With the compliments of the author.

NEW

SURGICAL APPARATUS.

BY

WILLIAM P. BOLLES, M.D.

Reprint from Medical and Surgical Reports of City Hospital, Third Series.

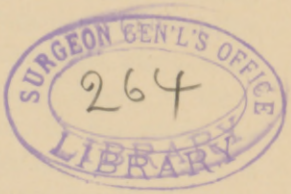
BOSTON:
PRESS OF ROCKWELL AND CHURCHILL, No. 39 ARCH STREET.
1882.

NEW

SURGICAL APPARATUS.

BY

WILLIAM P. BOLLES, M.D.



Reprint from Medical and Surgical Reports of City Hospital, Third Series.

BOSTON:
PRESS OF ROCKWELL AND CHURCHILL, No. 39 ARCH STREET.
1882.

NEW SURGICAL APPARATUS.

By William P. Bolles, M.D.

The following novelties, designed during the writer's connection with the hospital, and for the most part first tried within its walls, have never been described in print, or to any extent offered to the public; but having answered in his hands good purposes, and having received the commendations of those of the staff who have used them, he places them on record in the official publication of the hospital as the most appropriate channel through which he can offer them to the profession. As they are all mechanical appliances, intended to accomplish purely mechanical purposes, their adaptability can usually be seen and judged of at a glance. On this account he has not thought it necessary to relate the cases in which they were used, or direct the manner of their application, but only to describe them with so much care that any one, who may wish to do so, can make them correctly from the description. In order to prevent that deterioration of shape and quality that almost always takes place when new inventions are left unwatched for any length of time, in the hands of uninterested mechanics, he has made the following descriptions full and particular, and drawn a number of illustrations of details, that can hardly be misunderstood, and, if properly followed, will serve to exactly reproduce his instruments in all essential points.

It cannot be expected that a paper written for such a purpose will be interesting continuous reading, or even tolerable to those who do not wish either to make or understand the objects described. If it reads very much like a patent application, it may be remembered that its object is the same, — to thoroughly explain the new inventions.

The use of proper machinery in the cases of the fracture-box, ham-splint-hinge, etc., will reduce what would otherwise be very expensive luxuries, to reasonable cheapness.

ADJUSTABLE FRACTURE-BOX. — (PL. No. I.)

This, while answering all the requirements of the ordinary fracture-box, is particularly intended to be used in the more severe cases of compound or complicated fractures, where daily attention — syringing, washing, or dressing — is needed,

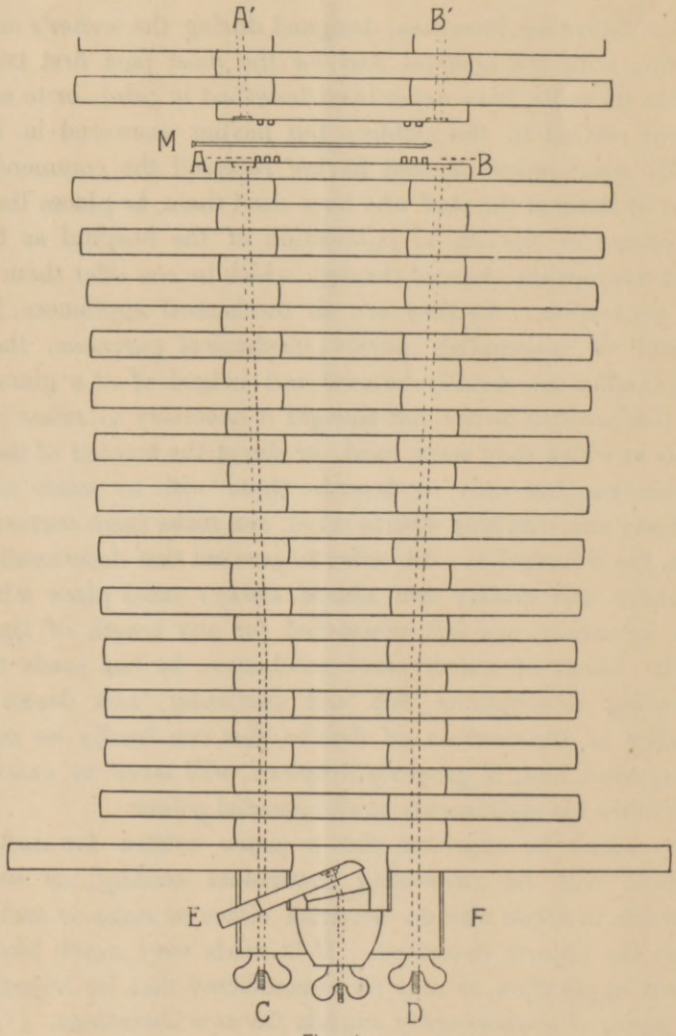
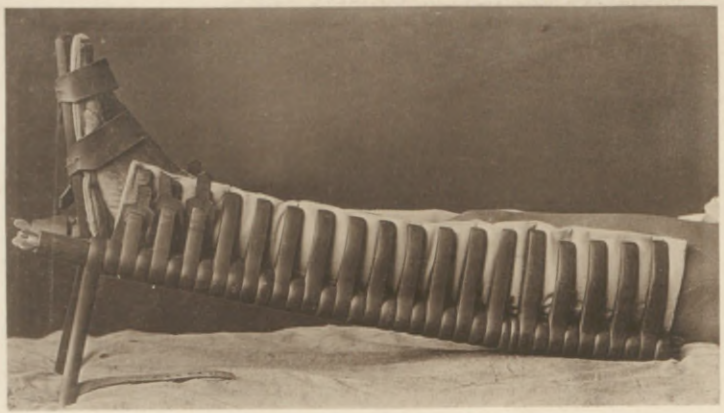
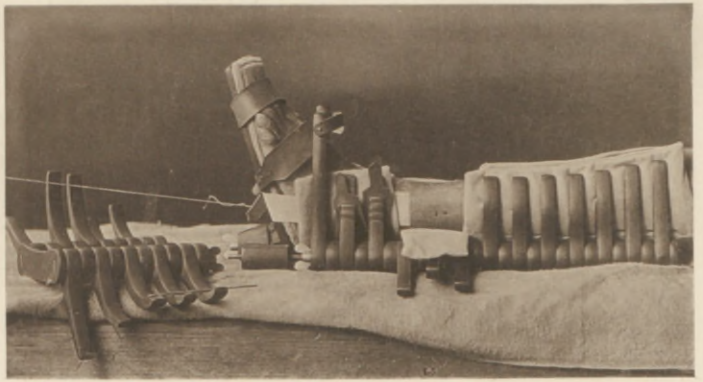


Fig. I.

at the same time with firm and accurate support to all the parts not necessarily exposed for the purpose. It does not of course compete with the plaster of Paris, glue and starch,





HELIOTYPE PRINTING CO., BOSTON.

ADJUSTABLE FRACTURE BOX.

or side, or hanging splints, in cases where those forms of apparatus are sufficient; but it is in all cases more comfortable than the old fracture-box, and for the particular ones described above it has numerous important advantages over any heretofore made.

It consists — leaving out of the question the portion above the joint at the knee and the foot-piece, which latter will be described later — of a series of segments, strung, bottom and side pieces alternately, upon two bolts A, C, and B, D (Fig. 1), reaching from the knee to a point below the foot. The bottom segments are pierced at each end with the holes through which the bolts pass, the side segments are traversed by the same bolts through their inner (lower) extremities only, while their other ends are free to move around them as centres. By means of a thumb-nut on each of the bolts these side pieces may be firmly held in any position.

The bolts, which should be smooth and true, of about five-sixteenths inch diameter, of tough material like Bessemer steel, approach each other from the knee to a point somewhat below the middle of the leg, where there is a slight bend in them, below which they are parallel to the end. This enables the five or six lowermost pairs of segments to be removed when it is desirable to apply the apparatus to a shorter leg. A thread is cut upon the bolts up to this bend, so that when the lower pieces are taken off the nuts may still follow up to the remaining ones.

The segments, which form the bottom of the box, are graduated in length, as indicated by the direction of the bolts, becoming shorter from the knee to the bend in the bolts. Below this they are of exactly the same length to the foot; they are large and rounded at each end, perforated by the hole for the bolts, and have circular, flat surfaces around this of exactly the same size in all, and the same also as the corresponding faces of the side segments. These surfaces, by their friction, serve to fix the parts when the nuts are tightened. (Fig. 2.) The middle portions of

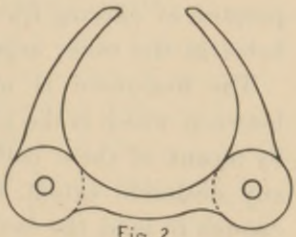
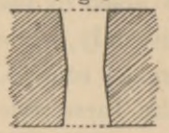


Fig. 2

the different segments are variously cut away above to fit the surface of the back of the leg, and below to remove superfluous material. The drilling of the holes in these pieces is a matter of considerable nicety: if they are large the work will be loose-jointed and clumsy; if small they must be very true; those in the upper ones must be oblique, those in the lower, of course, perpendicular to the surface.

The lateral segments have their attached ends like those of the bottom, but their free ends are narrow and tapered; they are carved to fit the sides of the leg. (See Figs. 3, 4.) Those in the upper part of the leg, where the bolts are not parallel, should have holes slightly larger than the bolts to allow for their diagonal passage; or, still better, should be reamed out from each side. (Fig. 3.) The lower three or four side pieces are notched, for the purpose of supporting leather straps, which serve as slings on which the heel and ankle may rest, and which can be changed, raised or lowered a trifle, without disturbing the limb, and thus the weight of the foot may be supported by different points in succession, and the pain ensuing upon pressure of the heel prevented. (Fig. 4.)

Fig 3.



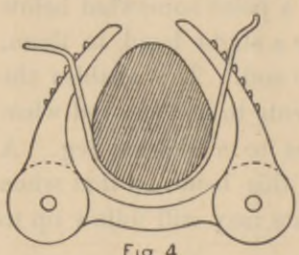


Fig.4

The lowest bottom-segment, E, F (Figs. 1 and 5), is larger than the others, and modified to hold the foot-piece, G, which is attached to it by means of a jointed bolt, H, passing through a slot, I. The surface surrounding I is flat, for the same purpose of offering friction as the surfaces around the bolt-holes in the other segments.

The foot-piece is mounted upon two bevelled collars, between which is the joint of the bolt above mentioned, and by means of these collars it can be turned and inclined, to any desirable extent, in any direction. It should be long enough to hold the bedclothes from the toes of the patient and as broad as the foot. It should be provided with suitable holes, screws, pins, or other convenient means of fastening straps, bandages, and padding, and also with a hook for

the attachment of the cord of a pulley when extension is desired. There is a circular depression at the bottom for the nut, M.

The bolt, H, is composed of two pieces, united so as to form a universal joint between J and K. The shorter end passes through J and the foot-piece, where it is retained by the circular flat nut, M. The longer, through K and E, F, and the thumb-nut, L, by means of which all parts are clamped together to make the foot-piece immovable.

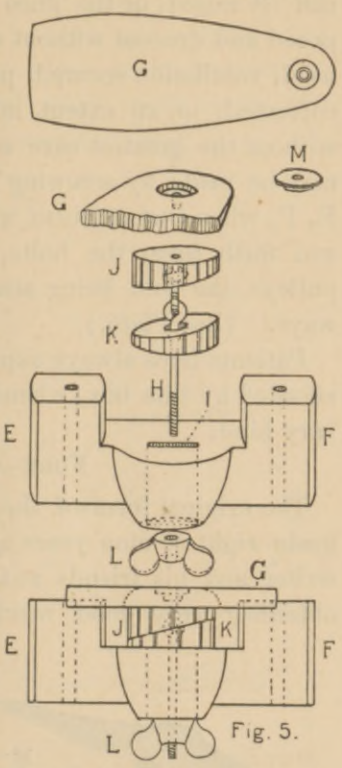


Fig. 5.

The collars, J, K, have their circumferences grooved or roughened, to facilitate turning with the fingers; their other surfaces are flat; that of J which is next to G, and that of K which is next to E, F, are perpendicular to their circumferences, as well as to the holes for the bolt, H; but their contiguous surfaces are oblique, so that by turning one of them upon the other the different positions of the foot-piece are obtained. An excavation for the joint of the bolt has to be made in each, and all their flat surfaces must be perfectly true, to insure a sufficient amount of friction to prevent motion when the nut is tightened.

The portion above the knee is constructed similarly in principle to that below, and is tightened in the same way, by nuts at the upper end. It is united with the leg-piece by hinges, and can be separated from it by drawing the pin, M (Fig. 1), from the hinges.

As will be seen, both from these details and the accompanying heliotype, this apparatus is capable of more complete adjustment than has ever been attempted in instruments of this kind, adapting itself to the limb, not at three or four

points only, but at every inch or two of its entire length; accommodating itself to different sizes and peculiar shapes almost as perfectly as if it were made for each individual case, and having a capacity of turning the foot in every possible direction that a foot can be made to take. The foot can be raised, or the knee bent, or both; parts can be exposed and dressed without danger of displacement, irrigation used, ventilation secured, pressure relieved, or mal-positions corrected, to an extent impossible with the ordinary box without the greatest care and skilled assistants. Extension may be made by screwing the thumb-nuts above the block E, F, when that segment with the foot-piece will slide back and forth upon the bolts, and may be drawn upon with pulleys, the foot being attached to it in one of the usual ways. (See Plate.)

Patients have always expressed satisfaction at the comfort afforded by this box, whenever it followed one of the ordinary kind.

Fore-arm Splints.

The original form of these splints was a curved pattern, made eight or nine years ago, and considerably used by the writer and his friends at that time, with the satisfaction of obtaining very good results with no unusual care, in a

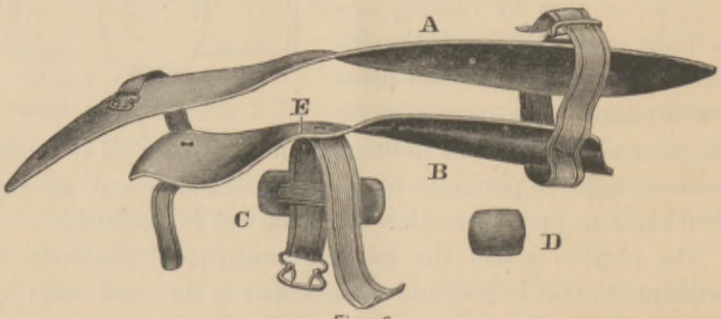


Fig. 6.

number of cases of Colles's Fracture. It was afterwards figured and supplied to a small extent, under the name of the "Spiral Splint," by Messrs. Codman & Shurtleff, who have courteously loaned the accompanying cut. (Fig. 6.)[1]

[1] The letters in this figure are not referred to in the text.

This still seems to the writer the most perfect form of his splint. As a carved instrument it was necessarily so expensive as to make it almost impracticable, and several attempts have been made to press it into shape from veneers and other flexible material, which are not yet wholly successful.

At about this time the Gordon splint made its appearance in this country, and its system of wooden pads upon a flat board indicated at once the way by which an approximation to the surface of the original spiral splint might be cheaply made; and the present form is the result. (Fig. 7.)

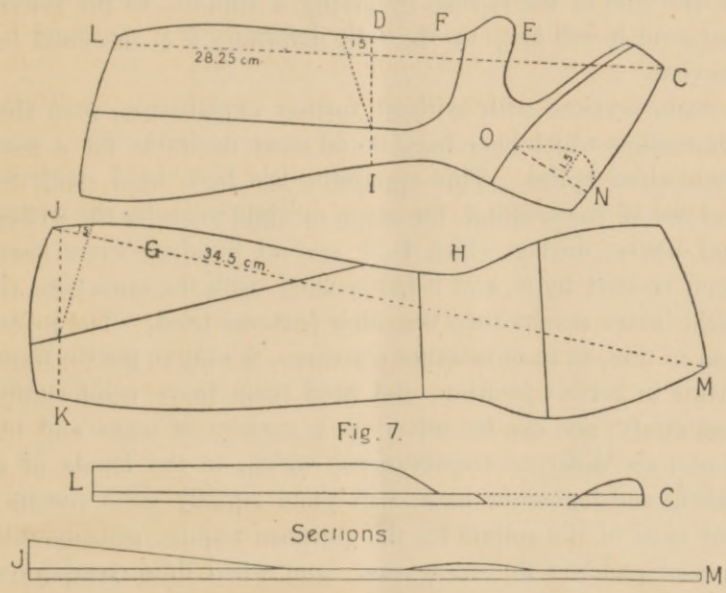


Fig. 7.

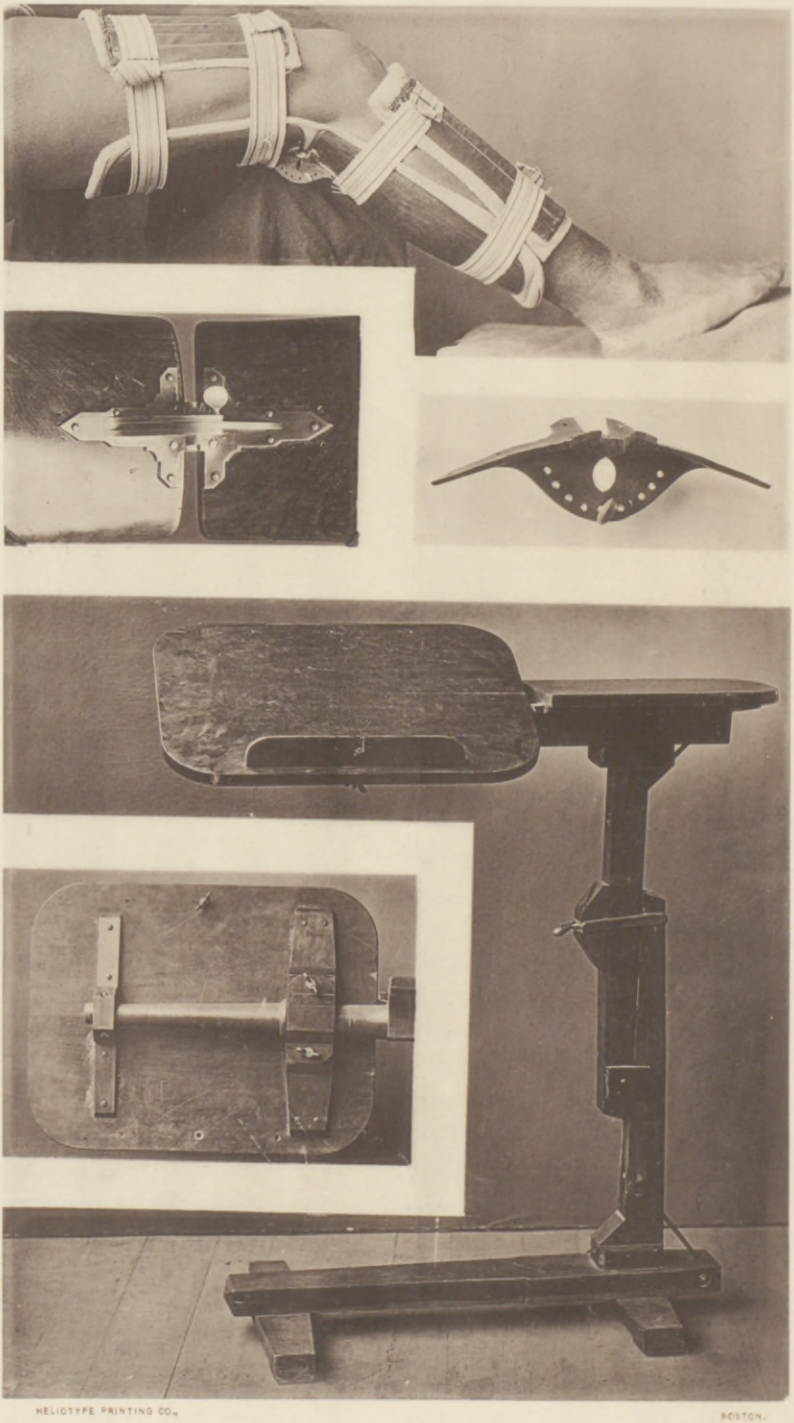
Each splint consists of a flat foundation of thin pine, or some light wood, upon which are fastened thicker pieces, so cut as to give an approximation to the desired surface. The outline of the anterior piece is somewhat like that of the Bond splint, being obtained by laying the hand and arm flat upon a board, palm downwards, and tracing its shape; this is then cut off in a line with the knuckles, and has a large recess cut away for the ball of the thumb. A rounded pad at C fills the hollow of the hand, and a bevelled and rounded one at D the concavity of the anterior surface of the radius.

The posterior splint, corresponding in general shape with the anterior, but longer, has the two pads — G, on the upper ulnar part, and H, across the wrist — to fill spaces which will be always found there.

It is important, in the construction of the anterior piece, that the distance E, F, which corresponds to the enlargement of the lower end of the radius, shall be long enough to give it plenty of room, and that the pad above it should be sufficiently high to prevent all pressure upon that part of the wrist; for if the pad is too thin, or extends down as low as the end of the radius, by giving a support to the lower fragment it will keep up the very deformity it is designed to prevent.

Some sections will, without further explanation, give the dimensions which have been found most desirable for a medium-sized splint. This apparatus has been used, both in and out of the hospital, for seven or eight years by the writer and others, during which time several hundred cases have been treated by it, and it has seemed, with the same care, to yield better results than the other patterns tried. The problem in this, as in most other fractures, is only to get the fragments in perfect position, and hold them there comfortably and safely, and can be solved in a variety of ways and by numerous different contrivances, which, in the hands of a skilful and ingenious man, will yield equally good results; but most of the splints for this purpose require considerable special padding for every case, and when these temporary pads are finally correctly arranged, the surface will be found to resemble that already obtained by the wooden pads of this splint, which will be found at least a convenience in this respect. To those but little used to fractures it is still more necessary.

In the writer's experience, of perhaps a hundred and fifty cases, nothing but an even layer of cotton has ever been really necessary to adapt the surface of the splint to the arm. But in three or four cases (and no more) a special pad has been used to secure a more perfect fit. Lateral pads for the ulna and the lower fragment of the radius, to prevent lateral deformity and spreading of the wrist, however, were frequently used.



HELIOTYPE PRINTING CO. BOSTON.

HAM SPLINT. . INVALID TABLE.

For all fractures of the forearm below the middle, and for sprains of the wrist, these splints are equally useful; but for fractures at the middle of the arm, or above it, other forms will be found to be better.

Ham Splint. —(Pl. II.)

This is intended especially for cases where a comfortable apparatus, easily removed and applied by the patient, having a strong adjustable locking joint, so compact as to permit the clothes to be drawn over it without cutting, is desired.

The splint proper is more deeply excavated than usual, for the thigh and calf, embracing enough of their surface to hold its place without slipping, and it is fastened on simply by means of the four straps and buckles, shown in the plate; neither plaster nor bandage being required. The front of the limb is protected from the constriction of the straps by coaptation splints of suitable form, above and below the knee, which equalize the pressure as completely as bandaging would do it, and greatly increase the support given by the splint itself. An ordinary ham splint, however, may be used by sawing it at the knee and fastening the hinge upon it. It may be applied either by bandaging and plaster, or by the straps and anterior splints just mentioned.

The hinge is very strong; it consists of two somewhat curved plates, long and broad enough to be firmly secured to the splint. From the back of one of these plates arises one, from the other arise two, vertical interlocking quadrants, having the axes of the hinge as their centre, and bearing a quarter circle each of holes, by means of which, and a pin or thumb-screw, the hinge may be fastened at a variety of angles. Each half of the hinge is a single casting.

If the number of positions were limited by the number of practicable holes in so small a circle as this, they would be necessarily too few, say six or seven, for accurate adjustment; but, by taking advantage of the principle of graduating the vernier and drilling six in one side and seven in the other, about twenty-four positions may be had, which answer most requirements. The hinges should always be fastened to the

splints by means of rivets. Screws will loosen and draw out.

Invalid Table. (Pl. II.)

A piece of sick-room furniture, designed for the use of chronic invalids, whose long confinement in bed renders it desirable that they should have a means of reading and writing, as well as eating, in a recumbent position.

In its general shape it resembles the commonly made tables for bed use, having its post or standard at one end and a long foot extending under the bed, while the top projects over it. Like these, also, it is adjustable for height.

It is new, however, in the manner in which this adjustment is effected, and also in the capacity of being inclined for use as a reading rack or desk. The standard consists of two parts, A, B (Fig. 8), one attached to the foot-piece, and the other to the top, loosely bound together by the ferrule, D, E, and capable of sliding against each other. The post, A, which, as it arises from the foot, may be called the stationary one, has near its top, at D, a slight transverse furrow or other contrivance, by which means the ferrule is kept in place, but allowed a slight rocking movement.

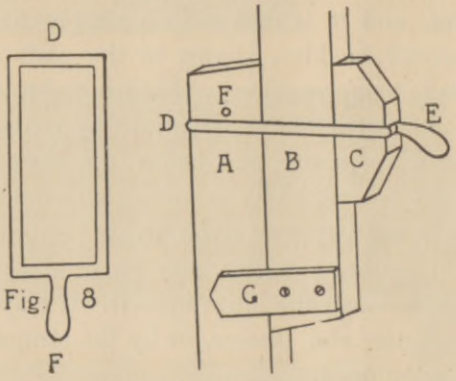


Fig. 8

The movable post, B, has at its lower end, on each side, a small projecting lip, G, embracing the post, A, and preventing lateral movement. (A groove and tongue upon the contiguous faces of A and B would effect the same purpose, in some respects more satisfactorily.)

A brake, C, is also enclosed with A and B, by the ferrule, and retained by a furrow at E, similar to that of the post A at D, so that while it may move up and down to a limited extent with this end of the ferrule, it cannot escape.

The contiguous surfaces of A, B, and C must be parallel and true.

The ferrule is of the exact width of the above parts, long enough to allow B to slide freely between A and C when it (that is, the ferrule) is held exactly at right angles to the posts, yet so short as to bind firmly, if the end, E, drops a few degrees. It has a small projecting handle at E, by which it may be lifted, and there is a pin at F, on A, to prevent its binding in an upward direction.

When at rest the brake drops by its own weight sufficiently to hold the post, B, and the friction between their surfaces causes any increase of pressure upon the table to only bind these parts more closely together, and so hold them the more securely. The table is thus self-fastening at any height within its outside limits. To raise it, it is usually only necessary to lift it, by taking hold of the top somewhere near the standard, to the desired height and let go; it is instantly and firmly held there; if it sticks a little upon starting, the fingers, underneath the handle at E, can always easily loosen it. To lower the table steady it with one hand and loosen the ferrule by lifting the end, E, when the top will slide easily down to the desired extent, and be caught at once by letting E go free.

The top is divided into two portions, one over the standard, which is always level; the other, supported upon a long horizontal axis, can be inclined to either side and to any required degree, and fastened by means of thumb-nuts. By moving it horizontally upon the axis it can be made to slide over a couple of lips upon the stationary part, that serve to keep it safe when it is not inclined. The ledge for holding books, etc., is reversible, and the table can be used on either side of the bed.

Besides its obvious qualities of simplicity and adjustability it is so constructed that its movable parts can never wear loose or rattle; and it has no inaccessible crevices to serve for the habitation of vermin. This last feature will commend itself to those seeking hospital supplies.

TIN FINGER SPLINTS.

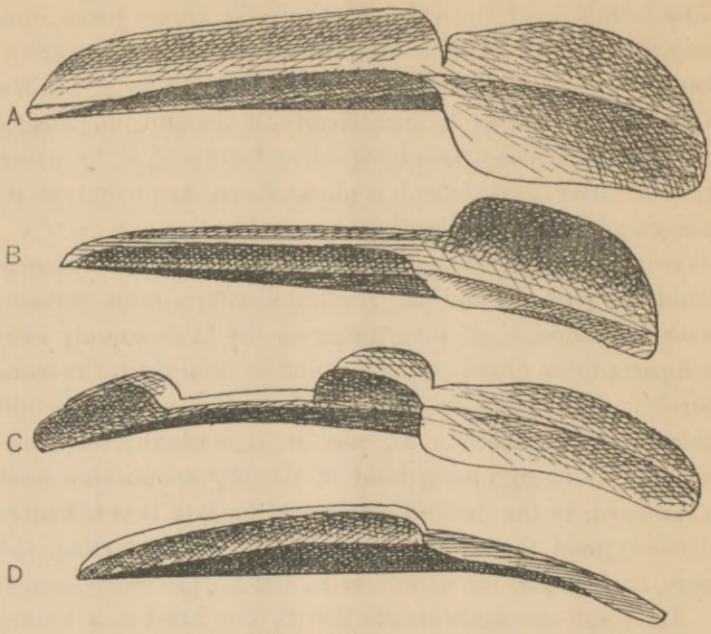


Fig. 9.

These little appliances, while they introduce no new principle of treatment in fractures or other disabilities of the fingers, are lighter, neater, and more convenient than those heretofore used here, whether of wood or tin, and very much stronger than the latter, as ordinarily made.

They consist of a broad, roundish, flat portion for the palm of the hand, and a digital portion made concave, so as to fit the anterior surface of the fingers. A longitudinal fold of the metal extending from one end to the other of the splint, deep in its central portions, but tapering down to nothing at the extremities, serves to give a slight bend to the finger and to stiffen and strengthen it where the old tin splints always yielded or broke; namely, opposite the knuckle-joint.

The introduction of this fold is their chief novelty, and has elevated metal finger splints, as used in the out-patient department, from a very unsatisfactory to an almost perfect condition.

The wooden splints heretofore used here, although having a somewhat similar outline to these, were straight, flat, and clumsy. Tin splints had been, after trial, pretty much discarded, from their liability to bend or break at the junction of the finger with the palm. Gutta-percha was clumsy, uncertain, and expensive; while these are cheap, comfortable, light, perfectly fitting, and permanent.

They may be made of any thin flexible sheet metal, such as tin, zinc, brass, or German silver, and their manufacture, contrary to what might be imagined from seeing the finished production, is simple and easy, requires no apparatus beyond a mallet and vise, and no skill that one or two attempts will not develop. After a little experience from five to ten minutes will suffice for the whole operation.

Indeed, it is the fact that any one having these two tools can make the splint while his patient is waiting, or make a dozen in some leisure hour, or get a common tinsmith or his house officer to produce them by the score; that contributes to their value, and will excuse the detailed directions which follow.

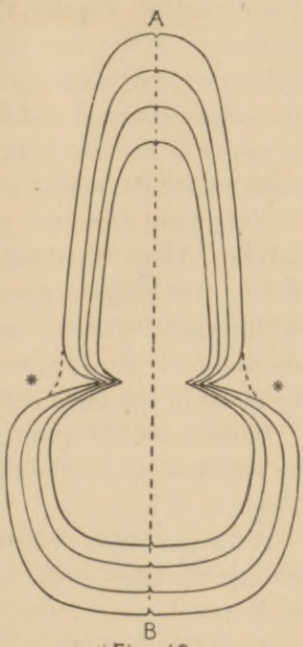


Fig. 10

The metal, say brass No. 25–30, zinc No. 7, or thin tin, must be cut to something like the size wanted; the length should be exact; the sides can be trimmed afterwards. The following outlines (Fig. 10), reduced one-half, will indicate the sizes and shape which have been found to be generally useful, but need not be followed exactly.

It will be better not to cut the notch* until after the fold is made, as a troublesome wrinkle is apt to result in the flattening. The metal is first folded lengthwise along the middle, A, B, and pressed or pounded down until the fold is close, then placed obliquely in the vise (Fig. 11), so the point, C, shall be over the edge of the jaw, and that about five millimeters of the fold shall be

nipped by the vise; but the point A should be just above the surface, and not pressed at all. The two halves are then to be separated and bent down, making the angle along the mouth of the vise as sharp as convenient; but it is best not to completely flatten the splint until after the next step, which consists in taking it out, reversing it, and treating the other end exactly as the first. Then the notches at C can be

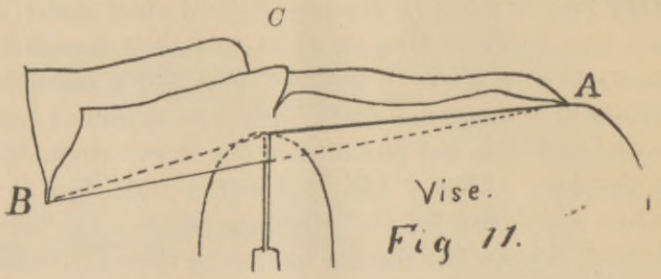


Fig 11.

cut away (unless it is for the index or little finger, when one may be left, if desired), the sides flattened, and the corners beaten sharp. Finally, the digital portion is rounded up over the handle of the vise, the round of a chair, or any convenient cylinder; the palmar portion is shaped a little over the vise, the edges trimmed and filed, and the splint is done. A piece of paper in the vise to prevent scratching, and a bit of broomstick under the mallet to prevent indenting, are refinements.

Variations from the ordinary shape easily suggest themselves. Thus, the depth of the fold determines the angle of flexion, the deepest point the place, and these may be varied within certain limits, and placed under whichever joint is desired; or two angles, and consequently two bends, may be made in the same splint. (Fig. 9, D.)

Portions of the splint may be cut away to favor ulcerations or enlarged joints, the fold perfectly maintaining its stiffness. (Fig. 9, C.)

If for the index or little finger, the palmar portion curved around the edge of the hand gives additional support. (Fig. 9, B.)

A similar fold taken more deeply has been used to give a slight bend at the knee in tin ham splints for small children; and a rather clumsy, but still useful, splint for the back of the thumb and wrist can be made by means of a modification of the same fold.