

April 30, 1963

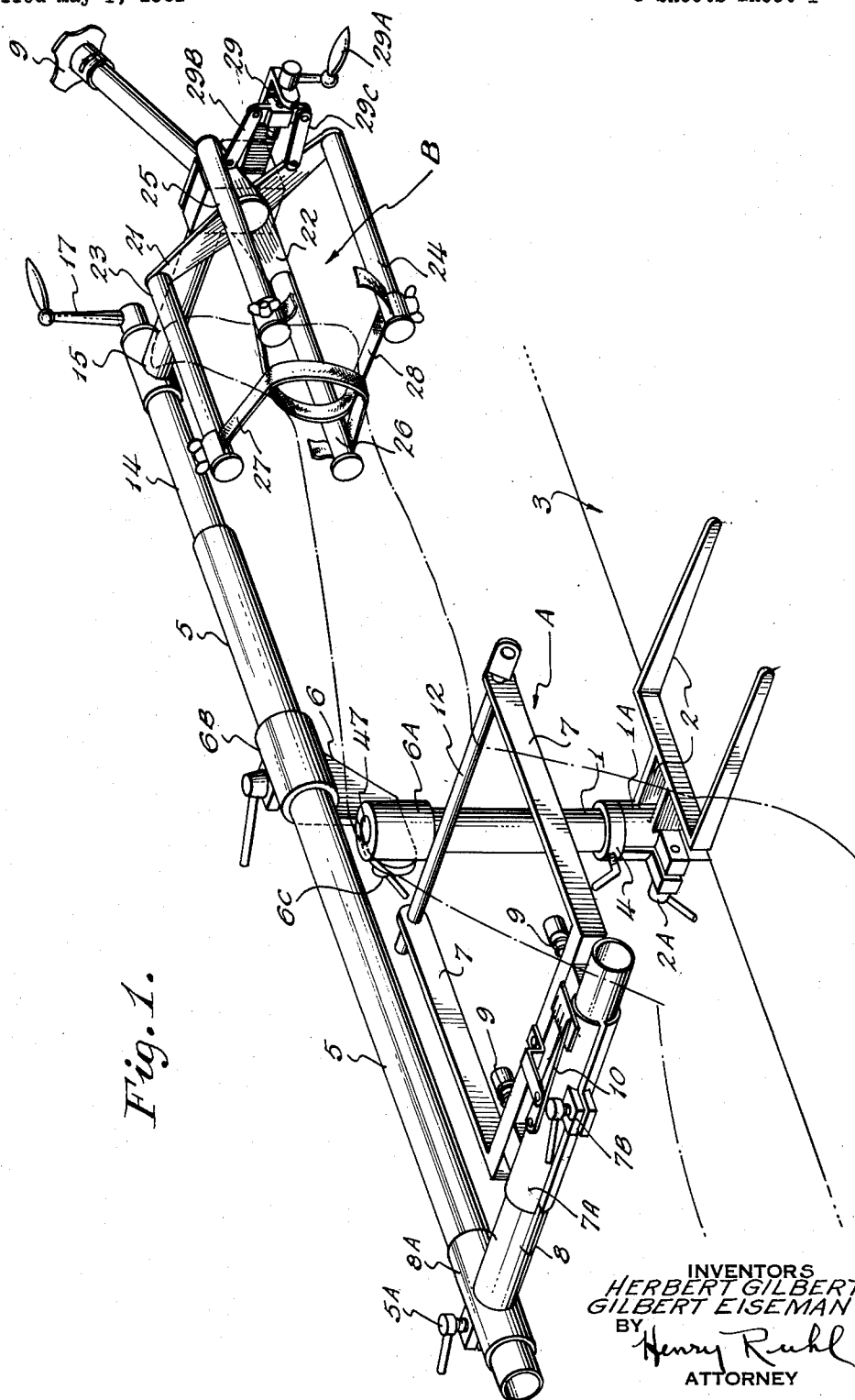
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UNIVERSAL ORTHOPEDIC TRACTION AND HOLDING DEVICE

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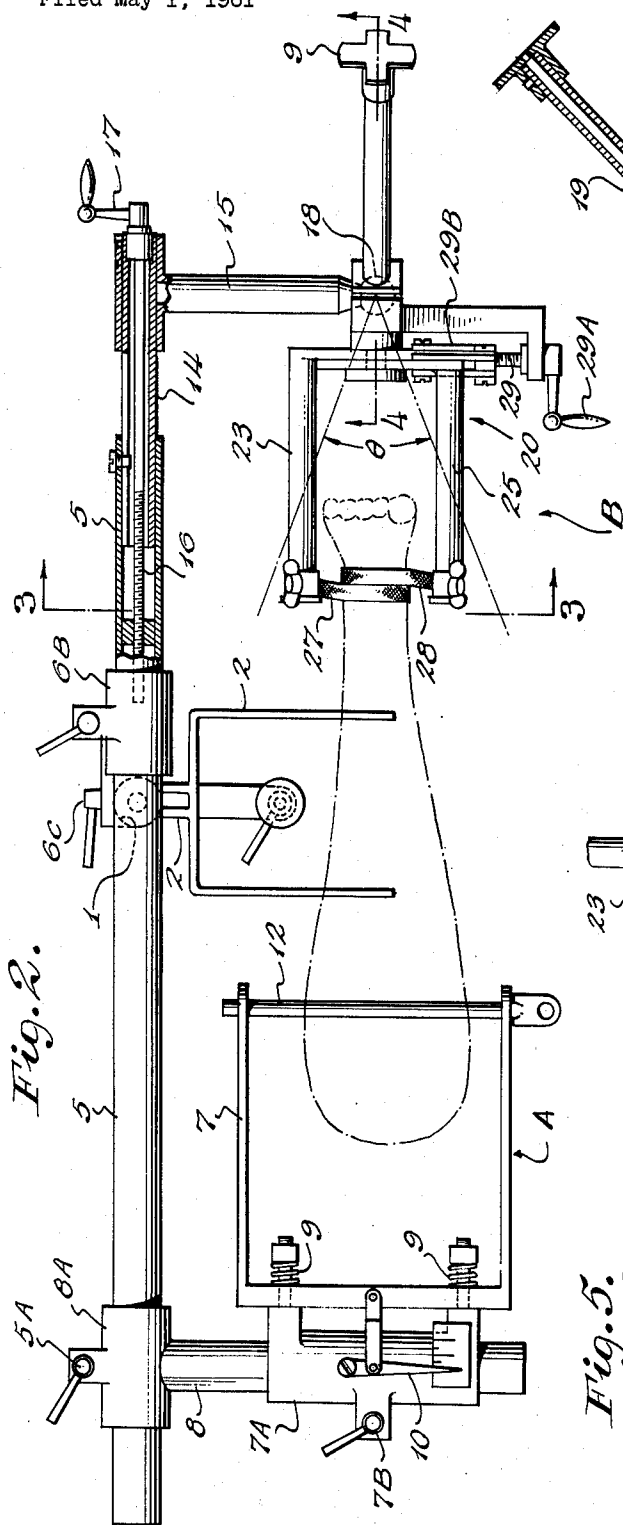
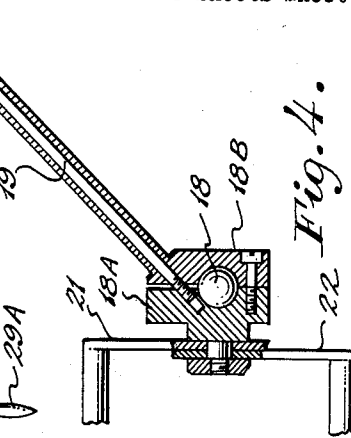
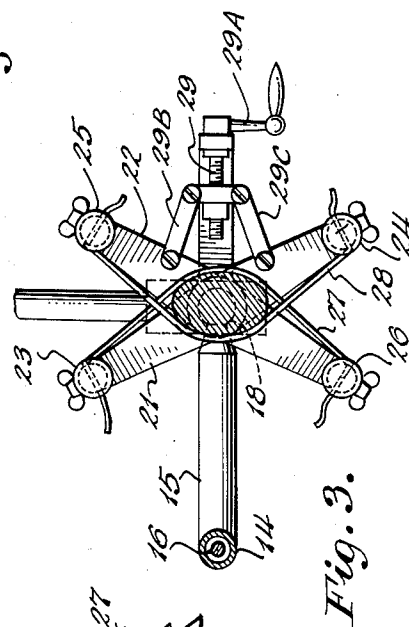
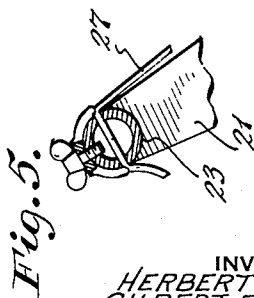
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5 Sheets-Sheet 2



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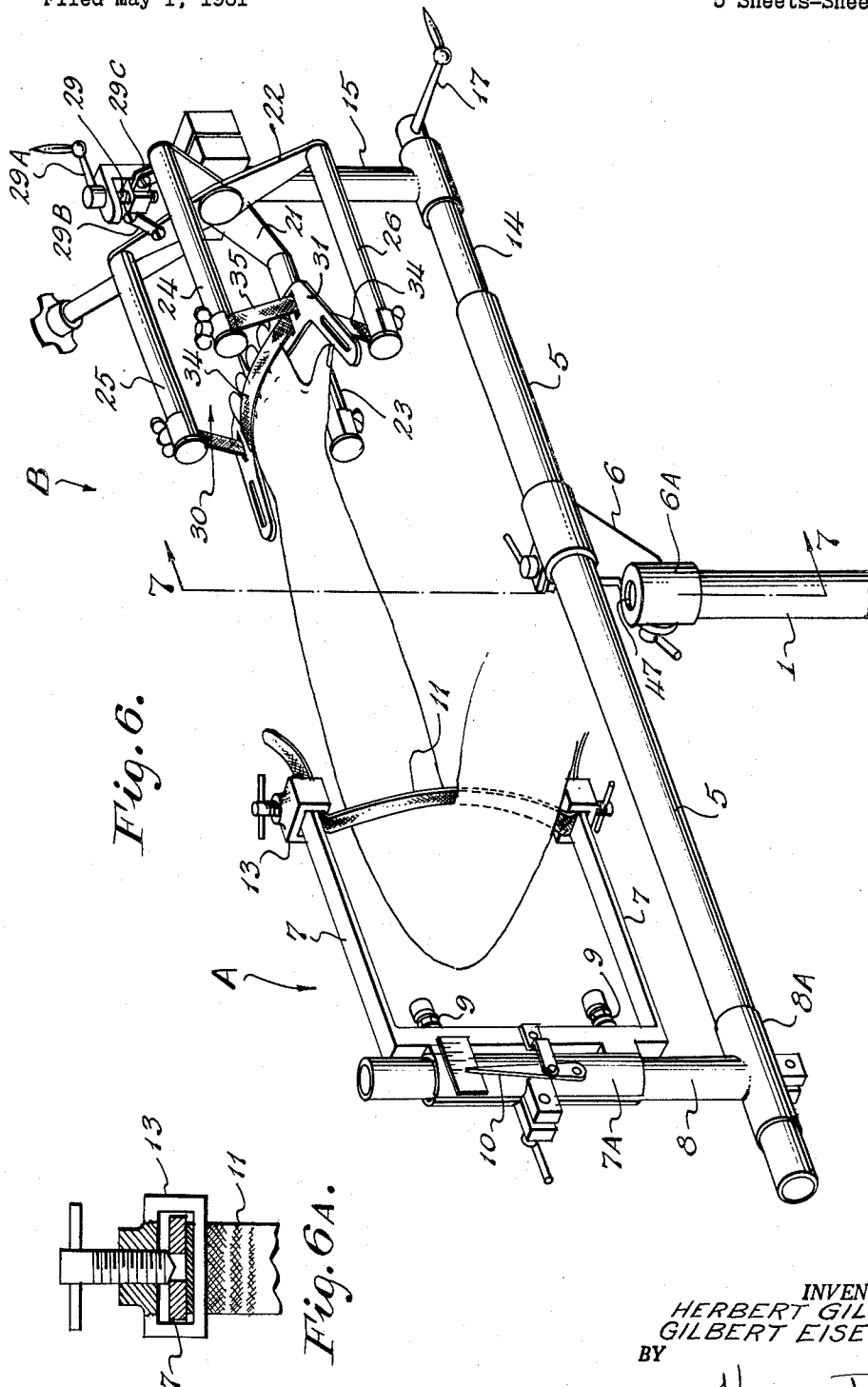
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5 Sheets-Sheet 3



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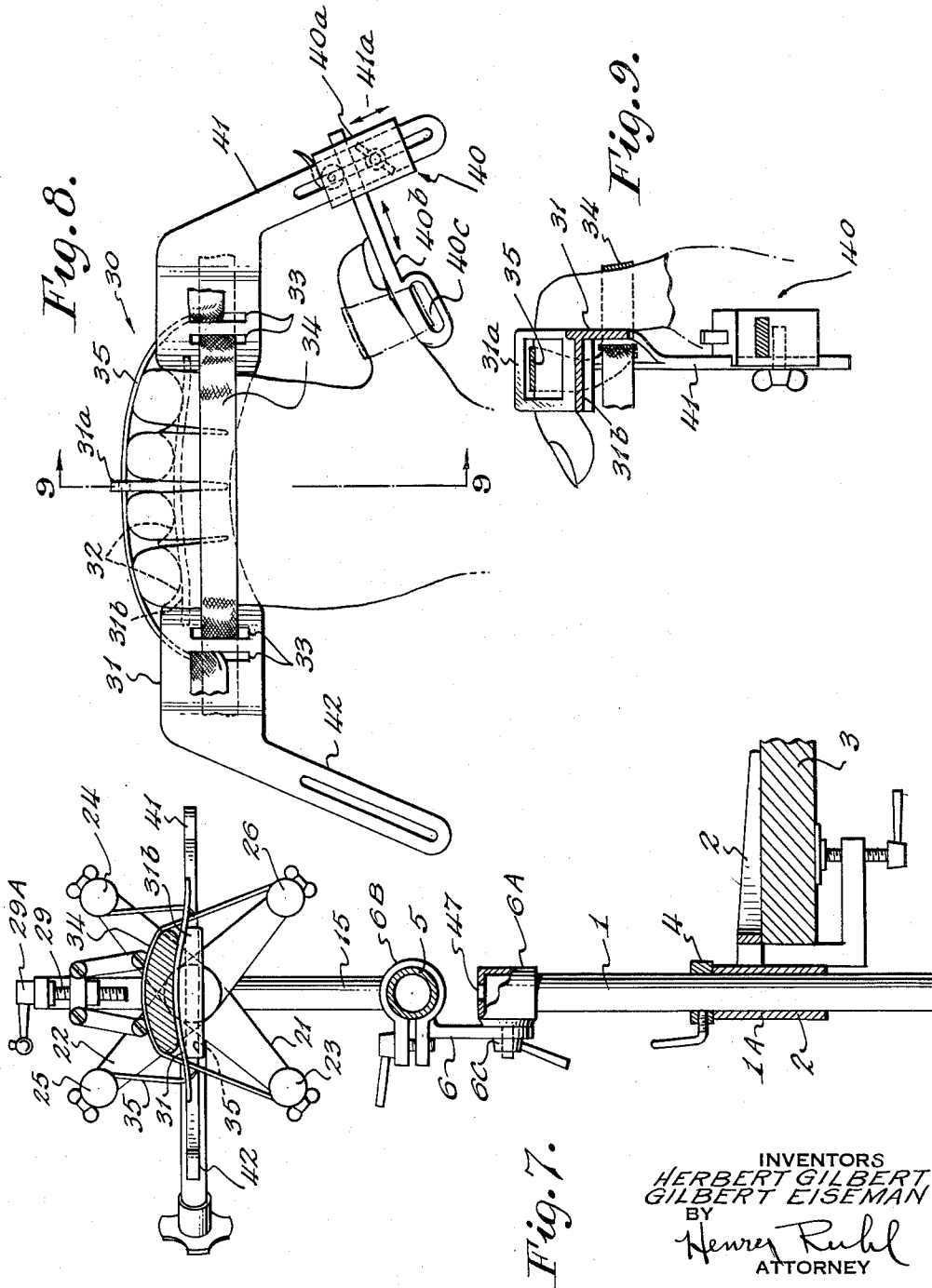
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UNIVERSAL ORTHOPEDIC TRACTION AND HOLDING DEVICE

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5 Sheets-Sheet 4



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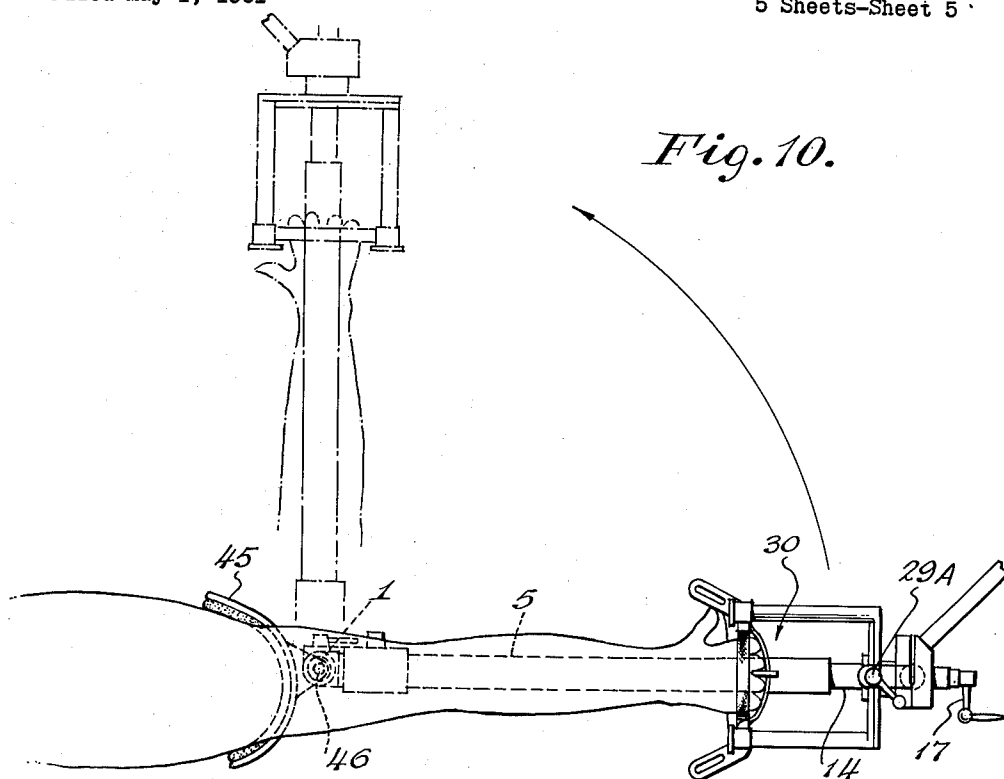
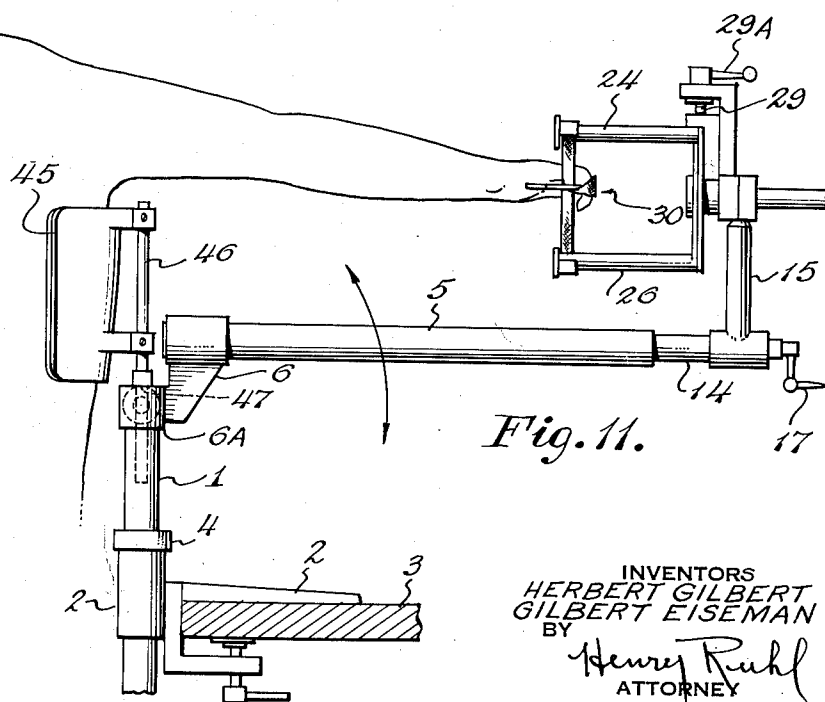
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5 Sheets-Sheet 5



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UNIVERSAL ORTHOPEDIC TRACTION AND HOLDING DEVICE

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This invention relates to a traction device to be employed by physicians and surgeons, and in particular to a traction device which is portable in nature and universal in that it does not require any special table. The device can be attached to a standard hospital stretcher, examining table, and the like.

Heretofore when treating bone fractures or dislocations of arms, legs, and/or shoulders, an orthopedic surgeon, for example, has required the assistance of one or two trained aids, because of the physical exertions involved; in some instances, the application of extraordinary prowess is required; muscle spasms sometimes complicate the picture and call for the use of unusual strength.

In addition to the foregoing, it sometimes happens that, after the fractured bone has been set (or reduced) and the cast applied, an X-ray discloses improper reduction. Such an occurrence calls for further treatment because the cast must be removed from the limb containing the fractured bone and a new effort made to properly set the fracture.

Earlier devices and practice included so-called finger traps for use in applying traction in arm fractures or dislocations. This is an ancient oriental device still used at the present time. The use of prior devices has, in some instances, resulted in tissue damage and the tearing of skin.

In applying traction to the leg, similar difficulty has been encountered and prior practice has often required the use of a Steinman pin being inserted in the os calcis, or heel bone, to provide a purchase on the foot and allow the application of necessary traction. While such procedure is effective it is also a painful process and causes a wound which requires time to heal. Some of these prior devices have been heavy and some have involved the use of auxiliary equipment, such as cables, weights, etc.

Considering the problems just discussed, it is an object of this invention to provide an improved device, for applying traction to arms and legs, which is light in weight, and consequently portable, and that may be quickly assembled or taken apart for storage, transportation or sterilization.

Another object of this invention is to provide a novel device in which human limbs may be put in traction between either the extremities of the limbs and intermediate points or the opposite end of the limbs and the extremities.

It is a further object of this invention to provide an improved traction device which may be used and manipulated effectively by one person working alone in fracture and dislocation cases.

A further object of this invention is the provision of a novel device which, being self-contained, requires no auxiliary equipment.

A still further object of this invention is to provide a portable device which allows the operator to leave the patient in the device, and X-ray the injury, meanwhile maintaining the reduction, thus allowing the physician to make any necessary corrections before applying the cast.

In general, the above and other objects are accomplished by providing a device comprising a portable frame of strong but light weight metal which has adjustable gripping means hereinafter called toggle grips, for gently holding the extremities of arm or legs. The device also has means for holding the broken limb at a point close

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to the body. The application of traction is applied gently through the frame, the amount of force being measured on a gauge provided for this purpose. The use of aluminum or other non-sparking metal is contemplated to prevent the danger of explosives in environments, such as operating rooms, where explosive gas mixtures are sometimes present. Although the novel features which are believed to be characteristic of this invention will be pointed out with particularity in the appended claims, the manner of its organization and the mode of its operation will be better understood by referring to the following description read in conjunction with the accompanying drawings forming a part hereof, in which:

FIGURE 1 shows the device in perspective as it is used to treat a fracture of a leg.

FIGURE 2 is a top view of FIGURE 1 partially in cross-section to show the traction applying mechanism.

FIGURE 3 is a front view of a toggle or X-arm arrangement taken along line 3—3 of FIGURE 2 and showing the means of attaching the gripping strap.

FIGURE 4 is a cross-sectional view along line 4—4 of FIGURE 2 showing the details of the ball joint assembly.

FIGURE 5 is a detail section of the strap clamping means.

FIGURE 6 is a perspective view of the device as used in treating an arm fracture.

FIGURE 6a is a detail of a strap clamping means.

FIGURE 7 is a cross-sectional showing of the apparatus taken along 7—7 of FIGURE 6.

FIGURE 8 shows a top view of the device for gripping the fingers of a hand.

FIGURE 9 is a cross-sectional view along the line 9—9 of FIGURE 8.

FIGURE 10 is a top view showing the use of a body shield and two of the alternative positions possible for the treatment of shoulder injuries.

FIGURE 11 is a side view of the showing of FIGURE 10.

Referring now to FIGURES 1 and 2, the device consists of a base having a vertical bar 1 adjustably secured in a sleeve socket 1A which is rigidly connected to a bracket 2. Bracket 2 is used to fasten the device to a support. A showing of the use of bracket 2 may be seen in FIGURES 7 and 11. Vertical height adjustment of the bar is facilitated by means of a collar 4 which is slidably mounted on the bar and can be locked by means of a set screw at any point thereon to set the vertical position of the bar 1. The bar 1 can also be rotated about its vertical axis and may be locked in position by locking means 2A on the sleeve socket 1A.

A horizontal bar 5 is adjustably fastened to bar 1 by means of a two-way pivot bracket 6. This bracket has a socket element 6A for connecting the bracket to the bar 1 and sleeve socket element 6B for securing the bar 5. An adjustable pivot point 6C is also provided by means of which the bar 5 may be adjusted through various angles. The bar 5 supports at either end the two major elements of the device. At one end is the holding element A and at the other is the traction device B. The element A consists of a U-shaped bar 7 adjustably supported by a sleeve socket 7A on a bar 8 which in turn is adjustably attached to bar 5 by means of sleeve socket 8A. This socket is rotatably and slidably attached to bar 5 so that it may slide along bar 5 and also may be rotated with respect thereto. A sleeve socket clamp 5A is provided which permits locking the socket at any prechosen position.

Socket 7A, similar to the function of socket 8A, permits the proper positioning and adjustment of holding element A. After such positioning the socket 7A may be locked by means of a socket clamp 7B attached thereto. Attach-

ment of the U-shaped holding bar 7 to the sleeve socket 7A is accomplished through two bolts on which are mounted and held suitable tension springs 9. The required pull of element A, a measure of the amount of traction, is determined through gauges 10 mounted on opposite sides of sleeve socket 7A each consisting of a pointer pivotally mounted on sleeve socket 7A. The pointer is moved through a link attached between the pointer and the U-shaped bar, the moving force being measured on scales mounted on socket 7A.

A holding rod 12 extends across the opening of the U-shaped bar. This rod, which is removable through holes in the bar 7, is positioned under the knee or elbow and provides a holding base from which the pressure may be applied to pull the limb. For purposes of comfort, since traction is sometimes needed for a considerable length of time, a strap 11 may be substituted for the rod 12, as shown in FIGURES 6 and 6A.

The traction end B consists of a bar 14 telescopically movable within bar 5 and rigidly supporting a bar 15. The position or degree of telescoping of bar 14 into bar 5 is determined by means of a screw 16 and crank 17, as seen in cross-section in FIGURE 2. Bar 14 is prevented from rotating within bar 5 by means of a key on bar 5 and a keyway in bar 14.

Referring now to FIGURES 2 and 4, traction end B is attached to bar 15 through a universal ball and socket arrangement. As seen in the drawings a ball 18 is secured to the end of bar 15. The socket is composed of two cooperating parts 18A and 18B. Socket part 18B carries a clamping screw 19 which serves to lock the position of the socket with respect to the ball. Details of one form of clamping screw arrangement are shown in FIGURE 4. Socket part 18A carries the balance of traction end B. This comprises gripping means 20 consisting of adjustable X-arms 21 and 22 which are rotatably fastened to socket part 18A and which carry extensions 23, 24, 25, and 26. To the outer ends of the extensions are fastened gripping straps 27 and 28. As may be seen in FIGURES 1, 2, and 3, these straps are fastened about the patient's angle, this being accomplished by the positioning of the X-arm. The proper degree of gripping action is achieved by means of an adjustment screw 29, crank 29A and arms 29B and 29C which transmit the action of crank 29A to the X-arms 21, 22, thereby changing the angle between the arms.

The universal joint in addition to providing the means of joining the traction element B to the bar 15 permits the doctor to manipulate and align the limb after it has been clamped.

Referring specifically to the straps, these may be made of any suitable material, such as leather, canvas or a plastic material, such as nylon. The material used must be comfortable to the person whose limb is being treated and must be tough enough to stand repeated sterilization. The clamps shown in FIGURE 5 and 6A provide a means for quickly adjusting the various straps as well as providing a means for their quick replacement if necessary.

Referring now to FIGURE 6 the device is shown being used to set an arm fracture. The similarity between FIGURES 1 and 6 suggests the universal nature of the device. While it is undoubtedly obvious to one skilled in the art of orthopedic practice, it should be pointed out that positioning of the apparatus from the left side to the right of the table provides for its use for right as well as left limbs.

While the same gripping means which is shown in FIGURES 1, 2 and 3 may on occasion be used to grip the wrist, a hand grip 30, as seen in FIGURES 6, 7, 8 and 9 is needed to permit setting of arm and wrist fractures.

Grip 30 is attached to the straps of the X-arms and consists of a plate or casting 31 slightly bent or curved to conform to the curve of the hand and fingers. The front edge of the plate has finger cutouts 32. Plate extensions 41, 42 are also provided for a purpose to be

later described. Strap slots 33, in plate 31, two on each side of the hand position are positioned to receive the straps so that one strap may extend over the front 35 of the bent fingers and the other may extend over the top 34 of the fingers where they join the hand. Thus, by adjusting the traction as shown in FIGURE 7 a gentle but firm gripping action may be applied to the fingers and hand. A guide slot 31A is provided in the center of and perpendicular to plate 31 which limits the movement of the front strap on the fingers. A plate 31B is attached to plate 31 for the bent finger joints to rest on and permit the pressure on the fingers to be applied evenly.

As seen in FIGURES 8 and 9 the extensions 41 and 42 are slotted to receive a thumbholding arm or bracket 40 used in the reduction of certain fractures such as the Colles fracture. This bracket comprises a shoe 40A which can move in the directions of arrow 41A on extension 41 and which may be locked at any position along the slot in 41. The thumb holding arm 40B moves perpendicularly to the shoe 40A (in the direction of the arrow shown) which also has locking means to lock the arm at the desired spot. An eyelet 40C is provided to permit taping the thumb to the arm.

As can be seen there is ample area between the thumb, hand, plate 31 and extension 41 to permit the physician to work on the hand for bandaging or to apply a cast.

As previously stated, the device of FIGURE 8 can be used for either right or left hands. It is also possible to hold the limb in a vertical position while it is being reduced.

Referring now to FIGURES 10 and 11 there is shown the use of a chest plate 45 in place of the holding element A. This plate, which is curved to fit the side of the body or chest, is pivotally mounted on a bar or stanchion 46 which is inserted in a hole 47 in socket 6A. In the particular use illustrated in these two figures, the hand grip is used to facilitate setting a broken or dislocated shoulder.

Traction is applied to the limb through the screw 17. In this type of setting it may be necessary to manipulate the arm in the direction of the arrow of FIGURE 10 as well as in the direction of the arrow of FIGURE 11. As previously set forth, once the bone is set the device is locked in the desired position until the cast is applied.

Other advantages and uses of the invention will be self-evident to an orthopedic surgeon or doctor who treats fractures or dislocations. One of the principal features of the device lies in its possible use by a physical working alone. Thus, it is possible for the broken limb to be manipulated with one hand leaving his other hand free to feel the fractured or displaced member.

It is also possible to use two or more of the devices at the same time if more than one limb is fractured, broken or dislocated.

The versatility of the device can be extended by using the traction end B separately from the supporting structure. For example, the toggle or X-arm assembly can be attached by the bracket 2 to a base such as a table. In such a situation, the physician uses the device and adhesive tape to achieve immobility of the patient. The extensions 41 and 42 may be made removable from the main body of the hand piece, so that—when they are not in use—the operator has additional room to work.

What is claimed is:

1. A universal traction and holding device comprising a base, a holding member and a traction member, means on said base for carrying and adjustably positioning said limb holding and traction members, said traction member being maintained in predetermined spaced relationship with respect to said holding member, limb gripping means including an adjustable X-arm and strap arrangement mounted on said traction member and adjusting means between the holding and traction members to apply a force of predetermined amount between

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said members, said X-arm consisting of a pair of arms pivotally mounted at their centers; adjusting means inter-connecting said arms so that a predetermined angle may be obtained between said arms, the pivotal axis of said arms being substantially coextensive with the longitudinal axis adapted to be assumed by a limb under traction, lateral extensions attached to the outer ends of said arms in parallel spaced relationship to each other and adapted to surround and overlay the position to be assumed by a limb, said strap arrangement comprising a pair of straps, each of which is removably connected between the upper and lower free ends of said lateral extensions located on different arms of said X-arm arrangement, the adjusting means actuating said arms to permit said straps to define a limb gripping section therebetween whereby the adjustment of said arms will result in the predetermined tightening of said straps about a limb.

2. In a device according to claim 1 a limb contacting plate having a front edge, suitably spaced strap receiving holes in said plate, said straps extending through the holes in said plate, one of said straps extending across the top of said plate and the other of said straps extending across the front edge of said plate, said plate cooperating with said straps to form a limb gripping

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section whereby the adjusting means actuating said arms and lateral extensions causes one of said straps to adjust itself across the top of said plate and the other of said straps to adjust itself across the front edge of said plate.

3. In a device according to claim 2 wherein the limb contacting plate further comprises a downwardly extending front shoulder portion and an extension means secured to said plate, said extension means including digit holding brackets adjustably mounted thereon whereby the digits of a limb may be held immobile when the straps are tightened.

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