

Jan. 28, 1941.

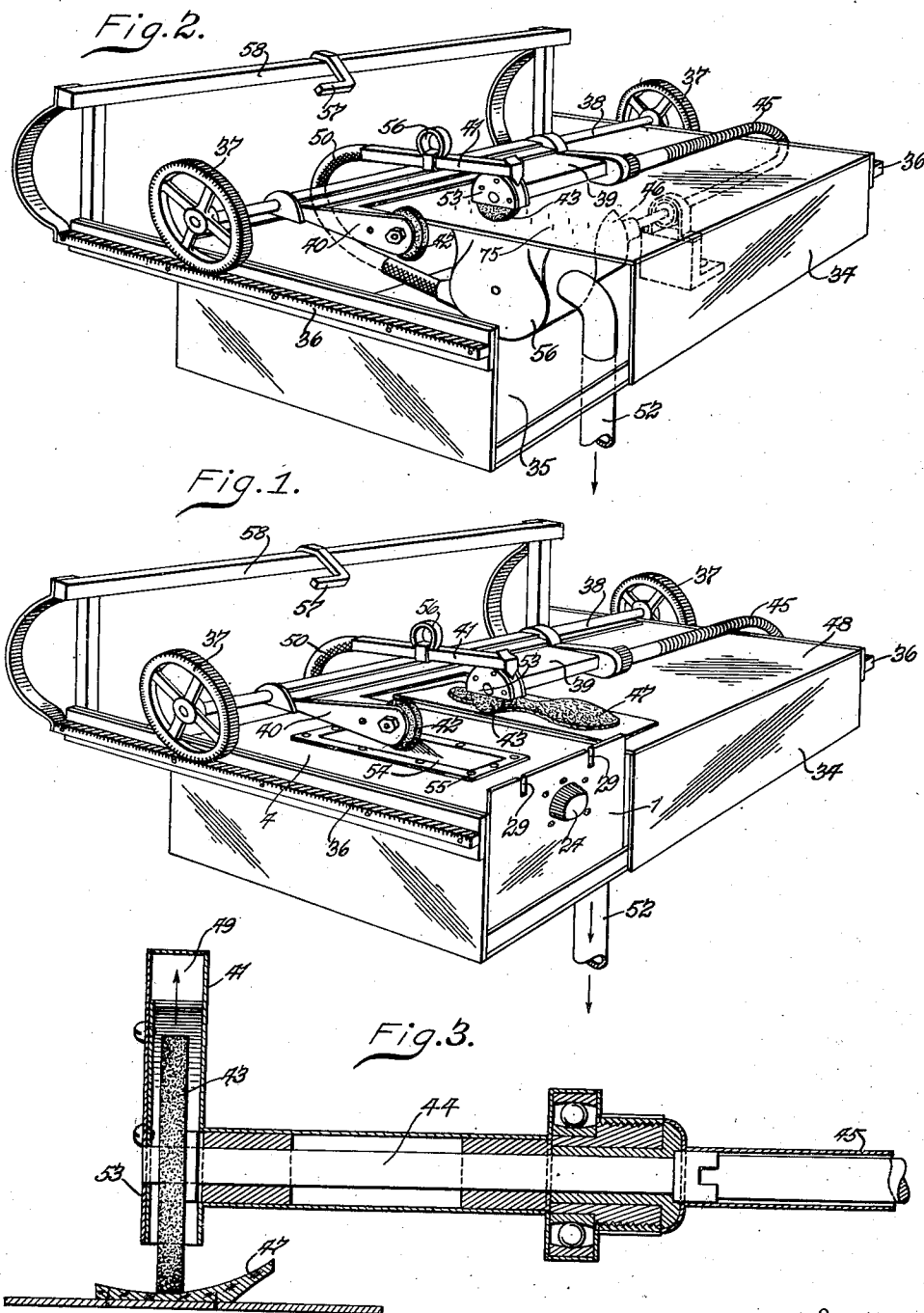
D. F. HYLAND

2,230,143

METHOD AND APPARATUS FOR MAKING ORTHOPEDIC LIFTS

Filed Dec. 8, 1937

3 Sheets-Sheet 1



Inventor
Daniel F. Hyland
by *Bruninga & Rutherford*
His Attorneys.

Jan. 28, 1941.

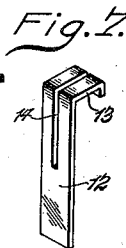
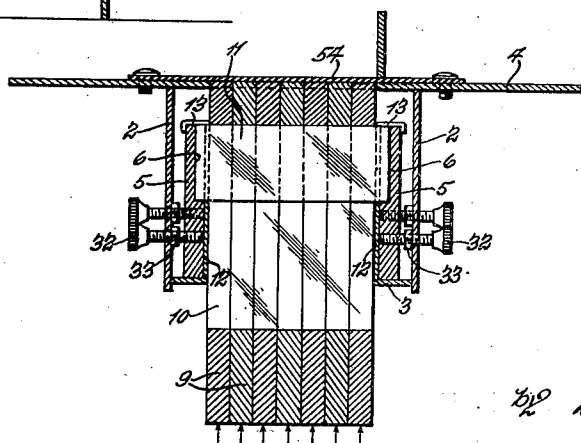
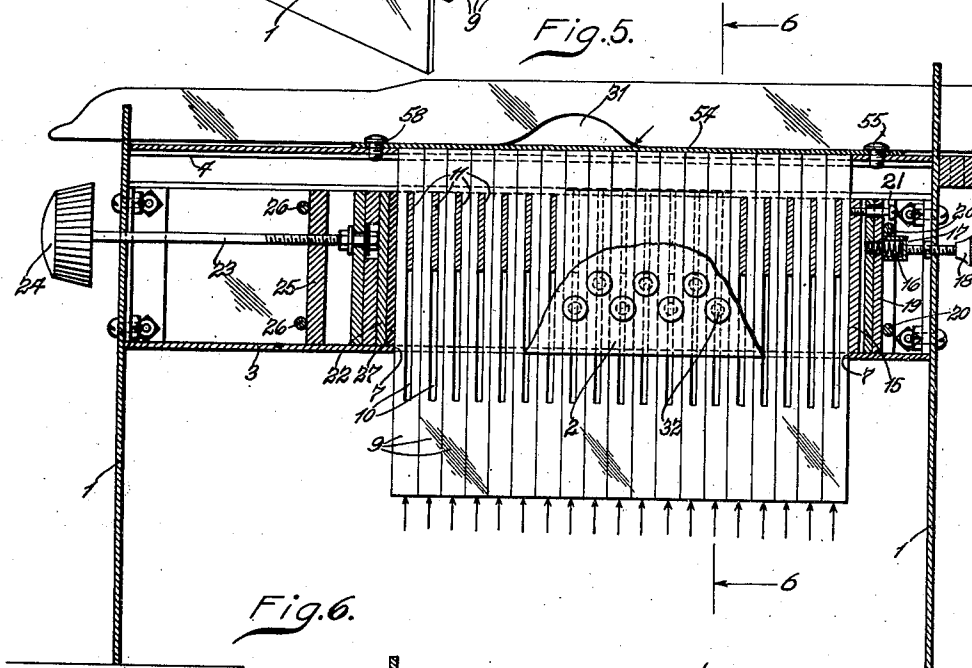
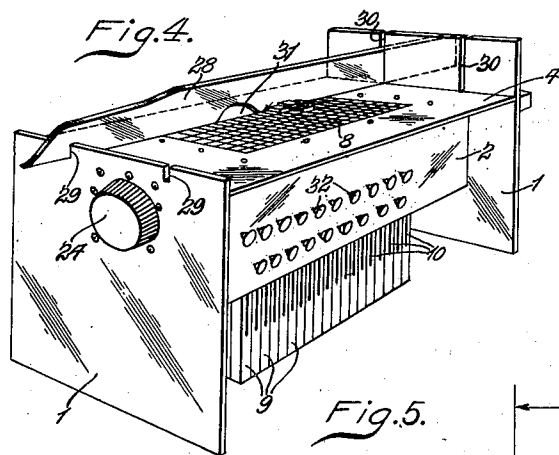
D. F. HYLAND

2,230,143

METHOD AND APPARATUS FOR MAKING ORTHOPEDIC LIFTS

Filed Dec. 8, 1937

3 Sheets-Sheet 2



Inventor
Daniel F. Hyland
By *Brunnig & Sutherland*
His Attorneys.

Jan. 28, 1941.

D. F. HYLAND

2,230,143

METHOD AND APPARATUS FOR MAKING ORTHOPEDIC LIFTS

Filed Dec. 8, 1937

3 Sheets-Sheet 3

Fig. 8.

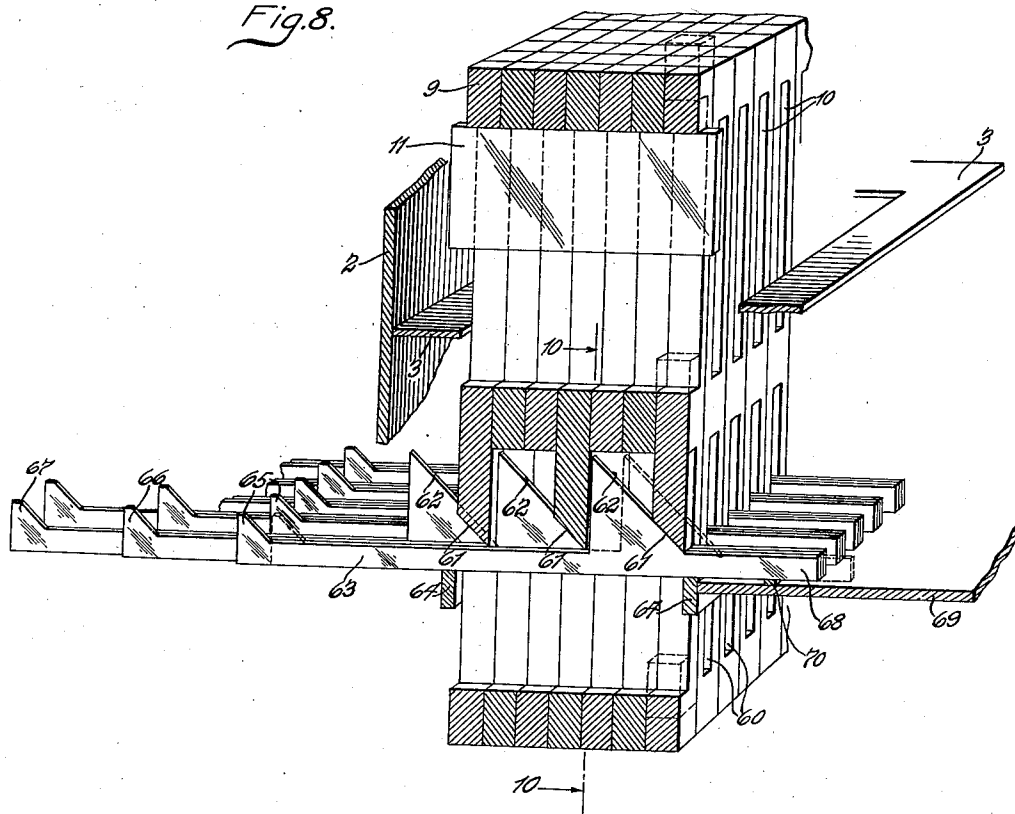


Fig. 9.

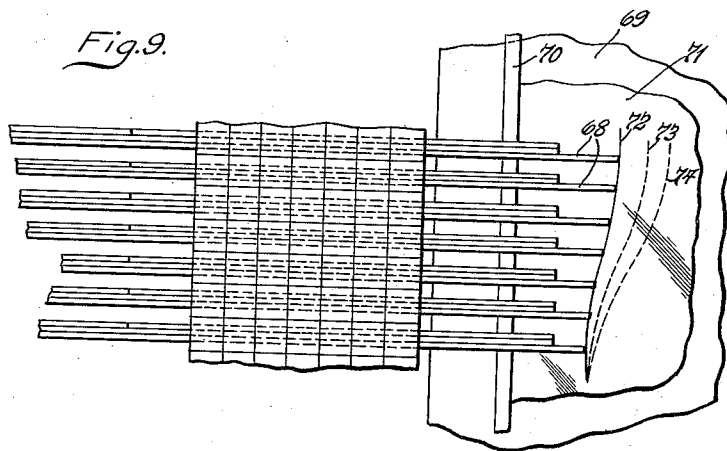
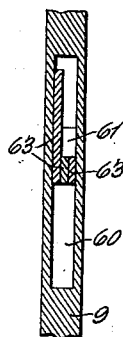


Fig. 10.



INVENTOR.
Daniel F. Hyland
BY *Bruninga & Sutherland*
HIS ATTORNEYS.

UNITED STATES PATENT OFFICE

2,230,143

METHOD AND APPARATUS FOR MAKING
ORTHOPEDIC LIFTS

Daniel F. Hyland, St. Louis, Mo., assignor, by
mesne assignments, to Arch-O-Graph Com-
pany, a corporation of Missouri

Application December 8, 1937, Serial No. 178,712

11 Claims. (Cl. 12—60)

This invention pertains to a method and appa-
ratus for producing orthopedic lifts for the cor-
rection of foot troubles such as fallen arches
and the like. While the invention is directed
5 primarily to the correction of such troubles, it
is also applicable to the preservation of normal
feet against any tendency toward such troubles.
This application is a continuation in part of my
co-pending application Serial Number 43,817 filed
10 October 7, 1935.

The troubles due to weak feet and for the cor-
rection of which orthopedic lifts are used, con-
sist mainly in the breaking or falling of the
arches of the feet to a greater or less extent, and
15 this is usually accompanied by an inward de-
flexion of the whole foot, which is termed pro-
nation.

One of the objects of this invention is to pro-
vide a method and apparatus whereby corrective
20 lifts may be produced of proper shape to correct
such trouble for any particular foot.

Another object is to provide a method where-
by the extent of the trouble or, in other words,
the exact deformed condition of the foot may
25 be measured accurately and a lift produced in
accurate conformity with such measurement.

Another object is to provide a method where-
by such a deformed foot, particularly one suffer-
ing from pronation, may be measured in a part-
30 ly or wholly restored condition and a lift pro-
duced in accordance with such measurements.
The wearing of such a lift will tend to restore
the deformed foot to a normal condition.

Another object is to provide a method and ap-
paratus whereby a lift may be accurately formed
35 in accordance with measurements on a partic-
ular foot and in which the accuracy of forma-
tion is independent of any manual skill on the
part of the workman forming the same.

Another object is to provide an apparatus in-
cluding foot testing or measuring means and lift
forming means so organized that the measuring
means may be portable so that they may be car-
ried to the patient for measuring the foot and
45 then assembled with the forming means so that
the shape of the arches set up on the measuring
means may be taken off and transferred to the
forming means so that the lift may be formed by
the latter in exact correspondence with the
50 plantar area measured.

Another object is to provide a method and
apparatus whereby a foot suffering from pron-
ation may be elevated and restored to its proper
condition and a measurement of the normal
55 shape of the arches in that condition may be

taken and transferred to the forming means
whereby a lift of exact form for supporting the
foot in normal condition may be produced.

Further objects will appear from the follow-
ing description taken in connection with the ac-
companying drawings in which

Figure 1 is a perspective view of an apparatus
embodying this invention shown in assembled
form for transferring the measurements set up
on the measuring device to the forming device;

Figure 2 is a similar view with the measuring or
testing device removed;

Figure 3 is a detail sectional view somewhat
enlarged showing the mounting of the shaft of
the forming tool and its relation to the work;

Figure 4 is a perspective view of the measuring
device or master pattern;

Figure 5 is an enlarged longitudinal section
of the device of Figure 4;

Figure 6 is a transverse section on line 6—6
of Figure 5;

Figure 7 is a perspective detail view of one of
the movable supports for the measuring or gauge
elements;

Figure 8 is a fragmentary perspective view
showing another embodiment of the invention
providing means for recording the measurements
of the plantar arches;

Figure 9 is a fragmentary plan of Figure 8, and

Figure 10 is a section on line 10—10 of Fig-
ure 8.

Referring to the drawings and more particu-
larly to Figures 4 to 7 inclusive, Figure 4 illus-
trates one embodiment of the means for meas-
uring or gauging the arch of a foot. It com-
prises a pair of end supports 1 forming the front
and rear of the device, and a pair of longitudi-
nally extending side walls 2. A floor plate 3
extends horizontally between the plates 1 and 2
near the middle portion of the end supports 1
and a top plate 4 extends over the top of the
entire device to form a foot rest upon which
the foot to be measured may be placed. Extend-
ing longitudinally within the walls 2 are sup-
porting bars 5 provided along the upper portion
45 of their inner faces with longitudinal recesses or
channels 6.

The floor plate 3 is provided with a rectangu-
lar opening 7 and the top plate 4 is provided with
a similar opening 8. Extending vertically through
these openings 7 and 8 is a series of vertically
movable riser bars or gauging elements 9. These
bars in the embodiment illustrated are rectan-
gular in cross section and are arranged in lon-
gitudinal and transverse rows as may be seen

from Figure 4. The bars are in mutual contact with each other but are slidable vertically with relation to each other and with relation to the plates 3 and 4. Each bar 9 is provided with a slot 10 penetrating the same in a lateral direction and extending lengthwise for a considerable portion of the length of the bar. Traversing the slots 10 of each transverse row of bars is a cross supporting plate 11. The ends of the bars 11 rest in the channels 6 of the bars 5 and are movable in said channels lengthwise of said bars. The plates 11 maintain the riser bars of a single transverse row in alignment with each other and restrain the movement of said bars longitudinally of the device so as to cause each row to move as a unit. Each plate 11 is additionally supported by a pair of hangers 12, one of which is illustrated in detail in Figure 7. This hanger has a vertically extending shank and is bent over at its upper end to form a hook 13. A slot 14 is formed to extend vertically of the hanger through the horizontal portion of the hook 13 and downwardly along the shank of the hanger a sufficient distance to accommodate the height of the plate 11. As will be seen from Figure 6, the ends of each plate 11 rest in the slots 14 of a pair of hangers and the hooked ends 13 are passed over the upper edges of the bars 5. These hangers are thus restrained to slide lengthwise along the bars 5 with the plate 11 and the row of riser bars 9.

Extending transversely of the device between the bars 5 is a pressure plate 15 against which the last row of bars 9 engages. This plate is supported against rearward movement by one or more springs 16 carried by a transverse yoke 17 supported by one or more adjusting screws 18. The springs 16 may extend forwardly through perforations in a backing plate 19 which in turn is supported by transverse bars or pins 20 fixed in the side walls 2. The plate 15 has its forward movement limited by adjustable stop screws 21. At the front end of the device the bars 9 are engaged by another transverse pressure plate 22. Clamping screw 23 having a manipulating head 24 is threaded into a stop plate 25 secured against forward movement by stop pins 26. The screw 23 may be adjusted to force the plate 22 rearwardly against the bars 9 so as to clamp the entire assembly of bars and lock them in adjusted position. If desired a resilient plate 27 of rubber or the like may be interposed between the pressure plate 22 and the bars 9 so as to insure a uniform pressure on all the bars.

When the bars 9 are loose or unclamped they may be moved downwardly to their lowermost position as limited by engagement of the upper part of the slot 10 against the upper edge of the plate 11. When in this position the upper ends of said bars come flush with the upper surface of the top plate 4. By placing the bars under slight pressure by adjustment of the screw 23 any one or more bars may be moved upwardly so that its upper end projects above the plate 4 and it will be frictionally retained in such position. Accordingly, if a foot is placed upon the top plate 4 with its arch portion over the bars 9, the latter may be pushed up from below until their upper ends engage with the arch of the foot and they will be frictionally held in such position. By pressing upwardly on all the bars each one will be raised to a position corresponding to the height of the arch just above it, and when all have been thus manipulated the upper ends of the bars will define a three dimensional surface corresponding exactly with that of the plantar sur-

face measured. The bars may now be clamped in this position by operation of the screw 23 so as to preserve this adjustment.

In order to assist in correcting pronation, a longitudinal bar 28 is removably mounted in slots 29 and 30 in the front and rear plates 1. These slots are so positioned as to hold the bar 28 in longitudinal alignment with a row of the bars 9. This bar 28 provides a gauge against which the inner face of the foot may be positioned to take a measurement. As pronation is the result of a laterally inward roll or fall of the foot as a whole, by placing the inner face of the foot against the bar 28 the foot may be erected so as to eliminate such fall or pronation and restore the foot to its normal position. A recess 31 may be provided in the bar 28 in order to clear a prominent joint or bunion in case such would otherwise interfere with properly aligning the foot against the bar 28. Two sets of slots 29 and 30 are provided for the accommodation of right and left feet.

In restoring a faulty foot to normal position three parts of the arch are of special importance, and a foot specialist will usually see that these three parts are in proper adjustment, which would usually insure that the rest of the foot take its normal position. These parts are the transverse arches at the so-called metatarsal and cuboid regions, and the longitudinal arch or "scaphoid stream." This device provides for insuring proper adjustment of the arches at these points. A pair of clamping screws 32 is provided opposite each transverse row of the bars 9. These screws pass loosely through clearance holes in the plates 2 and are provided with nuts 33 on the inside of said plates. The screws also pass through clearance holes in the bars 5 and the ends abut against the lower portions of the shanks of the hangers 12 which thus serve as binding plates and to cover the slots 10. By adjusting the screws 32 lateral pressure may be applied to one row of bars 9 so that said row may be clamped in adjusted position and independently of the other bars. The loose mounting of the screws 32 permits sufficient forward and rearward movement of the bars 9 to permit clamping the same by means of the screw 23. The hangers 12, therefore, provide clamping plates for clamping a row of bars 9 and at the same time the hanger supports 12, by means of which a clamped row is movably suspended upon the bars 5. This arrangement permits careful attention to the adjustment of that row of bars 9 which engages the metatarsal portion of the arch so that accurate adjustment of that row of bars may be had and the bars then clamped to preserve the adjustment. The attention may then be turned to the cuboid region and the transverse row of bars at that point adjusted and clamped in a similar manner. This not only measures the arch at these important points, but, when these rows are clamped, the foot will be sustained in its adjusted position until all the other bars may be moved to their proper positions to collectively conform to the surface of the arches and when all are in adjustment they may all be clamped by means of the screw 23.

In order to form a lift to fit the foot measured, the device of Figure 4, having been adjusted and clamped as described above, may now be assembled with the lift forming mechanism as illustrated in Figure 1. The forming device comprises a supporting frame or box 34 having a gap

or opening 35 adapted to receive the device of Figure 4, which may be mounted therein in any suitable manner so as to be in proper registry with the mechanism thereof.

5 The frame 34 is provided at its ends with rearwardly extending racks 36 upon which a pair of pinions 37 may roll. The pinions are mounted on a common shaft 38 to which each of the pinions is fixed so that the engagement of said pinions with the racks 36 insures the travel of the shaft 38 at all times parallel to a single direction. 10 Mounted to rock on the shaft 38 is a frame 39 to which are rigidly fixed forwardly extending arms 40 and 41. The arm 40 carries at its forward end a wheel or roller 42 positioned to engage the surface formed by the upper ends of the bars 9 of the measuring device. This roller may move forwardly and rearwardly across the tops of these bars and may be shifted laterally 15 along the shaft 38 so that the entire surface defined by those bars may be followed out. The arm 41 carries a forming tool, in the embodiment illustrated in the form of a grinding or cutting wheel 43. This wheel is mounted on a shaft 44 20 journaled in suitable bearings in the frame 39 and connected by a flexible shaft 45 to a suitable driving motor 46 which, in the embodiment illustrated, is mounted within the frame 34 below the top 48 thereof. Means are provided for mounting a lift blank 47 on the top 48 in a position for proper engagement by the tool 43. This may be done by any suitable mounting upon the top such as pins 75 or other fasteners to which the lift blank 47, which may be of cork or other suitable material, may be securely attached. 35

In the embodiment illustrated the arm 41 is hollow, providing therein a passage 49 as shown in Figure 3, which is connected by a tube 50 with a suction fan 56 driven by the motor 46, said fan 40 having an exhaust outlet connection 52. A hood 53 may be provided at the end of the arm 41 to fit over the tool 43 so as to collect the cuttings formed thereby and carry them off by the draft of air produced by the suction of the fan 56.

45 In the operation of this device the measuring or gauging device of Figure 4, being portable, may be carried to the patient or person whose feet are to be treated and the plantar arches of one foot accurately measured by setting up the gauging elements 9 to conform to the shape of the arches and clamping said elements in adjusted position as described. The device may then be assembled as illustrated in Figure 1 and a lift blank secured in position at 47. With the tool 43 in operation 50 the roller 42 is passed successively over each longitudinal row of elements 9. As the roller passes over said elements its elevation will be varied in accordance with the adjustment of said elements. This variation in elevation will be transferred to the tool 43 by rocking of the frame 39 so that said tool will operate at a corresponding elevation with respect to the blank 47. The roller 42 may then be shifted laterally to another row of gauging elements. Such shifting will cause a corresponding 55 shift of the tool 43 with reference to the blank 47 and again as the roller 42 moves over the ends of the second row of gauging elements the tool 43 executes a similar movement. When the entire surface defined by upper ends of the bars 9 has been traversed by the roller 42 the blank 47 will have been formed by the tool 43 to a surface of like shape. By this operation the tool 42 functions as a take-off element to take off the shape of the surface defined by the gauging elements 60 and the shape so taken off is transferred through

the agency of the frame 39 to the forming tool 43 which latter operates to form the blank to a like shape. It will thus be seen that the shape of the surface taken from the foot is mechanically transferred to the blank to form a lift which will 5 fit exactly the form of the particular arch measured.

In order to form a relatively smooth surface the upper ends of the gauging elements 9 may be rounded slightly. This purpose may also be 10 accomplished by forming over or against the tops of the gauging elements a flexible sheet such as a sheet of rubber or other flexible material. In Figure 1 such a sheet is indicated at 54 which may be secured to the top plate 4 by suitable fasteners 55 such as snap fasteners or in any other suitable manner. When the device is not in use a ring 56 may be engaged on a hook 57 on a rear frame 58 so as to suspend the forming tool out of contact with the blank when not in use. 20

It will be seen, therefore, that this invention provides a method whereby a surface may be shaped by adjustment of the gauging elements to the shape of a foot arch and then mechanically transferred to a lift blank so as to form the latter 25 to a like shape. By providing a group of gauging elements such as the bars 9 in laterally and longitudinally adjacent relation as shown in Figure 4, these elements may be adjusted to shape the surface defined by their upper ends to correspond with any foot surface, normal or abnormal. By the use of a sheet such as 54, which is formed to the tops of the gauging elements, a relatively smooth surface may be defined so that the action of the take-off element 42 will be 35 smooth. The grouping of the gauging elements is such that any three dimensional surface within their range of adjustment may be formed or copied.

In adjusting the gauging elements to the foot 40 the provision of the clamping device 32 enables the important parts of the plantar arch, such as the metatarsal and cuboid regions, to be set up with particular care and those elements clamped in adjustment. 45

While in the apparatus illustrated the lift is formed to the exact shape and dimensions of the surface set up by the gauging elements, it is practical by this method to form lifts of different sizes but with the same general shape. This may be 50 done, for instance, by varying the relative lengths of the arms 40 and 41 and pivoting the shaft 38 at one or the other end thereof. By properly adjusting the relative lengths of the arms and the location at the pivots an increase or reduction in scale may be made during the transfer of the shape from the surface set up to the blank. This may be useful where it is desired to provide a series of lifts for different sizes of shoes all conforming to a standard shape of arch. 60

As it may sometimes be convenient to use the master pattern shown in Figure 4 for the purpose of measuring the plantar surface of a foot and recording the measurements rather than 65 immediately cutting a lift by means of the cutting device, means for recording such measurements may be provided as illustrated in Figures 8, 9 and 10. An arrangement for making a similar record with a machine having only one row 70 of riser bars is disclosed in the above-mentioned application Serial No. 43,817. Figures 8, 9 and 10 illustrate a way in which this method of recording may be applied to a machine having a gang of riser bars covering both length and width 75

of the plantar surface as illustrated in this application.

In the arrangement of Figure 8 the riser bars 9 are extended downwardly to a greater length than those illustrated in Figure 6 so as to provide means in the lower portions of these bars for controlling indicating elements from which the desired record may be made. The lower end of each riser bar may be provided with a longitudinal slot 60 which may be substantially in alignment with the slots 10. In certain of the bars 9 the slot 60 terminates in an angular cam surface 61 adapted to engage a similar cam edge 62 on a horizontally slidable indicator bar 63. In the embodiment illustrated each slot 60 is wide enough to accommodate three indicator bars 63 which traverse the slots 60 of an entire transverse row of riser bars. These indicators may be supported upon any suitable supports 64. In the embodiment illustrated cam surfaces 61 are formed upon three riser bars in the transverse row and the indicator bars 63 have their cams 62 positioned thereon so that each cam is adapted to operate or be limited in its movement by one of the riser bars in that row. In Figure 8 the cams 61 are shown upon the first, fourth and seventh bars in the row. Thus each transverse row has three riser bars arranged for cooperation with three indicator bars, all slidable within the slots 60 of that row of risers.

The three indicator bars 63 cooperating with the same row of risers, extend different distances to the left, Figure 8, and each is provided at its end with a finger lug, 65 for the first bar, 66 for the second and 67 for the third. These lugs are provided so that the indicator bars may be manipulated by sliding them to the right, Figure 8, as indicated in dotted lines for the first bar in that figure.

The cams 61 and 62 are preferably positioned at 45° so that the horizontal movement of the indicator bar will correspond exactly in extent with the vertical movement of the riser bar. This relation may, however be varied as desired. The right hand end of each bar 63 has an indicating extension 68 projecting from the bank of riser bars and extending over a table 69 supported in any suitable manner on the frame of the device. Below the extensions 68 there may be fixed upon table 69 a stop rail 70 providing an abutment for the edge of a chart or record sheet 71 upon which the record may be made. When the measurement of the plantar arches has been taken by elevating the proper riser bars, the record of this measurement may be taken as follows. With the riser bars all positioned and clamped the first indicator bar in each row may be pushed to the right, Figure 8, by manipulating the finger lugs 65. This brings each cam 62 of the corresponding indicator bar up against the cam 61 of its riser bar and accordingly the horizontal movement to the right of the indicator bar will correspond exactly to the vertical movement of the corresponding riser. The first indicator bars of each group will then extend to the right various distances as shown in Figure 9 and a curve 72 may be drawn across the ends of the extensions 68. This curve will represent the form of the arch taken along the first longitudinal row of risers. When this curve has been drawn the bars may be returned to their initial position and then the lugs 66 operated to move in a similar manner the second bar in each group, and from the extensions thus projected a second curve 73 may be drawn upon

the chart 71. These bars may then be returned and the third group extended by manipulating the lugs 67, whereupon a third curve 74 may be drawn upon the chart. In this manner a curve may be placed upon the chart for any longitudinal row of risers and this curve will represent the shape of the plantar arch along that line.

For the sake of simplicity in the drawings the arrangement has been shown such as to record only the first, fourth and seventh longitudinal rows of risers. It is obvious, of course, that additional rows of risers may be similarly recorded simply by multiplying the number of indicator bars which traverse a single transverse row of risers. In other words, instead of three bars in each slot 60 there may be five, seven or such other number as may be found suitable for the purpose, the cams 62 being positioned on the respective bars so as to cooperate with the proper row of risers.

With the recording means just described it will be possible to place in the hands of the shoe dealer or other person whose function it is to measure feet simply one of the measuring devices of Figure 8. He need not be equipped with a cutting device such as shown in Figures 1 and 2, but he may make a chart record of his measurements and send this record to a central cutting station where a measuring device may be reset according to the curves 72, 73, 74 of the chart and then assembled with the cutting device and a lift of proper shape cut therefrom. In this manner the equipment required of the shoe dealer is reduced in expense since he has to provide only the measuring device and a central service may be established for cutting lifts from the charts sent in by various shoe dealers.

While this invention has been described as embodied in a unitary apparatus or method, it will be understood that individual features or sub-combinations of the apparatus or individual steps or combinations of steps of the method may be useful without reference to other features or the complete combination, and it is understood that the employment of such partial features or sub-combinations is contemplated by this invention and within the scope of the appended claims.

It is further obvious that various changes may be made in the details of construction or procedure within the scope of the appended claims, without departing from the spirit of this invention. It is understood, therefore, that the invention is not limited to the specific details shown or described.

Having thus described the invention, what is claimed is:

1. The method of forming orthopedic lifts, comprising, positioning a series of laterally and longitudinally adjacent gauging elements by engagement with a foot arch, shaping the surface of flexible sheet material by forming the sheet against the engaging portions of said elements while so positioned, moving a forming tool over a lift blank to form the same, guiding the tool by a guiding element, and moving the guiding element in contact with said surface so as to move said tool to form the blank to a like shape.

2. In an apparatus of the character described for forming orthopedic lifts, gauging means having movable elements constructed and arranged for setting to the shape of a foot arch by engagement of said means with the foot, lift forming means, and transfer means engageable with said gauging means and connected to control said

forming means so as to form the lift to a like shape.

3. In an apparatus of the character described for forming orthopedic lifts, gauging means including movable elements constructed and arranged for setting collectively to the shape of a foot arch by engagement of said means with the foot, a support adapted for clamping said elements in set position, lift forming means, transfer means engageable with said gauging means and connected to control said forming means so as to form the lift to a like shape, and a frame having a seat adapted to receive and locate said support for removably assembling said gauging means with said lift-forming and transfer means in proper registry with the latter.

4. In an apparatus of the character described for forming orthopedic lifts, gauging means including a sole-engageable plate, a series of laterally and longitudinally adjacent gauging elements constructed and arranged for setting in relatively shifted positions to conform to a three-dimensional surface of a foot sole engaging said plate, a lift-forming tool, a take-off element mounted for engagement with said gauging elements, and connections between said take-off element and said tool to guide the latter to form a like surface.

5. In an apparatus of the character described for forming orthopedic lifts, gauging means including a series of laterally and longitudinally adjacent gauging elements constructed and arranged for setting in relatively shifted positions to conform to a three-dimensional surface, a flexible sheet engaging said elements to conform to such surface, a lift-forming tool, a take-off element mounted for engagement with said sheet, and connections between said take-off element and said tool to guide the latter to form a like surface.

6. In an apparatus of the character described for forming orthopedic lifts, gauging means including a series of gauging elements arranged in longitudinal and transverse rows constructed and arranged for movement to relatively shifted positions to conform to a three-dimensional surface, and means for separately locking a single transverse row of said elements in their shifted positions.

7. In an apparatus of the character described for forming orthopedic lifts, gauging means in-

cluding a series of gauging elements arranged in longitudinal and transverse rows constructed and arranged for movement to relatively shifted positions to conform to a three-dimensional surface, and means for separately locking separate transverse rows of said elements in their shifted positions.

8. In an apparatus of the character described for forming orthopedic lifts, gauging means including a series of gauging elements arranged in longitudinal and transverse rows constructed and arranged for movement to relatively shifted positions to conform to a three-dimensional surface, means for locking a single transverse row of said elements in their shifted positions, and means for locking all said elements in their shifted positions.

9. In an apparatus of the character described for forming orthopedic lifts, gauging means including a series of gauging elements arranged in longitudinal and transverse rows constructed and arranged for movement to relatively shifted positions to conform to a three-dimensional surface, means for locking a single transverse row of said elements in their shifted positions, and means for shiftably supporting the locked row.

10. In an apparatus of the character described for forming orthopedic lifts, gauging means including a series of gauging elements arranged in longitudinal and transverse rows constructed and arranged for movement to relatively shifted positions to conform to a three-dimensional surface, means for locking said elements in their shifted positions, and means for securing a flexible sheet over said elements so as to conform to said surface while leaving the formed sheet exposed for access.

11. In an apparatus of the character described for forming orthopedic lifts, gauging means including a sole-engageable plate, a series of laterally and longitudinally adjacent gauging elements constructed and arranged for setting in relatively shifted positions to conform to a three-dimensional surface of a foot-sole engaging said plate, a lift-forming tool, a take-off element mounted for engagement with said gauging elements, connections between said take-off element and said tool to guide the latter to form a like surface, and means for securing a lift blank in operative relation with said tool.

DANIEL F. HYLAND,