

## A FURTHER NOTE ON REDUCTION OF FRAGMENTS IN FRACTURES OF THE LONG BONES AT OPEN OPERATION.

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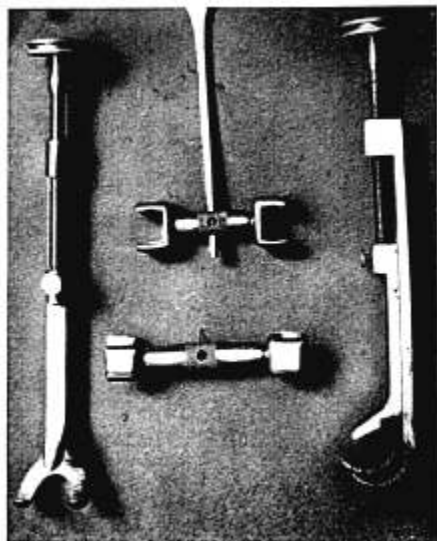
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SOME months ago I described a method for distracting the overlapping fragments of a fractured long bone by means of a turnbuckle placed between two Lowman clamps,<sup>1</sup> one on each fragment (Fig. 1). As the turnbuckle forces the clamps apart, the resistance of the soft parts increases. This resistance is chiefly noticeable on the side of the bone opposite to where the turnbuckle is applied. The tendency is for the fragments to kink (Fig. 1), and for the shafts of the Lowman clamps to diverge instead of remaining parallel. If the divergence is at all marked, the turnbuckle's jaws slip up the shafts and slide out of place. To prevent this occurrence it is necessary *a*, to place the turnbuckle as close down to the bone as possible; *b*, to keep the two clamps parallel to one another by means of an assistant's hand which grasps both milled heads of the Lowman clamps, one with the finger tips, the other with the hollow of the palm. At that time, I thought of using a second turnbuckle armed with hooks to accomplish this, but I chose manual rather than mechanical control because of the danger of using too great force with the latter method. However, the experience of W. H. Bishop, of New York, whose material has been much greater than my own, has shown that it was awkward and rather unsatisfactory for an assistant to control the clamps. During a difficult reduction of a fractured tibia he accordingly slipped the loop handle of one of the Lane bone retractors over the free ends of both

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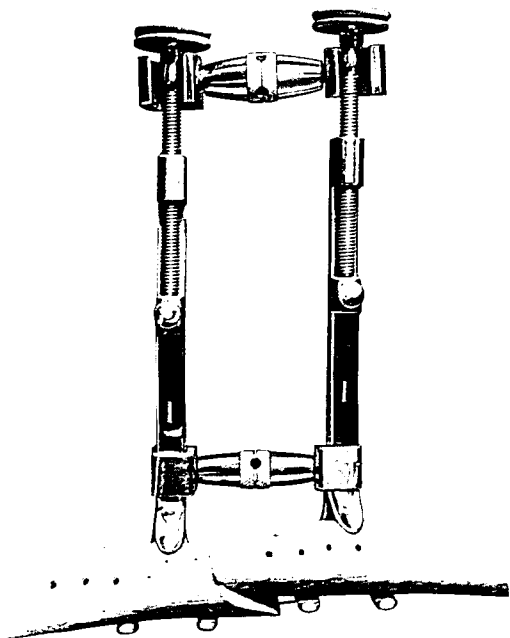
<sup>1</sup>"Reduction of the Fragments in Fractures of the Long Bones,"  
ANNALS OF SURGERY, November, 1912, p. 769.

FIG. 5.



Anterior and lateral view of modified Lowman clamps. Smaller turnbuckle with key in place. Range of smaller turnbuckle is from  $1\frac{7}{8}$  to  $2\frac{1}{2}$  inches; range of larger turnbuckle is from  $2\frac{1}{2}$  to  $3\frac{1}{2}$  inches.

FIG. 6.

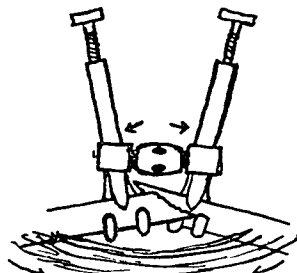


Photograph of clamps and turnbuckles applied to an adult femur (as in Fig. 3*a*).

at  
it  
m  
tu  
g  
b  
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Lowman clamps and blocked up the free space left at one end until the clamps were parallel. As the turnbuckle forced the clamps apart, one block after the other was removed. Reduc-

FIG. 1.



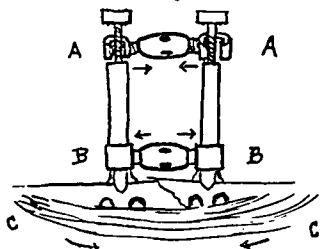
Showing tendency for distal ends of Lowman clamps to diverge because of resistance by soft parts.

FIG. 2.



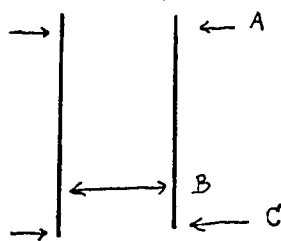
Turnbuckle armed with hooks.

FIG. 3a.



Divergence controlled by hooked turnbuckle at *AA*. Arrows indicate lines of force. Usually it is more convenient to apply turnbuckle at *BB*, maximally contracted, and to apply hooked turnbuckle at *AA*, expanded sufficiently to engage diverging shafts. Then this same turnbuckle at *AA* is contracted until clamps are parallel or nearly so, after this expansion of turnbuckle at *BB* can begin.

FIG. 3b.

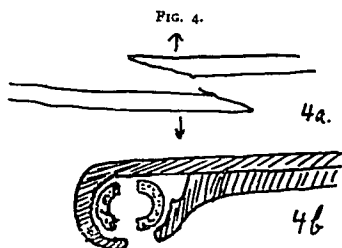


The Lowman clamps constitute levers; the turnbuckle at *B* is the fulcrum, the resisting soft parts at *C* and the turnbuckle at *A* balance each other.

tion was easy, and control was much more certain than by the assistant's hand. This crude make-shift was so satisfactory, that a turnbuckle was made, armed with hooks (Fig. 2) to keep the clamps parallel. As the turnbuckle close to the bone forces the clamps apart, the upper turnbuckle is released

just enough to maintain a proper parallel position of the Lowman clamps (Fig. 3a).

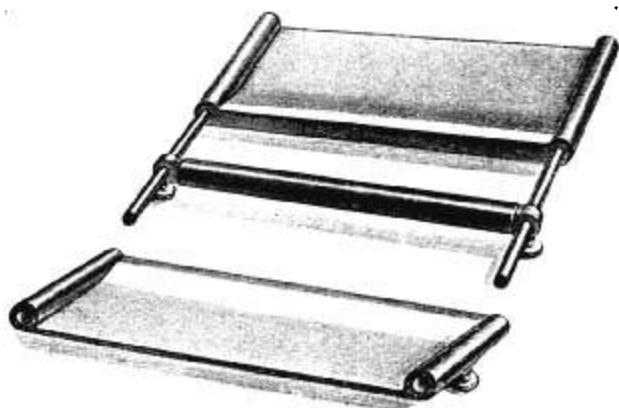
The six appended figures with their legends explain the mechanical conditions encountered and their method of con-



4a, during distraction frequently there is a tendency to lateral displacement. 4b, a third Lowman clamp, which embraces both fragments but is not tight enough to prevent distraction, readily controls this.

trol. I still recognize the ease with which too great force can be applied by this method. Distention should be gradual, not sudden; after a certain amount of resistance is met with, it is well to pause a minute or two and then proceed again.

FIG. 1.



Gastro-enterostomy clamp.