Sept. 3, 1946. M. G. HARDINGE 2,406,832

FRACTURE PLATE

Filed March 5, 1945

Fig. 1.

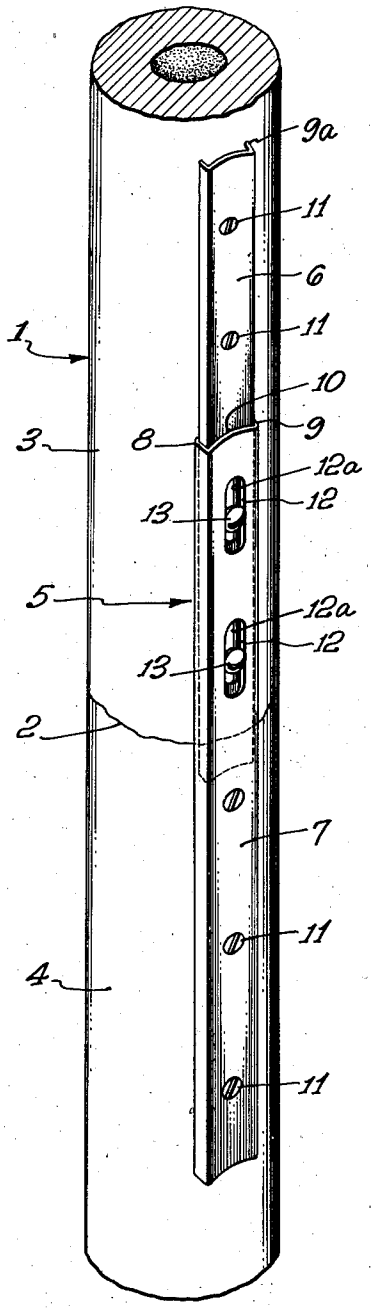
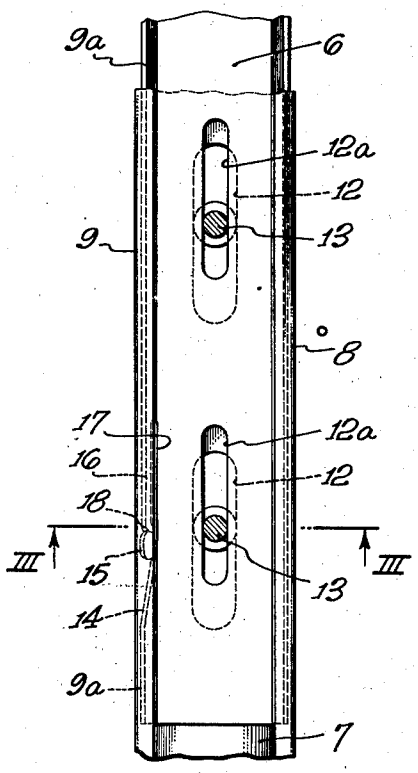


Fig. 2.



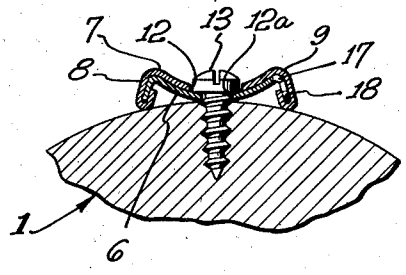


Fig. 3.

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FRACTURE PLATE

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5 Claims. (Cl. 128—87)

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My invention relates to fracture plates and has particular reference to a fracture plate which may be employed in the reduction of bone fractures.

In the reduction of bone fractures, it has become a practice to employ a metal plate extending along the length of the bone and secured directly to the bone on opposite sides of the fracture by means of screws or other securing devices extending into the bone structure. One of the difficulties encountered in the use of such metal plates is that while the plate will hold the bone fragments in alignment with each other and if properly placed will hold the adjacent fragment ends in abutting relation with each other during the healing process, it frequently occurs that more or less absorption takes place at the line of the fracture, resulting in a spacing of the fragment ends away from each other. Under these conditions, the fracture plates heretofore employed hold the bone fragment ends away from each other, materially interfering with the rapid healing at the fracture line and in some instances actually preventing healing unless the fracture plates are removed, the bone fragments again pressed into abutting relation with each other and then the fracture plate must be replaced with the bone fragments in the new position.

It is therefore an object of my invention to provide a fracture plate which, while it will hold the bone fragments in accurate alignment with each other, will automatically become shortened across the fracture line in the event any absorption at the fracture line takes place.

Another object of my invention is to provide a fracture plate of the character described wherein the fracture plate is adjustable in length while in place upon the bone.

Another object of my invention is to provide a fracture plate of the character described wherein any force exerted longitudinally of the bone fragments tending to press the fragments toward each other will cause an automatic shortening of the plate across the fracture line.

Another object of my invention is to provide a fracture plate of the character described wherein the fracture plate is yieldable longitudinally of the bone fragments to permit movement of the bone fragments toward each other but is prevented from elongation by forces tending to move the bone fragments apart.

Other objects and advantages of my invention will be apparent from a study of the following specifications, read in connection with the accompanying drawing, wherein

Fig. 1 is a perspective view of a bone section

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with my fracture plate in place thereon;

Fig. 2 is a fragmentary rear elevational view of the fracture plate shown in Fig. 1; and

Fig. 3 is a transverse sectional view taken along line III—III of Fig. 2.

Referring to the drawing, I have illustrated in Fig. 1 a portion of the length of a bone 1 fractured along the line indicated at 2, the proximal fragment 3 and the distal fragment 4 having been accurately aligned with each other and the ends of the fragments being placed in abutting relation with each other. To hold the bone fragments in this position, I employ a fracture plate indicated generally at 5, the fracture plate comprising a pair of elongated metal strips 6 and 7, comprising inner and outer plate elements, the strips being preferably deformed transversely in a general channel-shaped cross section, providing a pair of side flanges 8 and 9 interconnected by a web 10 which, if desired, may be given a curved transverse shape. The curve of the web and the side flanges act to render the plate elements 6 and 7 rigid along their lengths even though the strips may be formed from relatively thin material.

Each fracture plate is preferably formed of two nested strips, the side flanges of the outer strip 7 being bent over about the side flanges of the inner strip 6 to form a trackway along which the flanges of the strip 6 may slide in a contracting or extending motion of the strips relative to each other.

The fracture plate may be secured to the bone by means of screws 11, these screws extending through circular openings in the web 10 of each of the strips 6 and 7, respectively, on opposite sides of the fracture line 2, and I prefer to insert screws through the overlapping portions of the members 6 and 7 as by forming elongated slots 12 and 12a in the plates 7 and 6, respectively, the width of the slot 12 being such as to permit the passage of the head of a screw 13 while the slot 12a is formed of a width which will permit the passage of the screw but not the head.

Thus, the fracture plate when placed upon the bone may be elongated as by moving the strips to an extended position relative to each other to place the openings 12 and 12a on the inner and outer strips in such longitudinal relation to each other that after the screws 13 are inserted, the strips may be moved in a contracting direction as the bone fragment ends are pressed into tight abutment with each other and the fracture plate will hold the bones in accurate alignment with each other, permitting the patient to resume ac-

tivity with assurance that the fragments will be held in such alignment.

For example, if the fracture plate is used upon leg bones, the patient may be permitted to walk within a relatively short time of the setting of the bone fragments and such weight as may be placed upon the broken bone will cause the bone fragment ends to be urged toward each other, insuring the tight abutment of the bone fragments throughout the healing period. Thus if any absorption of the bone structure occurs at the line of fracture during the healing process the bone fragments will not be held in spaced relation to each other but will be permitted to move toward each other sufficiently to take up for any such absorption.

It is extremely desirable, however, that while the contracting movement of the plate strips may be permitted, means should be provided for preventing extending movement or elongation of the plate strips across the fracture line. To accomplish this, I prefer to provide an over-riding clutch structure between the strips 6 and 7. As seen particularly in Figs. 2 and 3, the side flange 9a of the inner strip 6 is partially cut away along an angular line 14 to provide a space in the channel defined by the bent over flange 9 of the outer strip and a small disk 15 is inserted in this space. The diameter of the disk is substantially equal to the depth of the flange 9a. By placing the fracture plate upon the bone with the inner strip 6 uppermost, the disk 15 will always tend to ride outwardly upon the angular surface 14, effectively clamping the strips 6 and 7 to each other against elongation of the assemlbed strips while any tendency of the strips to move toward the contracted position will be unresisted by the disk 15. To aid in this clamping action and particularly to prevent any lost motion between the strips 6 and 7 when any elongating force is exerted between them, I prefer to provide means for resiliently urging the disk 15 toward its clamping position. This may be done by providing a spring finger 16 extending along the channel formed by the bent over flange 9 of the outer strip and, as illustrated in Fig. 2, such spring finger may be formed merely by cutting out a portion 17 of the flange 9a, leaving a relatively thin finger of the metal of the strip 6 bent as indicated at 18 to engage the disk 15.

The metal of which the fracture plates are made is preferably steel or some material which has inherent resilience and thus the finger 16 will resiliently urge the disk toward its clamping position.

It will thus be apparent that while the fracture plate is in place upon a pair of bone fragments, the exertion of forces longitudinally of the bone fragments tending to move them toward each other will permit a contracting movement of the assembled fracture plate while any force tending to separate the bone fragments will be effectively resisted by the action of the over-riding clutch structure herein described.

While I have shown and described the preferred embodiment of my invention, I do not desire to be limited to any of the details of construction shown and described herein, except as defined in the appended claims.

I claim:

1. In a fracture plate to be secured to a pair of bone fragments and to extend across the fracture line, a pair of plate elements extending in overlapping relation to each other, means intercoupling said plates for telescopic movement relative to each other between an extended position and a contracted position, and means for resisting movement of said plates toward said extended position but permitting substantially free movement of said plates toward said contracted position.

2. In a fracture plate to be secured to a pair of bone fragments and to extend across the fracture line, a pair of plate elements extending in overlapping relation to each other, means intercoupling said plates for telescopic movement relative to each other between an extended position and a contracted position, and means for resisting movement of said plates toward said extended position but permitting substantially free movement of said plates toward said contracted position, said last named means comprising an over-riding clutch interposed between said plates.

3. In a fracture plate to be secured to a pair of bone fragments and to extend across the fracture line, a pair of plate elements, each formed as an elongated substantially channel shape, said plates being disposed in overlapping relation to each other, the flanges of the channel of one of said elements extending about and enclosing flanges of the other of said elements to interconnect the two elements for telescopic movement between an extended position and a contracted position, and an over-riding clutch disposed between the flanges of the two elements for resisting movement of the elements toward their extended position while permitting substantially free movement of said elements toward their contracted position.

4. In a fracture plate to be secured to a pair of bone fragments and to extend across the fracture line, a pair of plate elements, each formed as an elongated substantially channel shape, said plates being disposed in overlapping relation to each other, the flanges of the channel of one of said elements extending about and enclosing flanges of the other of said elements to interconnect the two elements for telescopic movement between an extended position and a contracted position, an angular surface formed upon the enclosed flange of one of said elements, a disk disposed between said surface and the surrounding flange of the other element to comprise an over-riding clutch permitting substantially free telescopic movement of said plates toward their contracted position but resisting movement of said plates toward their extended position.

5. In a fracture plate to be secured to a pair of bone fragments and to extend across the fracture line, a pair of plate elements, each formed as an elongated substantially channel shape, said plates being disposed in overlapping relation to each other, the flanges of the channel of one of said elements extending about and enclosing flanges of the other of said elements to interconnect the two elements for telescopic movement between an extended position and a contracted position, an angular surface formed upon the enclosed flange of one of said elements, a disk disposed between said surface and the surrounding flange of the other element to comprise an over-riding clutch permitting substantially free telescopic movement of said plates toward their contracted position but resisting movement of said plates toward their extended position, and spring means normally urging said disk along said angular surface toward a clamping position between said surface and the enclosing flange.

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