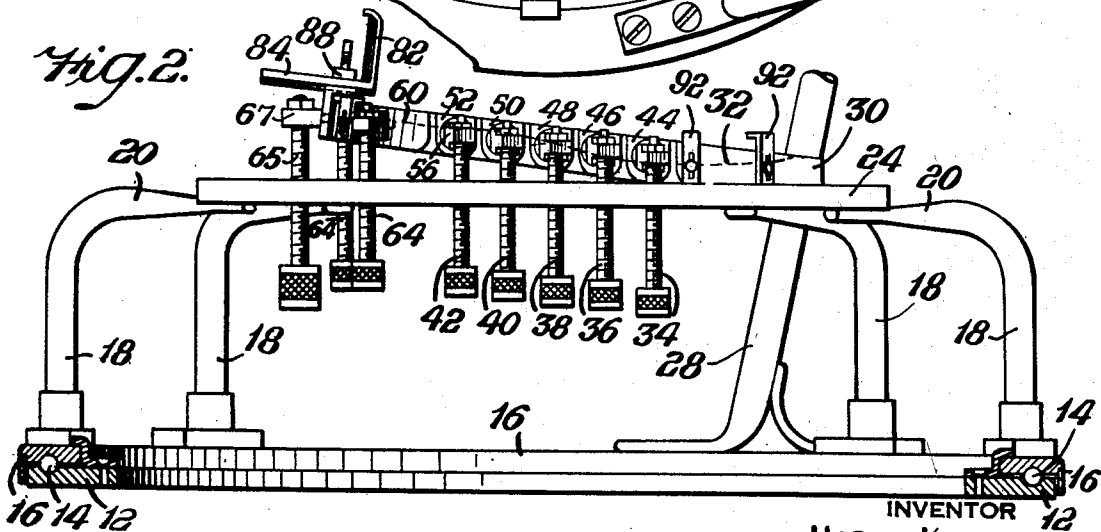


Fig. 2.



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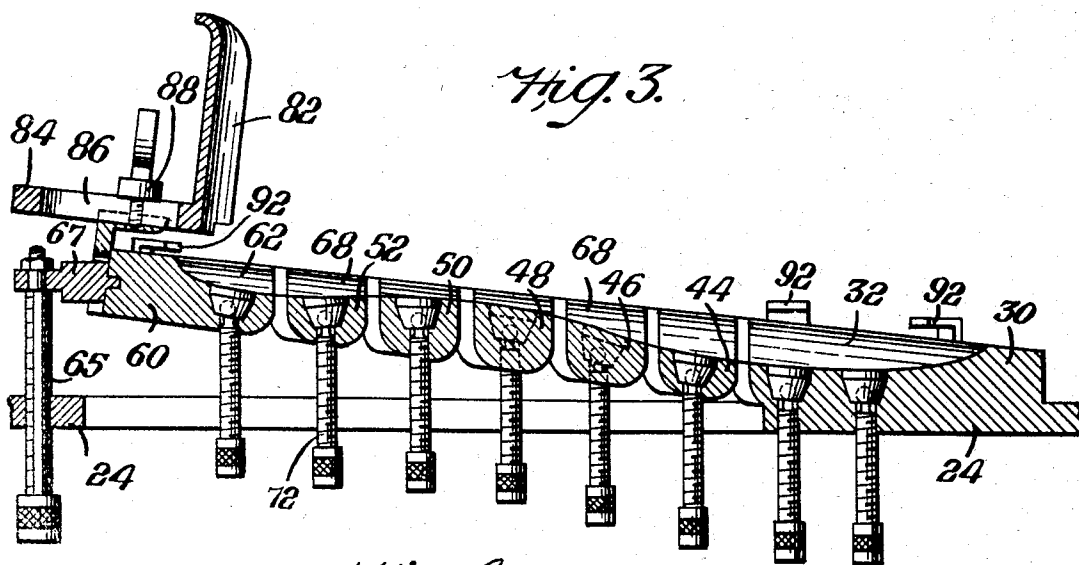
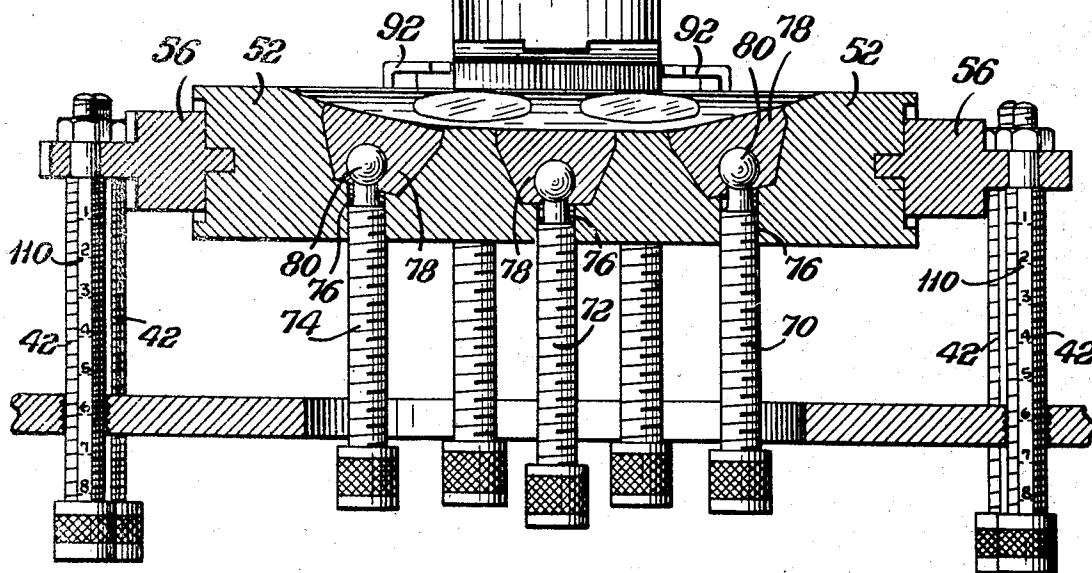
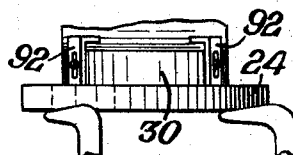


Fig. 4.

Fig. 4A.



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3 Sheets-Sheet 3

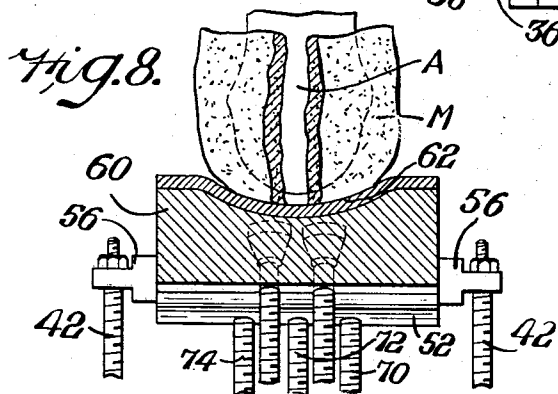
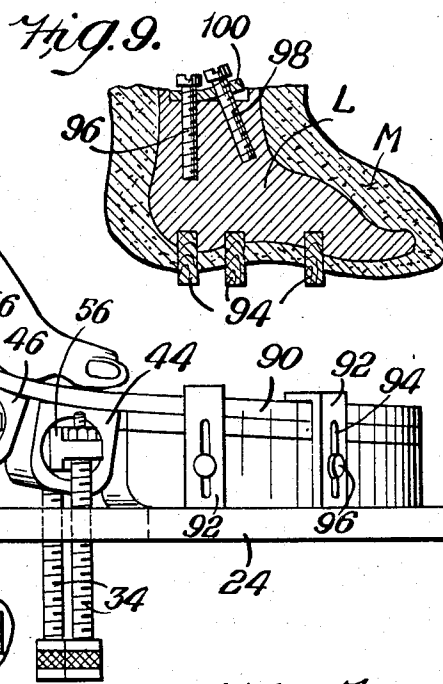
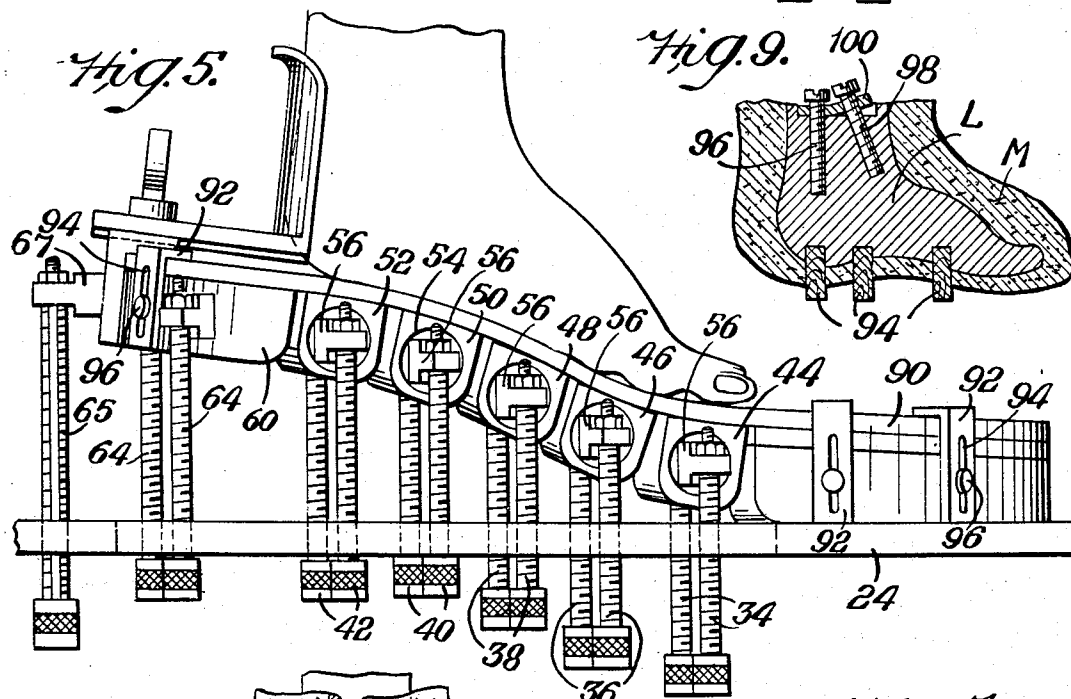
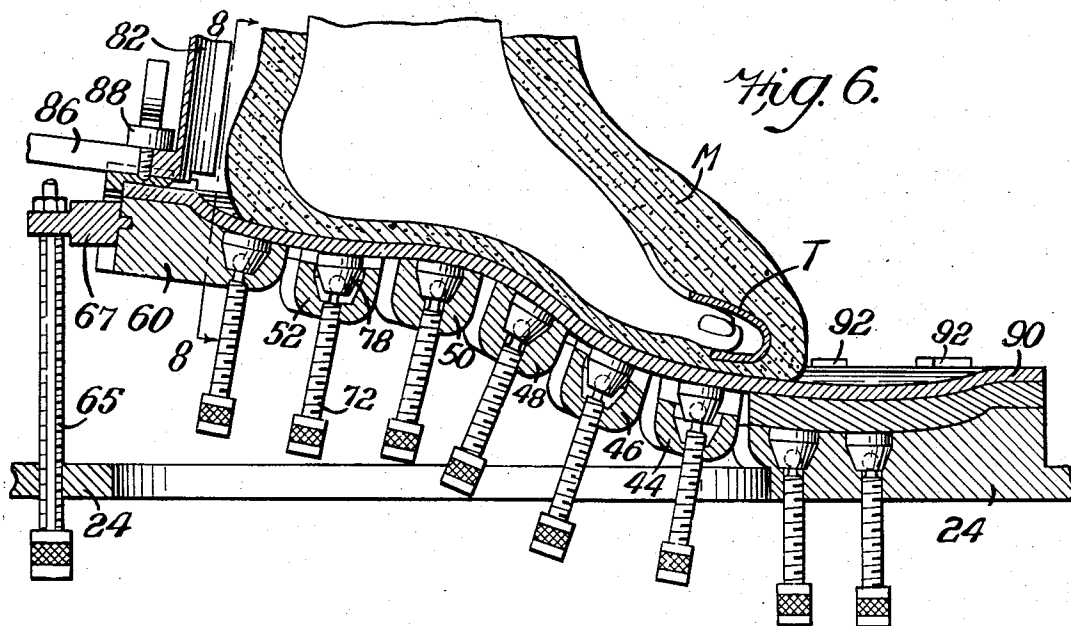


Fig. 7.

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UNITED STATES PATENT OFFICE

2,216,533

FOOT ADJUSTING AND GAUGING
APPARATUS

Harry Kaplan, Philadelphia, Pa.

Application March 6, 1940, Serial No. 322,474

4 Claims. (Cl. 33—3)

My invention relates to a new and useful foot adjusting and gauging apparatus which is particularly designed for corrective adjustment of non-chronic deformities or dislocations in the structure of the foot, or for gauging and locating chronic and permanent deformities so that, in the first instance, shoes may be built on lasts made according to this invention and by means of my novel apparatus for correcting the non-chronic and correctable deformities or dislocations, and whereby, in the second instance, shoes may be built also from lasts made according to the invention and with the use of my novel apparatus which will so accommodate the permanent and unchangeable deformities as to reduce or eliminate the pain during walking. The general object of my invention therefore is, to design a novel apparatus for the purposes indicated and a novel method of using the same in the production of orthopedic shoes having the necessary remedial of ameliorating characteristics.

As generally indicated above, foot ailments can be generally divided into incipient ills which produce painful symptoms during their formation and which in most cases can be corrected, and other deformities which are of a permanent character either due to having been neglected until they reached the chronic stage or which are of their nature irremediable. In both events the use of ordinary shoes made in standard sizes and on standard lasts is most undesirable, if not dangerous, since it does not relieve the pain and it has no corrective function for arresting incipient deformities or correcting the same. Nor is the practice of trying to correct such deformities or alleviating the pain therefrom by inserting a filler in one spot or cutting a depression in another spot in the inner sole of the shoe a successful method since all such attempted corrections are not only crude in their nature but are also necessarily carried on by a hit-and-miss method having no relation to the exact state of the foot.

In the accompanying drawings:

Fig. 1 represents a top plan view of an apparatus embodying my invention.

Fig. 2 represents a section on line 2—2 of Fig. 1.

Fig. 3 represents on an enlarged scale a section on line 3—3 of Fig. 1, certain parts being omitted.

Fig. 4 represents on an enlarged scale a section on line 4—4 of Fig. 1, certain parts being omitted.

Fig. 4a represents on a reduced scale a fragmentary view in elevation of the toe portion of the apparatus shown in Fig. 1.

Fig. 5 represents a fragmentary view in side elevation showing the apparatus with only par-

tial adjustment and with a defective foot resting thereon.

Fig. 6 represents in vertical cross section a view similar to Fig. 5 showing the device fully adjusted and illustrating the first step in the preparation of a last from which shoes for this particular foot will be made.

Fig. 7 represents an end elevation of a flexible strip impregnated with dehydrated gypsum and adapted to be wrapped around the foot and moistened to produce a cast or mold.

Fig. 8 represents a fragmentary section on line 8—8 of Fig. 6.

Fig. 9 represents in vertical cross section the mold formed from the foot as shown in Fig. 6 with the last of the shoe cast in the mold.

Fig. 10 represents in vertical cross section the finished last removed from the mold.

Referring to the drawings in which like reference characters indicate like parts, and more particularly to Figs. 1 and 2, my novel apparatus is supported on a base 12 which is preferably annular but which may be of any desired shape, and which is suitably mounted upon a platform or other permanent support. Rotatable over the base 12 and provided with the anti-friction bearings 14 is the annular member 16 which supports the framework consisting of the arms 18 which have the horizontal, deflected portions 20 which support the platforms 24 and 26 for the left and right foot, respectively. Carried by the rotary annular member 16 are the vertical arms 28 which extend upwardly to approximately the height of an average person, and which terminate in the horizontal hand portion 29 to be grasped by a person standing on the apparatus during the adjustment of the feet. This is merely for convenience and safety of the patient.

Since the apparatus for the left foot is identical with that for the right foot, both in structure and in operation, it is deemed that the description of the one will be sufficient.

Referring now to Figs. 2 and 3 and describing the apparatus for the left foot (as viewed in Fig. 1), it will be seen that the platform 24, which is supported on the deflected ends 20 of the up-rights 18, extends transversely of the annular member 16 and is provided at its front or toe end with the thickened and enlarged portion 30 which is dished out or concaved as at 32. At this point I wish to bring out the fact that the platform 24 is rigidly supported in position and immovable. Threaded through the platform 24 for vertical adjustment are the bolts 34, 36, 38, 40 and 42 which carry the slats 44, 46, 48 and 50 and 52 respectively, and it will be seen from Fig. 1 that there is a pair of bolts 34, one at each end of the slat 44, and a pair of bolts 36, one for each end of the slat 46, and so forth for each of the slats 48, 50 and 52. By turning the bolts

34 to 42 inclusive in either direction, the corresponding slats 44 to 52 inclusive are raised or lowered individually with respect to each other. In order to be able to tilt each of the slats 44 to 52 horizontally I provide the opposite ends of each of the slats 44 to 52 with round openings 54 which pivotally engage the dowels 56 so that, if the right hand bolt 42, for instance, of the slat 52 is turned more than the opposite bolt 42 of the same slat 52 the slat 52 will tilt accordingly as will be seen from Fig. 4. In this way each of the slats 44 to 52 inclusive can be raised or lowered equally from both ends so as to maintain a horizontal position, or any of the slats may be raised more at one end and less at the other so that such slats may be tilted in a horizontal plane and at an angle to the median line of the foot. Near the heel portion of the apparatus is provided the enlarged slat 60 which is also concaved at 62 and which is engaged by bolts 64 also threaded in the platform 24, it being noted from Figs. 3, 5 and 6 that the enlarged slat 60 is also supported by a rear, central bolt 66 and its dowel 67 so that the rear slat 60 can be tilted forwardly and backwardly in a horizontal plane independently of the slats 44 to 52. It will also be noted, particularly from Fig. 3, that the slats 44 to 52 are also more or less concaved at 68. The toe portion 30 of the platform 24, the rear enlarged slat 60 and all the intermediate slats 44 to 52 are each provided with one or more bolts which are threaded through the bodies of the slats and the toe and heel portions 30 and 60 and each of which may be raised and lowered independently for more minute adjustment. Since the construction and operation of all of the adjustment bolts is the same, I will, for convenience in description, refer to Fig. 4 which is a section through the slat 52, it being understood that the description of this slat is to apply to the other slats 44 to 52 as well as the toe and heel portions 30 and 60 regardless of the variation of the number of bolts in each of these parts. Referring to Fig. 4 it will be seen that the slat 52 is provided with three adjustment bolts 70, 72 and 74 which are threaded at 76 in the body of the slat 52 and which are provided with the heads 78 which have the ball and socket connection 80 with the bolts. Assuming that there is a fallen bone in the foot corresponding with the position of the bolt 72, it follows that it is desirable to raise the head of the bolt 72 to readjust the bone and put it back into position, and therefore the bolt 72 is turned in the proper direction to raise the head 78 thereof above the level of the heads 78 of the adjacent bolts 70 and 74. Also, due to the ball and socket or swivel connection 80 between the heads 78 and the bolts, the heads 78 of the respective bolts 70, 72 and 74 are capable of assuming the proper angle and tilting about their respective pivots so as to make the proper fit. Mounted on the rear or heel portion 60 is the heel adjusting member 82 which has the horizontal extension 84 which is provided with the slat 86 so as to be slidable with respect to the wing nut 88. In this way the heel adjusting member can be moved to the right or the left, as viewed in Figs. 3, 5 and 6, according to the size of the foot or its location with respect to the apparatus. The heel adjusting member 82 is shown in its extreme right hand position in Fig. 5 and in its extreme left hand position in Fig. 6. 90 designates a pad or a cushion of rubber or other flexible material which is super-

imposed on the top of the heel portion 60, the toe portion 30 and the intermediate slats 44 to 52 and is detachably held in position by a series of clamps 92. The clamps 92 may be of any desired construction but one preferred form is shown in Fig. 9 in which it will be seen that the clamp comprises a horizontal portion for engaging the mat or cushion 90 and a vertical slotted portion 94 which is engaged by a wing nut or the like 96.

The operation is as follows:

The foot of the patient is placed on the slats 44 to 52 or on the front portion 30 and the next adjacent slats, or on the heel portion and the next adjacent slats, according to the judgment of the operator, and the heel piece 82 is adjusted all as shown in Fig. 5. Assuming the foot of the patient to be flat or to have other correctable or incorrectable infirmities, the operator then proceeds to raise or lower with respect to each other any one or more of the slats 44 to 52, and to tilt the same to the right or to the left horizontally, or to tilt the heel portion 60 forwardly and rearwardly or to the right and to the left horizontally according to the requirements of the particular foot. After that general adjustment has been achieved, the operator proceeds to secure more accurate and detailed adjustment or correction by manipulating the bolts 70, 72 and 74, or any of them, in the slat 52, or any one of the other slats 44 to 52, or one or more or all of the corresponding bolts in the toe portion 30 or the heel portion 60. In that way, if the foot has a fallen bone or some other correctable projection, the same can be lifted back to proper position by manipulation of the bolt or bolts in the particular slat or slats corresponding to that particular portion of the foot, and, if the foot has some defect that is incorrectable, the bolts passing through the various slats or the toe or heel portions are nevertheless adjusted to conform to that particular deformity so as to produce an outline which corresponds to the foot as corrected or to the foot with its incorrectable deformities all as diagrammatically illustrated in Figs. 6 and 8. After this has been done the feet are removed and are encased in a plastic and the feet are again placed on the properly adjusted position of the device so that the plastic, when allowed to harden about the foot, will represent a mold which is a negative of the contour of the foot either as corrected or as gauged. One preferred method of applying the plastic to the foot consists in wrapping the foot with strips of flexible material impregnated with plaster of Paris or other composition which will set when wetted, such a strip being illustrated in cross section in Fig. 7. With the foot tightly wrapped around with the strips shown in Fig. 7, and when the same have been wetted and the foot is placed again on the adjusting device, the wetted plastic will conform to the contour of the foot and the adjusting device and will, when it dries, harden into a solid mold. After this is done the mold is cut open vertically as at A in Fig. 8 so as to permit withdrawal of the foot from the mold. The mold is then again closed and the slit A is sealed with adhesive strips or other material and is ready for casting a last from which the appropriate shoe is to be made. I then bore a series of holes in the bottom of the mold M and insert therethrough pieces of wood or other nail-engaging material 94 so that the upper ends of the pieces 94 project somewhat upwardly into the mold. I then pour the

plastic from which the last L is made into the mold and before the plastic has set I insert the screws 96 and 98 which also pass through a plate 100 which is deflected as shown in Fig. 9.

5 When the composition of which the last L is made has set, I remove the screws 96 and 98 and the plate 100 and split the last vertically as at 102 so as to make it into two pieces 104 and 106. Also I trim the lower ends of the pieces of wood 10 94 so that their bottom ends are now flush with the bottom contour or the sole 108 of the last. I then reapply the plate 100 and the screws 96 and 98 so as to hold the two pieces of the last 104 and 106 together. The pieces of wood 15 or the like 94 are adapted to receive nails and tacks that may be needed in the lasting of the shoe on the last L, and the splitting of the last L into two pieces 104 and 106 enables me to withdraw the last from the shoe by merely disengaging the screws 96 and 98 and pulling out of the shoe, first the rear pieces 104, and then the front piece 106. Some or all of the adjustment screws 34 to 42 as well as the adjustment screws 64 and 65 are provided with a scale 110 20 on one or more faces thereof and the same is true of the adjustment bolts 70, 72 and 74 of the slat 52 as well as all the other corresponding bolts of the remaining slats or of the toe portion 30 or the heel piece 60. In the drawings I have shown the scale 110 as applied to only certain of the bolts but this is only for convenience since the application of the scale to all of the bolts would interfere with the showing of their threads. The provision of the scale enables the 35 operator to translate the adjustments that may be made in each individual case in terms of inches and fractions thereof in order to record the same for future reference, either for when another similar shoe is needed, or in order to watch progress of adjustment and correction of the initial deformities of the foot.

It will thus be seen that by my novel apparatus I am enabled to adjust accurately, either for correction or for measurement of defects, in all horizontal and vertical planes conceivable, since the 45 tilting of the slats horizontally to the right or to the left with respect to the foot as well as the tilting of the slats forwardly or rearwardly about their pivoted dowels, together with the forward and backward as well as lateral tilting of the heel piece 60 and the vertical adjustment of the bolts passing through the slats or through the toe piece 30 or heel piece 60, together with the swivel connections of the heads 78 of said bolts with respect to the bolts themselves, renders my device capable of gauging or adjusting every point along the sole of the foot and not merely along general areas thereof. My novel apparatus has been embodied in a full size working construction and has been 50 used repeatedly with great success in the building of shoes that tend effectively to correct non-chronic defects and in other cases shoes have been built which have eliminated the pain which a person with chronically defective feet experiences in walking in ordinary shoes. The slats 44 to 48 are also tiltable horizontally at an angle to their longitudinal axis about the pivoted dowels 56. In order to protect the toes of the foot from unnecessary contact with the material of the 70 mold M, I encase the toes of the foot in the toe box T as best seen in Fig. 6. The toe box T, in addition to protecting the toes of the foot against unnecessary contact with the plastic of which the mold M is made, also serves to provide the proper

length and shape for the toe portion of the finished last in Fig. 10 in accordance with the requirements of the foot or in accordance with the desired style of the shoe. The toe box, when slipped over the toes of the foot as shown in Fig. 6, is held in position by a piece of adhesive tape which is attached partly to the toe box and partly to the foot. Also, in order to prevent the plastic of the mold end from sticking to the foot, the foot is coated with vaseline or some other lubricant prior to being wrapped in the plastic strips of Fig. 7.

It will be seen, particularly from Figs. 5 and 6, that the foot adjusting apparatus is made very much longer than is needed for the adjustment of the human foot, the object being to increase the range of possible adjustment and measurement. Thus, if it is determined that the heel of the foot needs no attention, the heel is positioned on the rear portion 60 and the rest of the foot is adjusted by the bolts supporting the slats and by bolts passing through the slats. On the contrary, if the toe or ball portion of the foot is normal, the patient is made to step forward on the device so that the toe and the ball or either will rest on the immovable front or toe portion 30 with the rear portion of the foot resting on the slats and adjusted thereby.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A foot adjusting apparatus comprising a plurality of slats on which the foot to be adjusted is adapted to rest, there being recesses formed in said slats and through openings communicating with said recesses, a plurality of bolts threaded through said openings, and a plurality of heads pivotally connected to said bolts and normally seated in said recesses.

2. A foot adjusting apparatus comprising a toe portion, a heel portion and a plurality of slats disposed between said toe and heel portions, there being recesses formed in the upper surfaces of said toe portion, heel portion and intermediate slats, and through openings communicating with said recesses, a plurality of adjustment bolts threaded through said openings, and heads pivotally connected to the upper ends of said bolts and normally lying in said recesses with the upper surfaces of said slats flush with the upper surfaces of said toe portion, heel portion and intermediate slats.

3. A foot-adjusting device comprising a rotatably mounted rigid support, a plurality of bolts threaded for vertical adjustment through said support, a toe portion at one end of said support, certain of said bolts extending through said toe portion, a pivotally mounted heel-supporting portion at the other end of said support, certain of said bolts extending through said heel portion, an adjustable heel abutment portion coacting with said heel-supporting portion, and a plurality of slats disposed between said toe portion and heel supporting portion, said slats being pivotally supported by certain of said bolts and certain of said bolts extending through said slats.

4. A foot adjusting device comprising a support, a plurality of bolts carried by and vertically adjustable with respect to said support, dowels carried by said bolts at an angle to the vertical axes thereof, and a plurality of foot supporting elements pivotally mounted on and carried by said dowels.

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