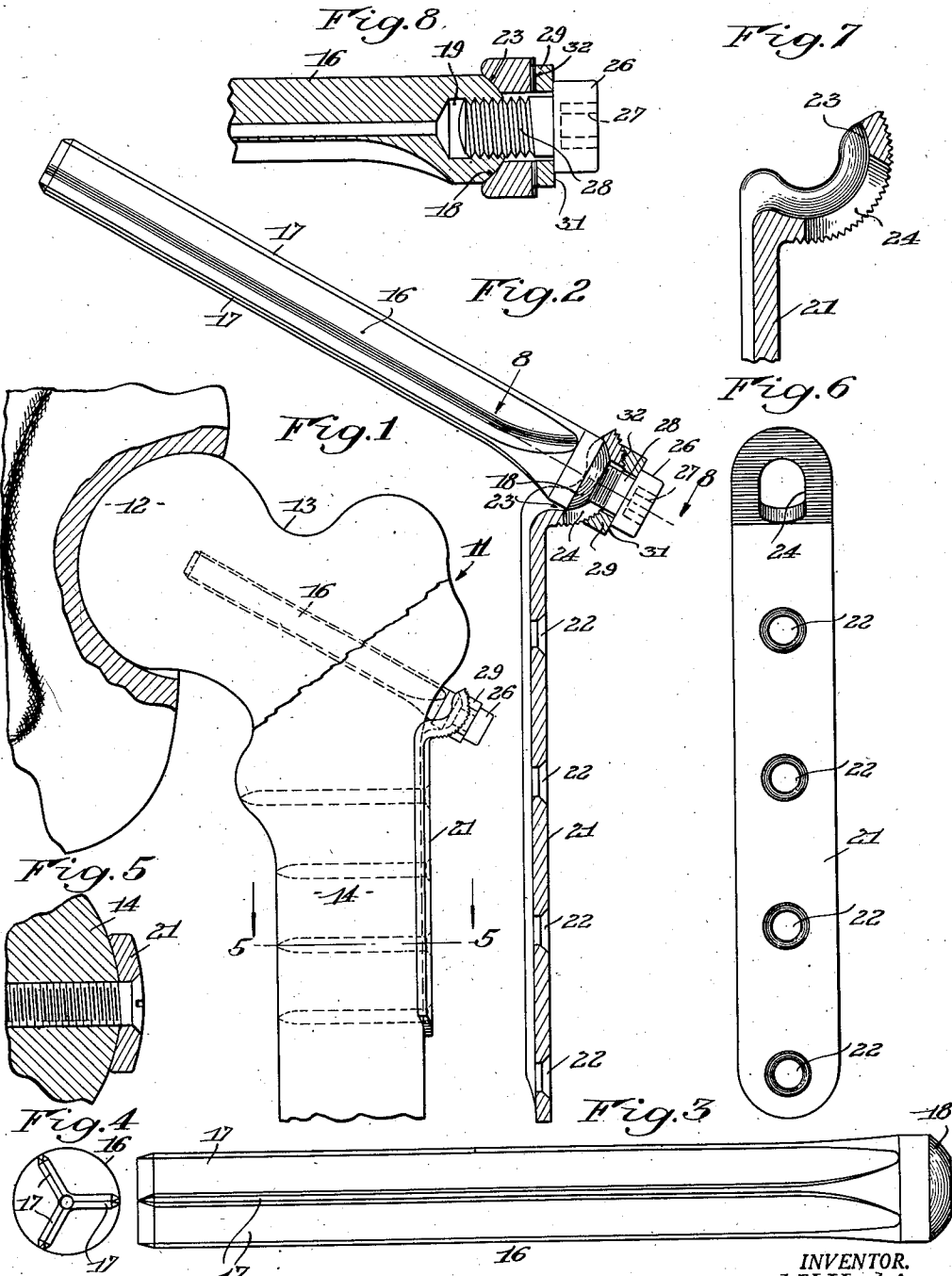


May 18, 1948.

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SURGICAL DEVICE

2,441,765

Filed April 28, 1945



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UNITED STATES PATENT OFFICE

2,441,765

SURGICAL DEVICE

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Application April 28, 1945, Serial No. 590,776

5 Claims. (Cl. 128—92)

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My invention relates to a surgical device and more particularly to a device for the purpose of internal fixation of inter-trochanteric fractures of the femur.

While the surgical device of my invention will be described for use in connection with fractures of the femur, the general principles thereof may have application in the fixation of other bone fractures. When a fracture of the neck of the femur occurs, it is essential to the welfare of the patient that the fixation nail be applied in the proper direction to be of maximum effectiveness and not cause pain to the patient or result in a stiff joint. Thus, depending upon the particular character of break, the angular position of the nail with respect to the shaft of the femur may vary.

Heretofore, in devices of the character with which my invention is concerned, the fixation or bone piercing nail and its extension arm which is tied to the shaft of the femur for holding the nail in position, have been in fixed angular relationship to each other. Because of the variable angular position of the nail with respect to the femur shaft it has been necessary in such fixed angle devices to apply the extension arm to the femur in a make shift manner or in a manner such that strains may be set up causing improper fixation.

An object of my invention is to provide a simple and inexpensive device for use particularly in connection with the internal fixation of inter-trochanteric fractures of the femur.

Another object of my invention is to provide a device for the fixation of fractures in which the angle of the nail with respect to the extension arm by which the nail is held in position, may be varied to accommodate the particular conditions encountered.

My invention further contemplates a device for the fixation of fractures of the femur in which the conventional nail employed in fixation is connected to an extension arm for holding the nail in position by a joint the angular position of which is variable whereby the longitudinal axes of the nail and extension arm may be positioned at various angles with respect to each other so as to accommodate the device to the particular conditions encountered in the fixation of the fracture.

Other objects and advantages of my invention will be set forth in the claims and will be apparent from the following description when taken in connection with the accompanying drawings, in which:

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Fig. 1 is a view showing the device of my invention in position for fixation of a fracture of the neck of the femur;

Fig. 2 is an enlarged view of the device of my invention;

Fig. 3 is a view showing a type of fixation nail which may be employed in the device of my invention;

Fig. 4 is an end view of the fixation nail;

Fig. 5 is a view taken substantially on the line 5—5 of Fig. 1;

Fig. 6 is a front elevation of the extension arm or strap of the device of my invention;

Fig. 7 is an enlarged sectional view of the head or socket of the extension strap; and

Fig. 8 is a sectional view taken substantially on the line 8—8 of Fig. 2.

In the drawings (Fig. 1) I have illustrated the femur, generally indicated by the numeral 11, which comprises the head 12, the neck 13, and the shaft 14. When fractures of the femur occur they usually occur either across the neck 13 or in the inter-trochanteric area, the angle of such breaks being variable.

Assuming the fracture has been reduced, the leg is held in proper position, the skin over the affected thigh is prepared and an incision is made from the great trochanter paralleling the shaft of the femur down to the bone. The doctor then attempts to drive a pin through the femur below the greater trochanter through the neck and into the head of the femur.

This positioning of the pin and the angle at which it should be driven is largely a guess under present practices. After the pin is in position an X-ray is taken to determine whether the pin is properly located with respect to the fracture and its direction is such that it is properly located with respect to the cortical walls of the femur to secure the greatest holding power. If the pin is not in its proper position another pin or pins must be inserted and additional X-ray or X-rays taken until the proper position of the pin is found.

When the proper position of the pin has been determined, the pin is used as a guide to drive into position a cannulated or non-cannulated nail, that most commonly used being known as a "Smith-Peterson" nail.

In connection with such fixation nails an extension arm or strap is employed to hold the nail in position. This extension arm is screwed into the shaft of the femur and the nail is thus rigidly held in position. As previously mentioned, in devices of this kind prior to my invention the longitudinal axis of the nail and the longitudinal

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axis of the extension arm have been in fixed angular relationship to each other. Because the angular position at which the fixation nail is driven varies and the bone contour varies, as between individuals, in most cases the extension arm or strap does not lie properly in parallel relation to and along the shaft of the femur. In many cases it has, therefore, been impossible for the doctor to secure a proper fit and attachment of the extension arm along and to the femur shaft.

The device of my invention is shown in connection with a cannulated "Smith-Peterson" nail although it can, of course, be used in connection with a non-cannulated "Smith-Peterson" nail. Such nails 16 comprise a pointed shaft having usually three longitudinal and radial fins 17. The head 18 of the nail, as shown, is partly hemispherical in shape and an axial threaded bore 19 is provided in the head which is concentric with cannulation. It is unnecessary to describe the fixation nail in more detail as such nails are well known in the art to which this invention applies.

The nail 16 is connected to an extension arm or strap 21 which has a plurality of countersunk screw openings 22 spaced longitudinally along the extension arm. Usually three or four screw holes are employed depending upon the length desired for fixation of the extension to the femoral shaft. As shown in the drawings, when the fixation nail is properly positioned the extension arm which is partly circular in cross section is placed against the femoral shaft and screwed into position.

In the device of my invention the upper end of the extension arm is provided with a socket, generally indicated by the numeral 23, which is shown most clearly in Fig. 7. This socket is partly spherical in shape and is adapted to receive the similarly configured end of the nail. With this arrangement it will be apparent that the angle of the axes of the nail and extension shaft may be varied while maintaining the head of the nail in the socket 23.

The socket at the end of the extension arm is provided with a slot 24 which extends through an arc in a direction parallel to and in fact preferably in coincidence with the longitudinal axis of the extension arm. While the length of this slot may be varied, I have found it adequate if the slot is of sufficient length to enable a shifting of the longitudinal axis of the extension arm with respect to the longitudinal axis of the fixation nail of approximately 30°.

A cap screw 26 is provided which has a head 27 having a hexagonal opening adapted to receive a suitable wrench. The screw is provided with threads 28 adapted to be threaded into the bore 19 of the fixation pin. A washer 29 having a planary face 31 which is engaged by the head of the cap screw is interposed between the head and the outer face of the socket 23. The washer 29 has a face 32 which is circular in cross section as shown in the drawings. The outer face of the socket is formed by the arc of the same circle as the face 32 of the washer.

The face 32 of the washer and the outer face of the socket 23 are each provided with serrations or teeth which are adapted to intermesh with each other and lock the fixation nail in the desired angular relation with the extension arm, after the cap screw is threaded firmly into position.

To minimize corrosion the parts of the device

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of my invention should be preferably made of "Vitalium" or certain stainless steels.

In practice after the nail is properly positioned as above described, the extension arm is swung, with the slot 24 shifting with respect to the cap screw, until the extension arm is snugly in position against the femoral shaft. The screws may then be positioned in the shaft to strap the extension thereto. The cap screw 26 may then be tightened to lock the parts together in the desired angular position of the fixation nail with respect to the extension arm. The intermeshing of the serrations on the washer and the socket then prevent the axes of the fixation nail and the extension arm from shifting out of their desired relationship.

While I have shown the preferred form of my invention it will be apparent that various modifications and changes may be made therein, particularly in the form and relation of parts, without departing from the spirit of my invention as set forth in the appended claims.

I claim:

1. A device for the purpose of internal fixation of a fracture comprising, in combination, a bone piercing nail, an extension arm, said nail and extension arm having longitudinal axes which are at an angle to each other, means including a slot for adjusting the angle of said axes to a desired adjusted position with respect to each other, and means including a threaded element extending through said slot for rigidly clamping the nail and the extension arm in said desired adjusted position.
2. A device for the purpose of internal fixation of a fracture comprising, in combination, a bone piercing nail having a threaded bore, an extension arm, said nail and extension arm having longitudinal axes which are at an angle to each other, said extension arm having a socket for the reception of the end of the nail and said socket having a slot, and a headed element having threads which extend into the threaded bore, said element extending through said slot and enabling the clamping of said socket between the head of said element and the end of said nail with the axes of said nail and extension arm in a desired angular position with respect to each other.
3. A device for the purpose of internal fixation of a fracture comprising, in combination, a bone piercing nail having a threaded bore, an extension arm, said nail and extension arm having longitudinal axes which are at an angle to each other, said extension arm having a socket for the reception of the end of the nail and said socket having a slot and a headed element having threads which extend into the threaded bore, said element extending through said slot and enabling the clamping of said socket between the head of said element and the end of said nail with the axes of said nail and extension arm in a desired angular position with respect to each other, and means between the head of said element and said socket for preventing shifting of said element in the slot when the parts are clamped together.
4. A device for the purpose of internal fixation of a fracture comprising, in combination, a nail adapted to penetrate the head and neck of the femur, said nail having a head at least partly spherical in shape and a threaded axial bore, an extension arm adapted to lie lengthwise adjacent the femur shaft and receive headed screws extending into the shaft, said nail and extension arm having their longitudinal axes extending at

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an angle to each other, a socket at least partly spherical in shape for the reception of the end of said nail, said socket having a slot with the long axis of the slot parallel to the longitudinal axis of the extension arm, a headed screw for reception in said bore, and a washer between said screw head and socket, said screw extending through said slot and after adjustment of the angular relation of the axes of the nail and arm clamping the parts together in the desired adjusted position. 10

5. A device for the purpose of internal fixation of a fracture comprising, in combination, a nail adapted to penetrate the head and neck of the femur, said nail having a head at least partly spherical in shape and a threaded axial bore, an extension arm adapted to lie lengthwise adjacent the femur shaft and receive headed screws extending into the shaft, said nail and extension arm having their longitudinal axes extending at an angle to each other, a socket at least partly spherical in shape for the reception of the end of said nail, said socket having a slot with the long axis of the slot parallel to the longitudinal axis of the extension arm, a headed screw for reception in said bore, and a washer between said 15

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screw head and socket, said screw extending through said slot and after adjustment of the angular relation of the axes of the nail and arm clamping the parts together in the desired adjusted position, said washer and socket having cooperating toothed surfaces adapted to intermesh and prevent shifting of said axes when the parts are clamped together.

HEYWOOD H. HOPKINS.

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