

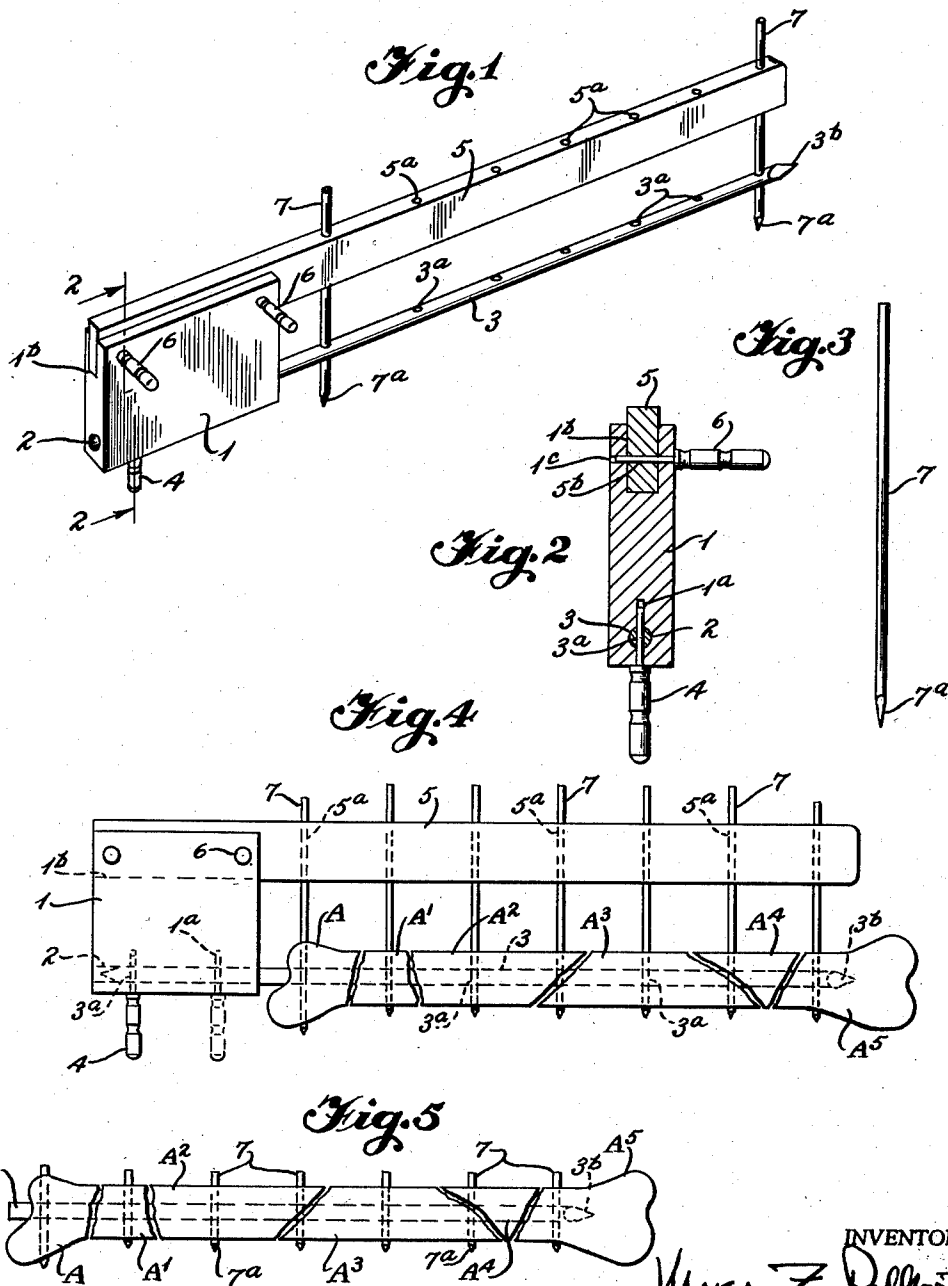
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M. Z. PALKOVITZ

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FIXATION APPARATUS FOR BONE FRACTURES

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BY

INVENTOR
Meyer Z. Palkovitz
BY [Signature]
ATTORNEYS

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FIXATION APPARATUS FOR BONE FRACTURES

Myer Z. Palkovitz, McKeesport, Pa.

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2 Claims. (Cl. 128—92)

This invention relates to apparatus for the reduction and fixation of fractures of bones.

My fracture fixation apparatus was developed primarily because it is important to immobilize a fracture rotationally as well as longitudinally. Several presently used apparatuses attempt to achieve this object. For example, present intramedullary pins, which are either triangular or square in cross-section, are inserted through the length of the bone by use of a mallet with the hope that the sharp edges of the pin will burrow into the cortex of the bone and thus prevent rotation of the fragments as well as maintaining longitudinal fixation. The Anderson splint, Patent No. 2,391,537 attempts to achieve rotational as well as longitudinal fixation by means of an external shape or form of splintage.

My fracture fixation device has a number of advantages over other currently used fixation devices. Some of these advantages are that a round intramedullary pin is usually more easily inserted than a square or triangular pin; also the anti-rotational or axial fixation achieved is more substantial than that of either the square or triangular intramedullary pin or the Anderson splint. In animals, the latter splint is notorious for its susceptibility to dislodgement by bumping, or other external forces, and for the imbedded pins loosening in the bone before the fraction has healed; and also intramedullary pins as a class provide more substantial longitudinal fixation than the Anderson splint.

The primary purpose of my device is to maintain the fragments of a fractured bone in both rotational and longitudinal alignment. This purpose is accomplished by using a perforated intramedullary pin which is inserted through the length of the fractured bone, and by smaller pins which are inserted by means of an adapter through both the bone and the perforations of the intramedullary pin. The purpose of the adapter is to enable the operator to insert the transverse pins through both the bone and the perforations in the intramedullary pin although the involved intramedullary pin perforations are not visible to him. Once this purpose is accomplished, the adapter is removed while the intramedullary and transverse pins are allowed to remain in position until the fracture is healed.

Another object of my invention is the fixation of the parts of a broken bone so that the fragments of the bone are secured, immobilized and maintained in both longitudinal and anti-rotational alignment.

Another object of my invention is the prevention of movement or migration of those parts of the apparatus that are left imbedded in the bone.

Another object of my invention is the maintenance of the fragments of the bone more securely in proper position during the healing process.

Still another object of this invention is the limitation of such protruding parts of the apparatus, during the healing process, as may be susceptible to bumping or other external force that may cause dislodgement or loosening of the imbedded parts.

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These objects are attained by inserting a perforated intramedullary pin in the fractured bone, and by inserting smaller pins transversely through both the bone and the perforations in the intramedullary pin, using perforations in a guide or adapter to guide the smaller pins through the perforations in the intramedullary pin. After all the pins are in place, the adapter is removed and all unnecessary protruding parts of the pins are removed leaving the remaining parts in position, which may, under proper conditions, also be removed after the bone has healed.

Other minor objects of the invention will be hereinafter set forth.

I will explain the invention with reference to the accompanying drawing, which illustrates one practical embodiment thereof, to enable others familiar with the art to adopt and use the same; and will summarize in the claims, the novel features of construction, and novel combinations of parts, for which protection is desired.

In said drawing:

Figure 1 is a perspective view of my novel apparatus, detached.

Fig. 2 is an enlarged transverse section, on line 2—2, Fig. 1.

Fig. 3 is an enlarged view of one of the transverse pins, detached.

Fig. 4 is a plan view showing the apparatus as initially applied to a broken bone, the bone being shown in six different longitudinal fragments which are held together by means of the apparatus.

Fig. 5 is a plan view showing the bone with its parts held in proper healing position by means of the intramedullary pin and the transverse pins, the adapter having been removed and the transverse pins having been clipped off.

As shown in Figs. 1 to 3, my apparatus consists of a base plate 1 which is preferably of rectangular shape and of substantial thickness, and has extending therethrough a bore 2 adapted to receive an intramedullary pin 3 of specific shape, said pin 3 being provided with spaced transverse bores 3a, extending throughout the length thereof, said bores 3a being diametrically disposed and the axes of all of the bores 3a being parallel. The inner end of intramedullary pin 3 is sharpened and is adapted to slidably fit the bore 2 of base 1, while the outer end 3b of the intramedullary pin 3 is likewise sharpened, for the purpose hereinafter described.

When pin 3 is inserted in bore 2 of base 1, the same is locked in position therein by locking pins 4, two being shown in Fig. 4, which pins 4 enter bores 1a in one edge of the base 1 and are spaced apart a distance equal to the spacing of the bores 3a of intramedullary pin 3, said locking pins 4 having heads which may be grasped to insert or remove the pins 4 from base 1. Said pins 4 have shanks adapted to pass through adjacent bores 3a of pin 3 so that when pins 4 are engaged as shown in Fig. 4, the intramedullary pin 3 will be prevented from movement axially or circumferentially of bore 2, and will be securely locked in fixed position in base 1. Obviously, upon removal of the locking pins 4, the intramedullary pin 3 may be shifted axially within bore 2 and other pairs of bores 3a engaged by locking pins 4.

In the edge of base 1 opposite from the bores 1a, is a slot 1b of rectangular cross-section adapted to snugly receive an adapter 5 consisting of a bar of rectangular cross-section having extending therethrough from its outer to its inner edge a plurality of bores 5a, and having at its end adjacent the base 1 a pair of transverse bores 5b (Fig. 2) adapted to receive the shanks of locking pins 6 (Figs. 1 and 2), which pins 6 are passed through bores 1c in base 1 and through the bores 5b of adapter 5, so that when pins 6 are inserted in the manner shown in

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Figs. 1 and 2 the bores 5a of adapter 5 will be axially aligned with the bores 3a of intramedullary pin 3 regardless of which of the bores 3a of intramedullary pin 3 are engaged by the locking pins 4 in base 1, the bores 5a of adapter 5 thus acting as guides for transverse pins 7, hereinafter described, which pins 7 have one end sharpened as at 7a and the other end blunt.

By the above construction, when it is desired to fix a fractured bone which may be fractured in a plurality of longitudinal fragments, the apparatus may be used to maintain the fragments of the fractured bone in both rotational and longitudinal alignment. In using the apparatus, the intramedullary pin 3 is inserted axially through the fractured bone to align the segments A, A', A², A³, A⁴, and A⁵ of the bone in the manner shown in Fig. 4, according to the usual practice, the intramedullary pin 3 being inserted axially through the bone leaving one end of intramedullary pin 3 extending beyond the end of the bone but extending through the adjacent tissues, as shown in Fig. 4, the fragments A—A⁵ of the bone being disposed on intramedullary pin 3 in the correct position for healing, the fragments being spaced apart a distance to prevent foreshortening of the bone as the fragments knit together. On the exposed end of intramedullary pin 3 is applied the base 1, as shown in Fig. 4, and the locking pins 4 are then inserted through base 1 into a pair of adjacent bores 3a of the pin, in the manner shown in Fig. 4. The adapter 5 is then positioned on base 1, same lying in the slot 1b, and the locking pins 6 inserted in the bores 1c as shown in Fig. 2, to lock the adapter to the base 1 so that the bores 5a of adapter 5 are axially aligned with the bores 3a of intramedullary pin 3, the alignment of the bores 5a and 3a being thus automatically arranged. The transverse pins 7 are then inserted at the desired positions through the guide holes 5a in adapter 5, and the pins 7 are driven through the bone fragments A—A⁵ as shown in Fig. 4, through the bores 3a of pin 3, the guide bores 5a guiding the pins through the bone, or other bores which may have been preformed in the bone, and through the bores 3a of intramedullary pin 3 so that when positioned in the apparatus the transverse pins 7 will assume the positions shown in Fig. 4, the pins 7 maintaining the bone fragments A—A⁵ not only in correct longitudinal relation but also preventing rotational movement of one fragment A—A⁵ with respect to the others, thus insuring that the bone when healed will not have any of the fragments in incorrect rotational or longitudinal position with respect to the other fragments.

The use of the guide bores 5a in the adapter 5 permits the surgeon to directly insert the transverse pins 7 through the bone fragments A—A⁵ and through the bores 3a of intramedullary pin 3 although the bores in the bone fragments and intramedullary pin are not visible to him.

Once this purpose is accomplished the adapter 5 and base 1 are removed from intramedullary pin 3, but the transverse pins 7 are allowed to remain in position until the fracture is healed, the pins 7 being preferably cut off as indicated in Fig. 5 and allowed to remain in such position until the fracture has healed. After healing, the sections of the transverse pins 7 still in the bone and intramedullary pin are removed, releasing the intramedullary pin 3 itself from the bone, which pin 3 may thereafter be likewise removed.

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According to my invention, it is not necessary that the intramedullary pin 3 be of any specific cross-section, as the same may be round instead of triangular or square in cross-section, and in fact an intramedullary pin of any desired cross-section may be used. The bores 5a of the jig accurately guide the transverse pins 7 not only through the bone fragments A—A⁵ but also guide pins 7 through the aligned bores 3a of intramedullary pin 3. If desired, the cut-off sections of the transverse pins 7 may be left in the bone; also instead of using transverse pins 7, screws might be used passing through the bone fragments A—A⁵ and into tapped bores provided therefor in the pin 3.

I do not limit my invention to the exact form shown in the drawing for obviously changes may be made therein within the scope of the claims.

I claim:

1. Apparatus for reduction and fixation of bone fractures, comprising an intramedullary pin having a plurality of spaced transverse bores extending therethrough with their axes disposed parallel; a base removably mounted on one end of the pin against axial or rotational movement; a bar removably mounted on said base against axial or rotational movement and disposed parallel with the pin; said bar having spaced guide bores therethrough disposed in axial alignment with the bores in said pin; and a plurality of transverse pins adapted to extend through said guide bores of the bar and through the bores of the intramedullary pin, whereby when the intramedullary pin is inserted longitudinally through a fractured bone with one end exposed and carrying the base and bar, the transverse pins may be guided through the bone fragments and bores of the intramedullary pin, and the intramedullary pin and transverse pins will maintain the bone fragments against axial displacement and rotational misalignment.

2. Apparatus for reduction and fixation of bone fractures, comprising an intramedullary pin having a plurality of evenly spaced transverse bores extending therethrough with their axes disposed parallel; a base having a bore extending longitudinally therethrough and snugly receiving an end of said pin; removable locking pins extending through bores in the base and through an adjacent pair of bores in said intramedullary pin to prevent axial or rotational movement of the intramedullary pin in said base; said base having a slot in its edge opposite from and parallel with the bore in the base; a bar snugly engaging said slot; other removable locking pins passing through other bores in said base and through bores in the bar adapted when inserted to maintain the bar parallel with the intramedullary pin and hold same against axial movement in said slot; said bar having spaced guide bores therethrough disposed in axial alignment with the bores in said intramedullary pin; and transverse pins extending through said guide bores of the bar and through the bores of the intramedullary pin.

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