UNITED STATES PATENT OFFICE.

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LIMB-StraIGHTENING DEVICE.

1,384,257.

Application filed January 8, 1921. Serial No. 435,614.


To all whom it may concern:

Be it known that I, JOHN HILGERS, a citizen of the United States, residing in Binghamton, county of Broome, and State of New York, have invented certain new and useful Improvements in Limb-Straightening Devices, of which the following is a full, clear, and exact specification.

My invention relates to limb straightening devices and refers particularly to devices for correcting deformities of the limbs.

It is well known that curved, or irregular, legs may be straightened by the application of continued pressure and my device is a means for accomplishing this result.

It is evident that such pressure must be of a character not to break, or injure, the bone, or joints, and as not to bruise, or injure, the flesh, and that it must be of a gradually increasing force, in order to follow the change of form of the bone, as it is brought back to a normal form.

As devices of this character cannot be worn continuously, without great inconvenience, it is advisable that they be of such construction that they can be readily applied and used with a minimum of discomfort.

As these devices are removed after each application and replaced for the next application, it is essential that some means be employed whereby the last pressure may be recorded, in order that additional pressure may be gradually used.

It is further evident that in straightening deformed legs, it is necessary that a proper pressure be brought to bear upon the joints of the bones.

It is further essential that the device be of such construction that a very gradual increase of pressure may be applied, in order that the bone may not be injured.

As various bones, as in the legs, may require straightening, and, as these vary in different individuals, it is evident that a device for general application must be of such character as to allow the pressure to be applied at varying predetermined places.

The device of my invention possesses all of these advantages and others which will be evident upon an examination of my drawings and specification.

In the particular form of the device of my invention, shown in the accompanying drawings, similar parts are designated by similar numerals:

Figure 1 is a perspective view of one form of a device of my invention.

Fig. 2 is a plan view of one of the limb plates.

Fig. 3 is a top plan view of a locking means in unlocked position.

Fig. 4 is a top plan view of a locking means in locked position.

Fig. 5 is a vertical cross-section of an ankle supporter.

Fig. 6 is a section through the line 6--6 of Fig. 8.

Fig. 7 is a plan view of one of the pressure devices.

Fig. 8 is a section through the line 8--8 of Fig. 7.

The particular form of my device, shown in the accompanying drawings, comprises a main supporting bar 10, carrying a plurality of slideable sleeves 11, 11, 11, each having a set screw 12 for the purpose of fixedly positioning the sleeve in a predetermined position upon the bar 10. Each sleeve 11 carries a sleeve 13, capable of receiving a sleeve 14, which can be maintained in a fixed position therein by means of a set screw 15. Spaced from, and parallel with, each sleeve 14 is a sleeve 14'. An externally threaded bar 16' extends through one end of the sleeve 14', the threaded portion thereof meshing with the internally threaded tube 17'. A check nut 18' is fixedly attached to the bar 16' within the sleeve 14' and a nut 19' is fixedly attached to the enlarged portion 20' of the bar 16'. The bar 16' passes through, and is attached to, the handle 21' for purposes of ease of manipulation. A collar 22' is fixedly attached to the bar 16'. A spiral spring 23' abuts upon the connecting bar 24' and the nut 19'. The tube 17' is extended into the flat member 25' having the elongated opening 26'.

It is evident, from the above description, that a revolution of the bar 16' will cause the tube 17' to have a longitudinal movement inwardly into, or outwardly from, the sleeve 14'.
The sleeve 14 is similarly attached to the tube 17 with the extended plate member 25. The revolution of the handle 21 and the rod member 20 will give a longitudinal movement to the tube 17.

A limb plate 27, carrying the pad 28, has an angular member 29, which is connected to the plate 28 by means of the screw bolt 30, passing through the opening 26 and threaded in an opening in the member 29. The other end of the limb plate 27 has the extended member 31 which has a hole through which the rod member 20 is passed.

The limb plate 32, carrying the pad 33, is extended into the plate member 34 which has a hole 35 through which the rod member 20 is passed.

The other extremity of the limb member 32 has the angular extension 35, having a threaded hole therein, into which the screw 36 is threaded. The member 25 of the tube 17 has a bolt-hole 37. Pivoted to the plate 25, at 88, is a locking member comprising the plate 39, the upwardly extended member 40, and the locking member 41. The operation of the locking member is shown in Figs. 3 and 4.

The Fig. 3, the locking member 41 is revolved into a non-locking position. The head of the screw 36 can now be passed through the larger portion of the opening 37, and the locking member is revolved around the pivot 38, thus bringing the locking member 41 against the screw 36 and maintaining it in position, as shown in Figs. 4 and 7.

The limb plates 27 and 32 have a series of ventilating holes 42, 42, 42.

The tubes 17 and 17' are similarly graduated or marked, to indicate the extent of their position outside of the sleeves 14 and 14'.

An ankle separator, for purposes to be described later, is shown in Figs. 5 and 6 and comprises two curved supports 50 and 51, each carrying a pad 52. The support 50 carries the plate 53 to which is attached the threaded member 54. The support 51 carries the plate 55 having the interiorly threaded tubular member 56 into which the member 54 may be threaded.

The operation of the device is as follows, special reference being made to Fig. 1—

All of the locking members 40, 40, 40 are revolved thus unlocking the screws 36, 36, 36, and allowing them to be withdrawn through the larger portion of the openings 37, 37, 37, and the limb plates 32, 32, 32, revolved thus allowing an entrance into the space between each set of parallel members 14, 14, 14, and 14', 14'. If the device is to be employed in the case of bowed legs, it is placed in front of the wearer and parallel with the longitudinal axis of his body, the main connecting bar 10 being in front of his legs and about midway between them, when his legs are introduced into the space between the parallel members 14, 17 and 14', 17'. The sleeves 11, 11, 11 are then moved into the desired position depending upon the particular curve to be remedied. For purposes of example, I will assume that one sleeve be positioned midway between the ankles and the knees, the central set, slightly above the knees and the other set near the upper extremity of the legs. The sleeves 11, 11, 11 are then fixed in these positions by means of the set screws 12, 12, 12. The ankle support is now placed between the two ankles and the pads 52, 52, so spaced from each other by means of the screw members 34 and 56, that they will press firmly upon the ankles when the latter are in a normal position. The limb plates 32, 32, 32 are revolved in position, the screws 36, 36, 36 passed through the openings 37, 37, 37, and locked therein by revolving the locking members 40, 40, 40 to the position shown in Fig. 4.

Each set screw 36 is now loosened and the handles 20 and 21' revolved until the pads 28 and 33 bear firmly upon the two limbs, the sleeve 14 being moved within the sleeve 13, so that when the pads 28 and 33 bear firmly upon the two limbs, the marks, or graduations, upon the tubes 17 and 17' will register the same and the sleeve 14 is then fixed by means of the set screw 15. Each of the three sets of devices will now conform to the natural position of the legs. Each of the handles 21 and 21' are now revolved equally until a strong forward pressure is caused upon the limbs at the point of contact and this pressure is maintained for an hour, or for as long a period as is necessary to accomplish the desired results. A record should be kept of the readings upon the tubes 17 and 17', in order that a continually increased inward movement may be attained at each application, until the legs are in a straightened position.

It is evident that the devices may be applied to any desired portion of the legs, in order to rectify the particular deformity. In the case of straightening of the legs which have knock-knees, the ankle support is placed between the knees and the pressure devices are placed above, and below, the knees, the ankle support being made wider from application to application, in order to force the knees outwardly.

From the above, it is evident that my device presents a means for straightening deformed limbs, and, especially, bowed legs and knock-knees, in a gradual manner without undue pain, danger, or discomfort.

I do not limit myself to the particular size, shape, number, or arrangement of parts as shown and described, all of which may be varied without going beyond the scope.
of my invention as shown, described and claimed.

What I claim is:

1. In a device of the character specified, in combination, a main supporting member, a plurality of compression members slidably carried by the supporting member, means for fixedly attaching the compression members at predetermined positions upon the supporting member, means for allowing an angular movement of the compression members with respect to the supporting member, means for fixedly attaching the compression members to the supporting member at predetermined positions with angular respect to the supporting member and means for contracting and expanding the compression members.

2. In a device of the character specified, in combination, a main supporting member, a plurality of angularly positioned limb plate rod members slidably carried by the supporting member, means for fixing the rods at predetermined positions upon the supporting member, a second rod parallel to and spaced from each slidable rod, two oppositely opposed limb plates connecting each pair of rods and means for moving the limb plates of each pair with respect to each other.

3. In a device of the character specified, in combination, a main supporting member, a plurality of angularly positioned limb plate rod members slidably carried by the supporting member, means for fixedly attaching the rods at predetermined positions upon the supporting member, means for allowing an angular movement of each slidable rod with respect to the supporting member, means for fixedly attaching each slidable rod to the supporting member at predetermined positions with angular respect to the supporting member, a second rod parallel to and spaced from each slidable rod, two oppositely opposed limb plates connecting each pair of rods, means for moving the limb plates of each pair with respect to each other and means for determining the extent of limb plate movement.

4. In a device of the character specified, in combination, a main supporting member, a plurality of angularly positioned limb plate rod members slidably carried by the supporting member, means for fixedly attaching the rods at predetermined positions upon the supporting member, a second rod parallel to and spaced from each slidable rod, two oppositely opposed limb plates connecting each pair of rods, means for moving the limb plates of each pair with respect to each other and means for determining the extent of limb plate movement.

5. In a device of the character specified, in combination, a main supporting member, a plurality of angularly positioned limb plate rod members slidably carried by the supporting member, means for fixedly attaching each slidable rod to the supporting member at predetermined positions with angular respect to the supporting member, a second rod parallel to and spaced from each slidable rod, two oppositely opposed limb plates connecting each pair of rods, means for moving the limb plates of each pair with respect to each other and means for determining the extent of limb plate movement.

6. In a device of the character specified, in combination, a main supporting member, a plurality of angularly positioned limb plate rod members slidably carried by the supporting member, means for fixedly attaching each slidable rod to the supporting member at predetermined positions with angular respect to the supporting member, a second rod parallel to and spaced from each slidable rod, two oppositely opposed limb plates connecting each pair of rods, means for moving the limb plates of each pair with respect to each other and means for determining the extent of limb plate movement.

7. In a device of the character specified, in combination, a main supporting member, a plurality of angularly positioned limb plate rod members slidably carried by the supporting member, means for fixedly attaching the rods at predetermined positions upon the supporting member, a second rod parallel to and spaced from each slidable rod, two oppositely opposed limb plates connecting each pair of rods, means for moving the limb plates of each pair with respect to each other and means for determining the extent of limb plate movement.

8. In a device of the character specified, in combination, a main supporting member, a plurality of angularly positioned sleeves slidably carried by the supporting member, means for fixing the sleeves at predetermined positions upon the supporting member, a second sleeve parallel to and spaced from each slidable sleeve, a member slidable within each sleeve, a limb plate connecting each sleeve with the oppositely slidable member and means for moving the limb plates of each pair with respect to each other.
in combination, a main supporting member, a plurality of angularly positioned sleeves slidably carried by the supporting member, means for fixedly attaching the sleeves at predetermined positions upon the supporting member, means for allowing an angular movement of each slidable sleeve with respect to the supporting member, means for fixedly attaching each slidable sleeve to the supporting member at predetermined positions with angular respect to the supporting member, a second sleeve parallel to and spaced from each slidable sleeve, a member slidable within each sleeve, a limb plate connecting each sleeve with the opposite slidable member and means for moving the limb plates of each pair with respect to each other.

10. In a device of the character specified, in combination, a main supporting member, a plurality of angularly positioned sleeves slidably carried by the supporting member, means for fixedly attaching the sleeves at predetermined positions upon the supporting member, means for allowing an angular movement of each slidable sleeve with respect to the supporting member, means for fixedly attaching each slidable sleeve to the supporting member at predetermined positions with angular respect to the supporting member, a second sleeve parallel to and spaced from each slidable sleeve, a member slidable within each sleeve, a limb plate connecting each sleeve with the opposite slidable member, means for moving the limb plates of each pair with respect to each other and means for determining the extent of limb plate movement.

11. In a device of the character specified, in combination, a main supporting member, a plurality of angularly positioned sleeves slidably carried by the supporting member, means for fixedly attaching the sleeves at predetermined positions upon the supporting member, means for allowing an angular movement of each slidable sleeve with respect to the supporting member, means for fixedly attaching each slidable sleeve to the supporting member at predetermined positions with angular respect to the supporting member, a second sleeve parallel to and spaced from each slidable sleeve, a member slidable within each sleeve, a limb plate connecting each sleeve with the opposite slidable member, means for connecting and disconnecting a limb plate from a rod to allow the insertion of a limb and means for moving the limb plates of each pair with respect to each other.

12. In a device of the character specified, in combination, a main supporting member, a plurality of compression members slidably carried by the supporting member, means for fixedly attaching the compression members at predetermined positions upon the supporting member, means for contracting and expanding the compression members and an extensible ankle separator.

13. In a device of the character specified, in combination, a main supporting member, a plurality of angularly positioned limb plate rod members slidably carried by the supporting member, means for fixedly attaching the rods at predetermined positions upon the supporting member, a second rod parallel to and spaced from each slidable rod, two oppositely opposed limb plates connecting each pair of rods, means for moving the limb plates of each pair with respect to each other and an extensible ankle separator.

14. In a device of the character specified, in combination, a main supporting member, a plurality of angularly positioned limb plate rod members slidably carried by the supporting member, means for fixedly attaching the rods at predetermined positions upon the supporting member, a second rod parallel to and spaced from each slidable rod, two oppositely opposed limb plates connecting each pair of rods, means for connecting and disconnecting a limb plate from a rod to allow the insertion of a limb, means for moving the limb plates of each pair with respect to each other and an extensible ankle separator.

15. In a device of the character specified, in combination, a main supporting member, a plurality of angularly positioned sleeves slidably carried by the supporting member, means for fixedly attaching the sleeves at predetermined positions upon the supporting member, means for allowing an angular movement of each slidable sleeve with respect to the supporting member, means for fixedly attaching each slidable sleeve to the supporting member at predetermined positions with angular respect to the supporting member, a second sleeve parallel to and spaced from each slidable sleeve, a member slidable within each sleeve, a limb plate connecting each sleeve with the opposite slidable member, means for moving the limb plates of each pair with respect to each other and an extensible ankle separator.

16. In a device of the character specified, in combination, a main supporting member, a plurality of angularly positioned sleeves slidably carried by the supporting member, means for fixedly attaching the sleeves at predetermined positions upon the supporting member, means for allowing an angular movement of each slidable sleeve with respect to the supporting member, means for fixedly attaching each slidable sleeve to the supporting member at predetermined positions with angular respect to the supporting member, a second sleeve parallel to and spaced from each slidable sleeve, a member slidable within each sleeve, a limb plate connecting each sleeve with the opposite slidable member, means for moving the limb plates of each pair with respect to each other and an extensible ankle separator.
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Signed at Binghamton, in the county of Broome and State of New York, this 5th day of January, 1921.

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