Dec. 9, 1952 P. CORDASCO 2,620,792

MEANS FOR INTERNAL FIXATION OF FRACTURED BONES

Filed Dec. 5, 1950 2 SHEETS—SHEET 1

Fig. 1

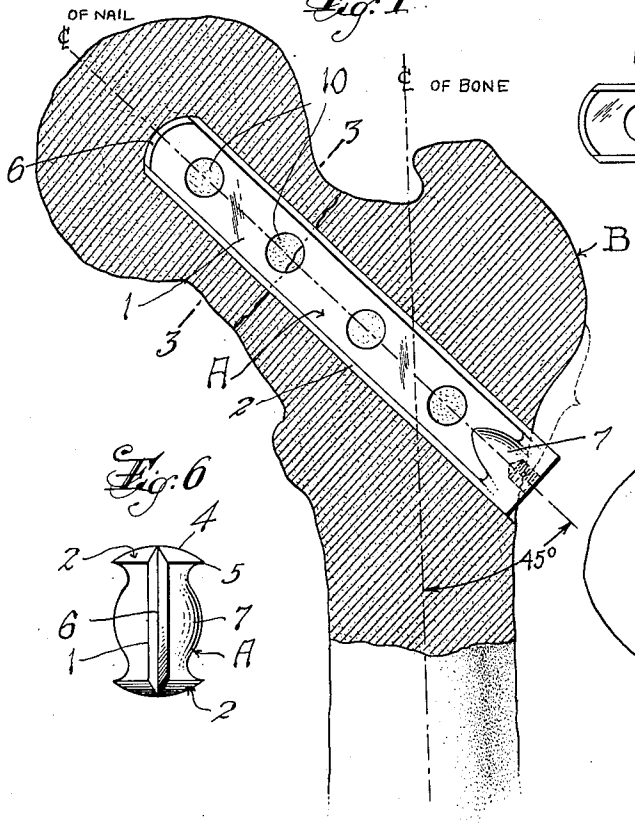


Fig. 7

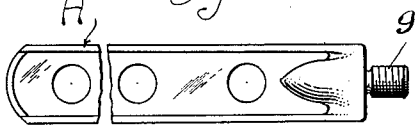


Fig. 2

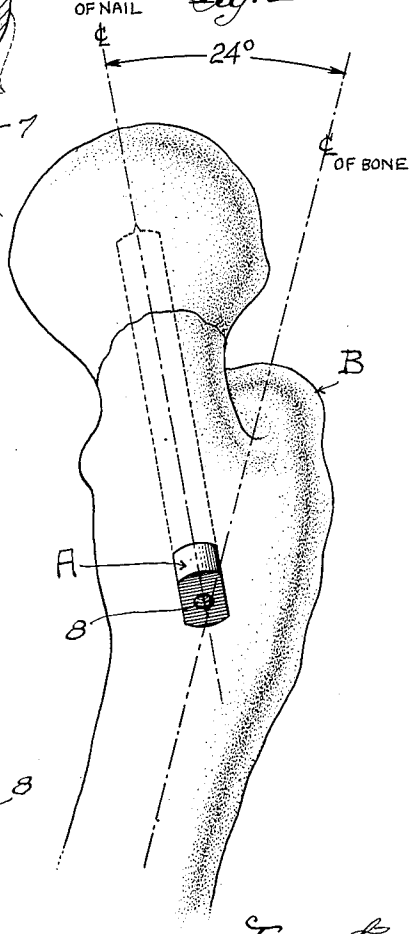


Fig. 6

Fig. 4

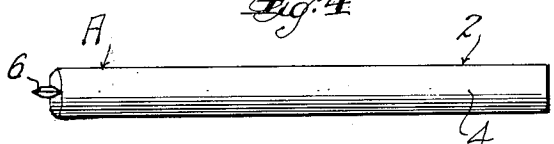
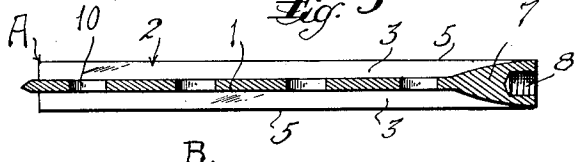


Fig. 5



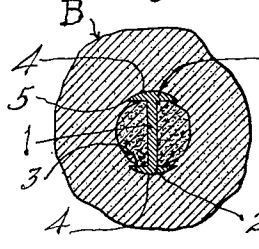


Fig. 3

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MEANS FOR INTERNAL FIXATION OF FRACTURED BONES

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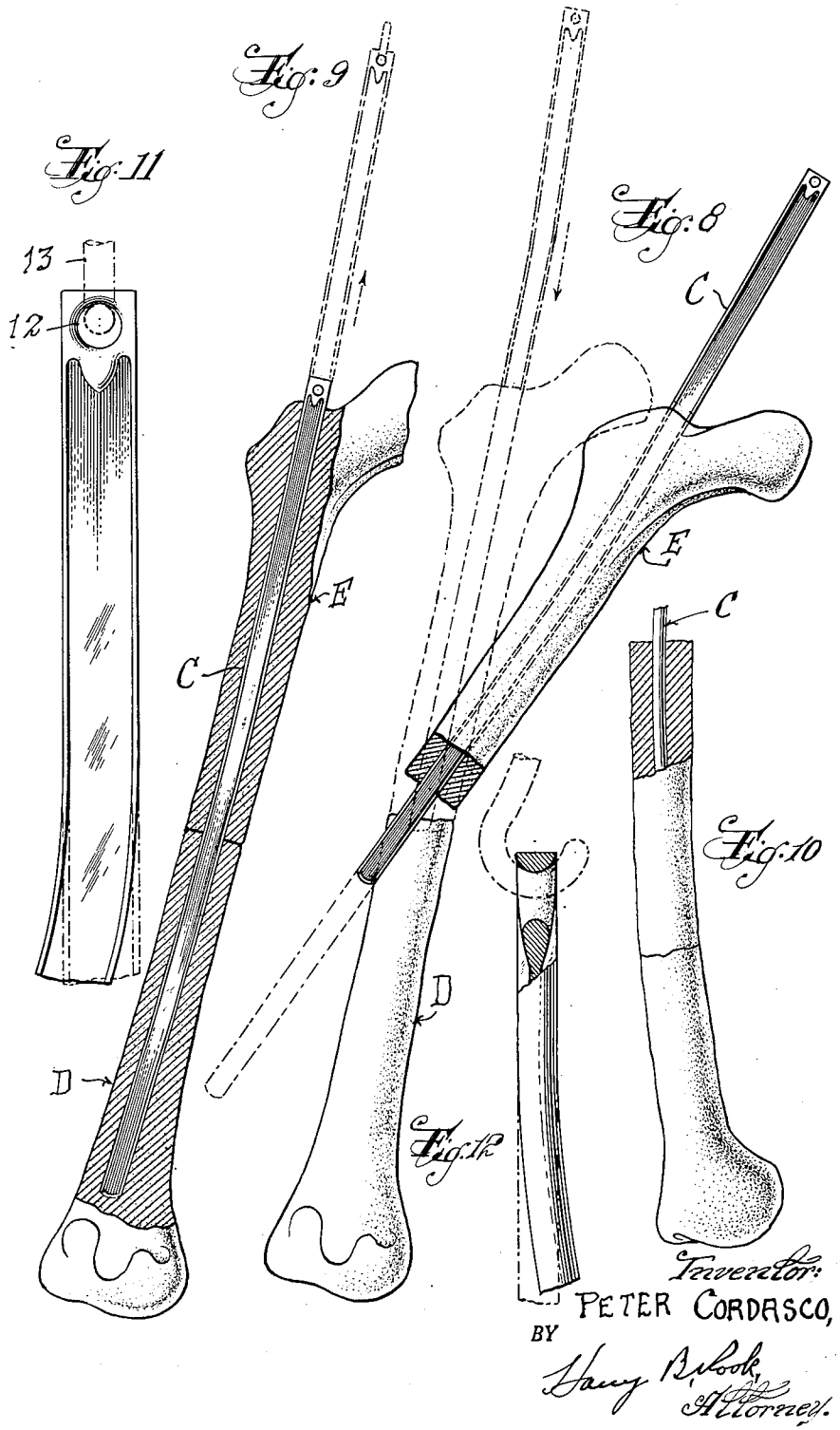

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MEANS FOR INTERNAL FIXATION OF FRACTURED BONES

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2 Claims. (Cl. 128—92)

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This invention relates to an appliance, particularly a nail or pin, for use in the internal fixation of fractured bones; and the invention contemplates devices of this character for fixing fractures of the neck of the femur and also fractures of long bones such as the shaft of the femur.

One object of the present invention is to provide fracture fixation means which shall embody novel and improved features of construction whereby it shall effectively resist all strains, particularly torsional and bending strains, at the plane of the cleavage of fracture of the bone.

Another object is to provide a fracture nail or pin which shall be so constructed that it can be easily driven into position and shall have firm bearing or contact with the bone fragments throughout its length so as to strongly resist all strains at the plane of fracture.

Other objects, advantages and results of the invention will be brought out by the following description in conjunction with the accompanying drawings in which

Figure 1 is a front elevational view of a fixation nail embodying the invention, illustrating it in position for the fixation of an intracapsular fracture of the femoral neck at the hip joint, with the bone shown partially in vertical section;

Figure 2 is a side elevational view of the thigh bone and fixation nail as illustrated in Figure 1;

Figure 3 is a transverse vertical sectional view approximately on the plane of the line 3—3 of Figure 1;

Figure 4 is a side elevational view of the fixation nail;

Figure 5 is a vertical longitudinal sectional view through the fixation nail;

Figure 6 is an enlarged and elevational view of the fixation nail;

Figure 7 is a front elevational view of a modified form of the nail;

Figure 8 is a composite side elevational view of fragments of a fractured thigh bone and a front elevation of a form of the invention adapted for the fixation of fractures of long bones, illustrating the manner of applying the fixation means to the bone;

Figure 9 is a vertical longitudinal section through the bone showing the bone fragments fixed by the fixation pin which is illustrated in front elevation;

Figure 10 is a fragmentary side elevational view of the bone and fixation pin as illustrated in Figure 9;

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Figures 11 and 12 are fragmentary front elevational and side elevational views, respectively of the fixation pin showing the manner of flexing of the pin and the method of removal of the pin from the bone.

Specifically describing the embodiment of the invention illustrated in Figures 1 to 6 inclusive, the fracture fixation member A is formed of any suitable corrosion resistant material, preferably stainless steel and is preferably I-shaped in cross section and of a length sufficient for the fixation of the particular fracture involved, in the present instance a fracture of the femoral neck at the hip joint.

In this form of the invention, the member is in the nature of a nail and comprises a flat web portion 1 having a flange 2 at each of its longitudinal edges extending perpendicularly to the general plane of the web, each flange extending approximately equidistantly from opposite faces of the web as best shown in Figures 3 and 5. The inner surfaces 3 of the flanges 2 are preferably straight and flat and perpendicular to the plane of the web, while the outer surface 4 of each flange is arcuately cylindrical, for example about a center lying in the longitudinal median plane of the web and mid-way of the thickness of the web, the arcuate surfaces meeting the straight surfaces 3 in sharp longitudinal edges 5.

One end of the nail has a scimitar-like edge 6, and as shown this edge is formed by convexly curving the end of the web and beveling said end to form a chisel-like edge. The width of the nail and the distances between the outer surfaces 4 of the flanges will vary for different purposes, depending upon the size of the intramedullary canal, but in all cases the width of the nail preferably will be such that the flanges 4 will penetrate the cortex of the bone B when the pin is driven into the intramedullary canal as best shown in Figure 3. The end edges of the flanges 2 are also sharpened or beveled to cut the bone.

At its end opposite the scimitar edge, the nail is provided with an enlarged portion 7 that may have a central screw threaded socket 8 for connection of a rod to be used in driving the nail into position. In Figure 7 the nail is shown as having a screw threaded stud 9 instead of a socket 7 for connection to the rod of a driver.

The nail is used in generally known manner. However, the sharp edges 5 of the longitudinal flanges 2 and the arcuately curved surfaces 4 of the flanges provide for easy and accurate cutting of the nail through the bone; and the arcuate

flanges in addition provide firm contact with the cortex throughout their lengths. Therefore, the nail can be easily driven into position with a minimum of discomfort to the patient and a minimum of damage to the bone, and at the same time the nail will effectively resist all strains, particularly torsional and bending strains at the plane of fracture. The scimitar edge **6** and the sharpened end edges of the flanges **2** insure a smooth cutting of the bone with a minimum of wedge action that might tend to put undue stresses on the bone during the driving of the nail.

As usual, preferably the nail has so-called breathing apertures **10** which permit free circulation of blood through the bone and also are useful in ascertaining by X-ray the extent of penetration of the nail into the bone.

Figures 8 to 12 inclusive illustrate a form of the invention particularly adapted for the fixation of long bones such as the shafts of femurs. Here the structure of the appliance or pin C is in general the same as that of the pin A, the main difference being in the dimensions. As shown, the pin C is much longer than the pin A, the pin C being intended to extend through a major portion of the length of the shaft of the femur.

This type of pin is applied to the bone in a different manner from that in which the nail A is inserted into the bone. As shown in Figure 8, the bone fragments D and E are bent apart at the fracture and the head end **11** of the pin is inserted into the upper section D of the femur from the broken end and pushed through the other end of the fragment as shown by solid lines. The scimitar end of the pin is then inserted into the broken end of the other bone fragment C and the bone fragments are moved into longitudinal alignment with each other with the fractured ends in mutual abutment as shown by broken lines. Then the pin is driven into the lower fragment C of the femur as shown by solid lines in Figure 9. The pin is preferably formed with a transverse opening **12** in its head for the insertion of a hook or other suitable member **13** for pulling the pin out of the bone as shown by broken lines in Figure 9.

It will be observed that the pin is flexible both

in directions parallel with its plane as shown in Figure 11 and in directions perpendicular to its plane as shown in Figure 12 so as to conform to the curvature of the bone as best shown in Figures 9 and 10. Of course, if desired the pin could be initially curved to correspond to the shape of the bone and this might be preferable in many cases.

While two now preferred embodiments of the invention have been specifically described, it will be understood by those skilled in the art that many modifications and changes may be made in the specific construction of the fixation member within the spirit and scope of the invention.

I claim:

1. For use in the internal fixation of fractured bones, an elongated member including a web and a flange at each longitudinal edge thereof extending equidistantly from both faces of the web and having segmentally cylindrical outer surfaces whose center lies in the longitudinal median plane of said web and centrally of the thickness thereof, one end of said web being scimitar-shaped and the corresponding ends of said flanges being beveled to sharp edges.

2. For use in the internal fixation of fractured bones, an elongated member including a flat web and a flange at each longitudinal edge thereof extending equidistantly from both faces of the web and having straight and flat inner surfaces perpendicular to the plane of the web, said flanges also having segmentally cylindrical convex outer surfaces whose centers lie in the longitudinal median plane of said web and centrally of the thickness of the web, said curved outer surfaces meeting said inner surfaces in sharp edges extending longitudinally of the flanges.

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