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2,490,364

BONE PIN

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Fig. 1.

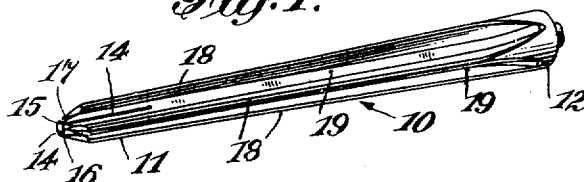


Fig. 2.

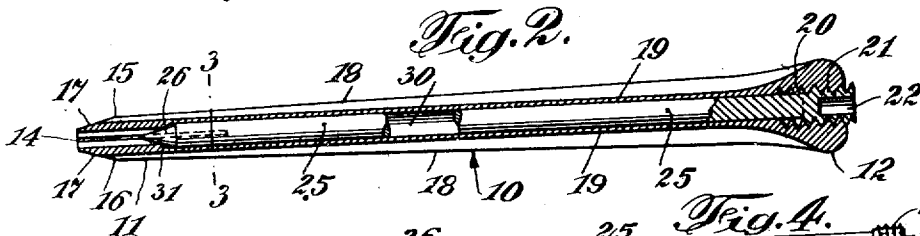


Fig. 4.

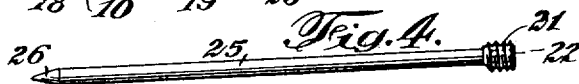


Fig. 3.

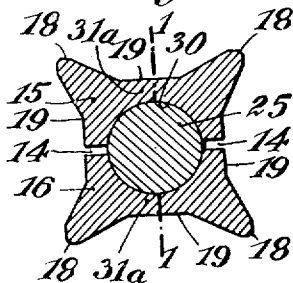


Fig. 5.

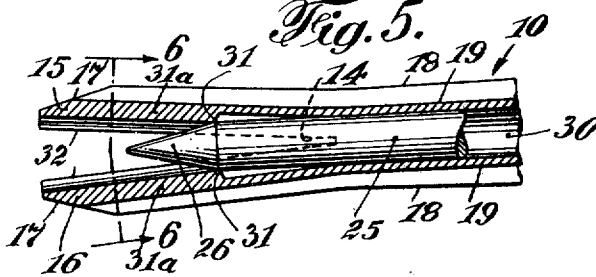


Fig. 6.

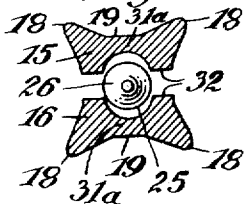


Fig. 7.

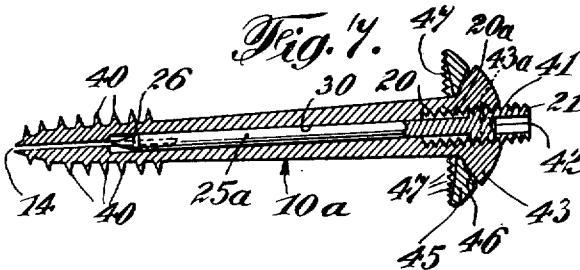
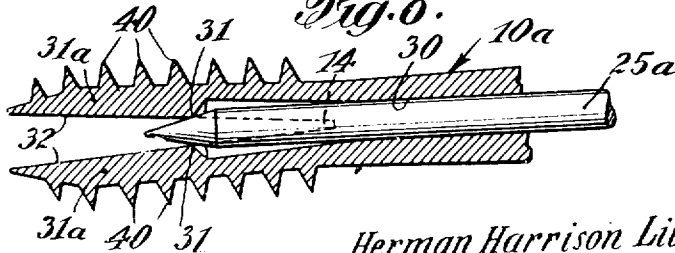


Fig. 8.



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BONE PIN

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2 Claims. (Cl. 128-92)

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This invention relates to bone pins, that is, pins used to hold broken bones together to enable their knitting or healing.

The invention consists of a tapered shell member converging towards the entrance point and at the entrance point having slits providing outwardly bendable jaws, said jaws to be moved outwardly after the parts of a broken bone have been set, in order to give a final clinching effect to the abutting bones, and permanently hold them together. The outward bending of the tip channel portions is controlled at a point outwardly of the set bones readily accessible to the surgeon. A central solid rod within the tapered shell member has substantially the same diameter as the central bore of said tapered member and acts as a strengthening member to the tapered member and as a wedge upon interior cams or shoulders of the tapered member. The other end of the rod is rotatably seated in the outer end of the tapered member, as is rotated and thereby driven forward to have its tip end act as the wedge. The tapered shell member has four tapered ridges with intervening channels which also taper to give a full wedging effect as the tapered member enters the bone by being driven into the bone, the four relatively flat sides acting to resist lateral displacement into the bone of tapered shell.

The invention may be embodied in a device having large exterior screw threads for entry into the bone.

The invention includes a self seating and gripping washer exterior to the bone being treated which enables the bone pin to adapt itself in position in respect to any particular bone structure.

The invention will be more fully described hereinafter, embodiments thereof shown in the drawings, and the invention will be finally pointed out in the claims.

In the accompanying drawings,

Fig. 1 is a perspective view of the improved bone pin;

Fig. 2 is a longitudinal section taken on line 1-1 of Fig. 3 being enlarged in size;

Fig. 3 is a transverse section taken on line 3-3 of Fig. 2;

Fig. 4 is a side view of the rod being shown in exact size;

Fig. 5 is an enlarged section of the tip portion of Fig. 2, showing the jaws, expanded;

Fig. 6 is a transverse section taken on line 6-6 of Fig. 5;

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Fig. 7 is a reduced longitudinal section of a modified form; and

Fig. 8 is an enlarged section of the tip portion of Fig. 7 in expanded position.

Similar characters of reference indicate corresponding parts throughout the various views.

Referring to the drawings, the bone pin in one of the embodiments consists of a tapering shell member 10 having a smaller cross-sectional entrance portion 11 and a larger cross-sectional base portion 12. This member 10 is split along part of its length at its entrance portion by lateral slits 14, one at each side, to form two channeled jaw portions 15 and 16. The tip is pointed as shown by inclined surfaces 17. The member 10 consists of four ridges 18 with a valley 19 between each pair of adjacent ridges, and each channel valley 19 tapers from the tip portion to the base portion of the bone pin, with the lowest depth or width at the tip portion and largest depth or width at the base portion all to create a gradual wedging effect on the movement of the member 10 into the bone when inserted or driven into the bone. The rear or base portion of each channel 19 and the tapered ridges 18 merge into a circumferential bone portion 12, adjacent the end of the shell member 10 at the base portion thereof (Fig. 2).

This base portion 12 is provided with an internally threaded bore 20, into which a screw-threaded collar 21 having an internal hexagonal wrench hole 22, fits. Integral with said collar 21 is a cylindrical rod 25, having a pointed end 26 of wedge shape (Fig. 4).

The interior of the tapering shell member 10 has a longitudinal bore 30 extending substantially through the length from the base portion to near the tip of the member 10, of an internal diameter substantially equal to the external diameter of the rod 25, so that the member 10 and the rod 25 form substantially one structural unit as to strength when set into the bone. At the end of the bore 30 near the tip of the member 10 there is a smaller diameter bore forming an internal shoulder 31, and from this shoulder parallel walls 31a form the lateral slits 14 which extend from the shoulder 31 to the tip of the member 10.

The length of the rod 25 is such that when the conical surfaces 26 of its pointed end rest against said shoulders 31, the other end of the rod, that is its screwthreaded portion extends outside of the member 10, a distance corresponding to the distance of the movement of the rod to its operative extent.

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When the rod 25 is rotated clockwise it is moved forwardly, and the wedge action of the pointed tip 26 of the rod 25, acts against the shoulders 31, and moves the two end portions or jaws into the general position as shown in Fig. 5, the slit 14 being now a gap 32. In consequence the outer parts of these jaws form a wedge acting anchorage, and move one part of the severed bone against the other so as to be in close contact to facilitate knitting.

Thus, the mere rotating movement of the rod serves to actuate the jaws or claws. If it is desired to withdraw the bone pin, the rod is rotated in its opposite direction, to withdraw its pointed end from the shoulders 31, and then due to the givable character of the material of the shell proximate to the shoulder portion, the jaws collapse, and the member 10 may be readily withdrawn from the bone. Thus, this expanding and collapsing is of the simplest form.

The relative flatness of the sides as shown in Fig. 3 is important. The bone pin is driven into the bone so that it takes the position as shown in Fig. 3. Thereby, the weight of the patient is resisted by the relatively flat upper and lower parts. If the bone pin were moved 45° to the position shown in Fig. 3, the wedge shaped parts 18 would be forced into the bone structure, and the bone pin would loosen. Likewise, the slit gap 14 should not be opened by any pressure as would be the case if the position of Fig. 3 be moved 90°. The converging wedges 18 with their valleys therebetween allow a ready insertion of the bone pin, with a tighter and tighter hold being obtained as the bone pin enters the bone. The thread 21 of the rod 25 is of a slow movement and to give a greater force of movement.

Another embodiment is shown in Fig. 7. It has some of the essential features of the invention as described, but is adapted to a form of screw. The exterior of the tip portion of the embodiment shown in Figs. 7 and 8 is provided with large low pitch screw threads 40 which are easy to turn and take up a small space. In this embodiment the four ridge tapering shell members are not used.

In both embodiments, adjusting devices may be used. For instance, in Figs. 7 and 8, the outer end of the rod 25a is provided with a screw threaded end 41 having a hexagonal bore 42 at the outside for the entrance of a tool. A washer 45 has a bore larger in diameter than the screw threads 40. The shell 10a with its screw threads 40 has a head 43 with a slot 43a, and this head 43 has an internal screw threaded bore 20a for the end 21. The washer like member 45 has a concave seat 46. Preferably, the inner side of the washer 45, is provided with serrations 47 to engage the bone surface. This self seating washer 45 is intended to adapt itself to the outer surface of the bone, by the flexibility of action between the washer and the head 43 of the screw 40. The drawings show a contact between the bore of the washer and the member 10a. The bore can be made larger to give more play if desired.

The slot 43a is in the same diametrical position in respect to the shell 10a, as the slots 14, to enable the surgeon to determine the position of the screw. When the screw is in position as to its length it is important that the portions 31a are horizontally disposed since the weight of the body should rest on such flat abutments as explained.

The improved bone pin has the four bone resting channels and the tapered wedging members advantage, due to its tapering wedge shape, of being readily insertable into the two parts of the

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severed bone, and due to the action of the jaws, to lock the bone pin in position and prevent its working out, the outwardly extending channel shape re-inforcement jaws serving at the same time to draw the severed parts together, conversely, the bone pin may be readily removed. Furthermore, another advantage results from the formation of the shell member in that it has fins and ridges, to gradually enter the bone mass, of tapering wedge shape longitudinally and transversely, with a longitudinal tapering channel between the ridges.

The principle of the invention resides in the combinative entity of a control central rod forming the vertebrate of the four sided shell with its longitudinal and laterally increasing ridges and fins tapering from the entrance point to the base portion, to the end that the rod strengthens the shell, and the shell with the rod enters the bones gradually yet the broad space span between the tips of the fins acts to prevent displacement.

The principle of invention of the adjustment feature is that with differently shaped bones, the improved bone pin is not subjected to unintended strains likely to displace the bone pin after its positioning in the injured bone.

I wish to be understood that I do not desire to be limited to the exact details of construction shown and described for obvious modification will occur to a person skilled in the art.

I claim:

1. In a bone pin, the combination of a single elongated shell having four exterior smooth and blunt wedges and interposed shallow valleys, an upper and a lower horizontal, and two lateral vertically disposed valleys, with slits at its entrance end in the lateral vertical channels, and an interior shoulder at said entrance and intermediate the length of the slits, the exterior of the shell tapering from the entrance end and terminating at the base portion of the shell, the wedges and valleys diverging longitudinally from the entrance end of the shell to its base portion and the wedges increasing in depth from the entrance end to the base portion, and a central bore interiorly screwthreaded only at the base portion of the shell and extending throughout the length of the shell to said interior shoulder, with a central rod wedge shaped at one end engaging said interior shoulder, and having an exteriorly screwthreaded portion only at its other end engaging the screwthreaded part of the base portion, the diameter of the rod being equal to the diameter of the bore throughout the length of the bore, for slipping contact of the rod in the bore and for forming part of the shell and strengthening the same, whereby after the shell is driven longitudinally into the bone portion with the upper and lower valleys horizontally disposed, and on the rotation of the rod the slitted ends of the shell are separated to parts angular to the length of the shell to form an anchor, the upper and lower horizontal channels being at right angles to the perpendicular forces applied thereto.

2. In a bone pin, the combination of an elongated shell having an entrance end with opposed longitudinal slits, and an interior shoulder intermediate the length of the slits, a base portion with an interior screwthread, and a uniform bore between said shoulder and said base portion, a rod having a wedge portion at one end adjacent said interior shoulder, and having an exterior screwthreaded portion at its other end engaging the screwthreads of said base portion and of a uniform diameter the same as that of the bore. a

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washer with a bore having a diameter larger than the diameter of the shell at its base portion and surrounding the same, said washer having serrations at one side towards said entrance end, and a concave curvature on the other side towards said base portion, the exterior of the shell at its base portion having a convex portion, concentric with and seated in the concave portion of the washer, whereby the washer automatically adjusts it self to the facial surface of the bone after the bone pin is driven home irrespective of the alignment of the bone pin.

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