A 'LIVELY' SPLINT FOR THE FLAIL HIP

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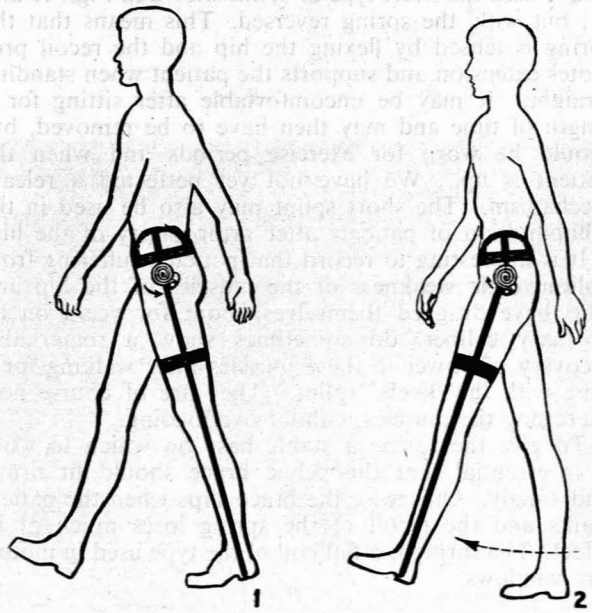
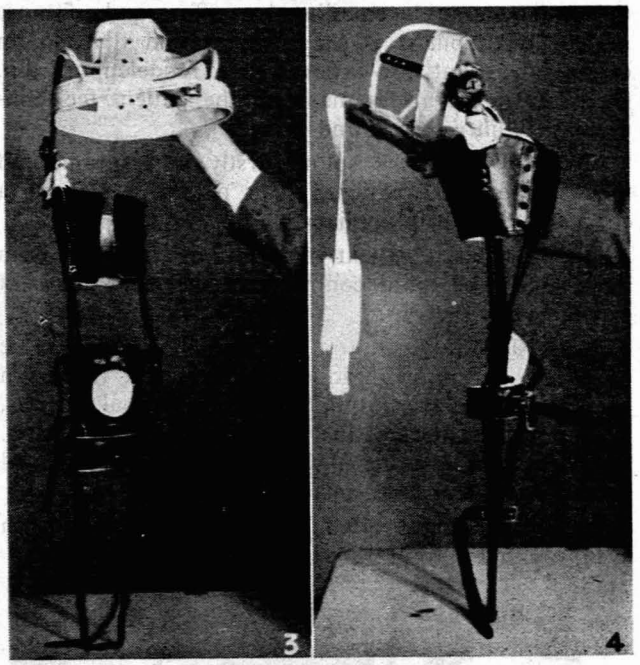
The patient with a flail hip walks at a great disadvantage. Instead of the normal pendulum motion at the hip, the trunk on the affected side must drag and swing the leg forward. Awkwardness is exaggerated by the sway and dip of the 'Trendelenburg' gait and, if the leg as well is paralysed, the weak side is encumbered by the additional weight of a caliper.

The splint to be described has been built on the principle that little force is required to *initiate* the swing of a pendulum, and that if the leg is to be used as a pendulum, the length and weight of the splint are an advantage. The splint has 3 parts:

1. The pelvic brace—a light, leather-covered metal frame which is adapted comfortably and firmly to the contours of the pelvis, thus giving stability to the spring and caliper below. In the line of the trochanter of the femur the brace has a bar which meets an extension of the lateral bar of the caliper at a joint with a coil spring. The centre piece at the back reaches above the pelvis to act as a lever by which extension of the spine may control the hip spring.
2. A light caliper with a corset for the thigh and the lateral bar extending upwards, as described in (1). The caliper need not be weight-relieving, as in this apparatus the patient takes weight normally through the hip joint, but if the hip is very weak a thigh corset taking weight from the ischial tuberosity adds to stability.
3. A joint-and-spring mechanism so fitted that when the thigh is extended the spring winds up. When weight is shifted to the other leg, the recoil strength of the spring is sufficient to initiate the forward swing of the limb.



Figs 1 *and* 2 show in diagram the 3 parts of the appliance. In Fig. 1 the spring is wound. In Fig. 2 the spring is released swinging the leg forward and so initiating a fairly normal stride.



Figs 3 *and* 4 show the spring from the front and from the side. Chamois-leather cover of the spring is undone.

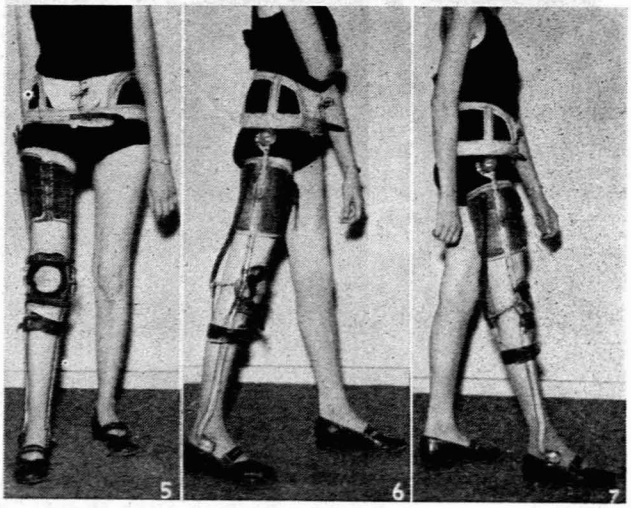


Fig. 5 shows a patient with a flail right leg in the splint. She is wearing a concealed foot-drop appliance.
Figs. 6 *and* 7 show the stride she can take.

By taking a stride forward with the sound leg, the spring is coiled. A tilt on to the sound leg lifts the flail leg which, as the spring unwinds, immediately swings forward in a fairly normal-looking stride. The following step by the sound leg rewinds the spring, and so on. The spring mechanism is not bulky and is inconspicuous under the patient's clothes. The winding of the spring is assisted by straightening the back and, with practice, a strong back can give a strong stride.

When designing the splint, I hoped it would give the patient a stride entailing less effort and of more normal type, but it is satisfying to find that, to an extent, the splint also relieves the Trendelenburg dip. Once the new walk is mastered the patient feels improved stability of gait and stance.

Figs. 1-8 show the splint, firstly in diagram, and then as used by a patient. This patient is wearing a concealed foot-drop appliance.

Fig. 9 shows a patient in whom the foot has been stabilized. The splint controls the knee and does not extend below the calf.

Figs. 10 and 11 show a short splint which can be used for a flail hip with good thigh muscles. It is worn by a member of the hospital staff with normal muscles, to demonstrate the possible range of flexion-extension. The force of the spring may be compressed or relaxed by using different holes in the ratchet.

The springs have a chamois-leather cover, shown in Figs. 3 and 4, to prevent friction on the clothes.

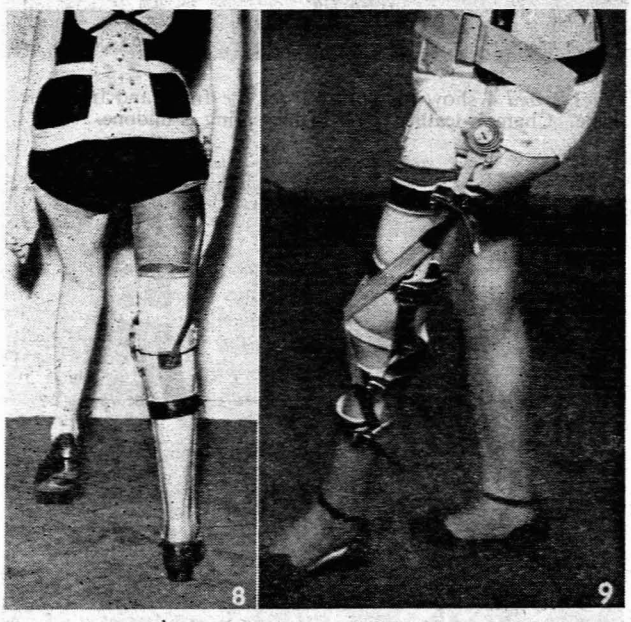
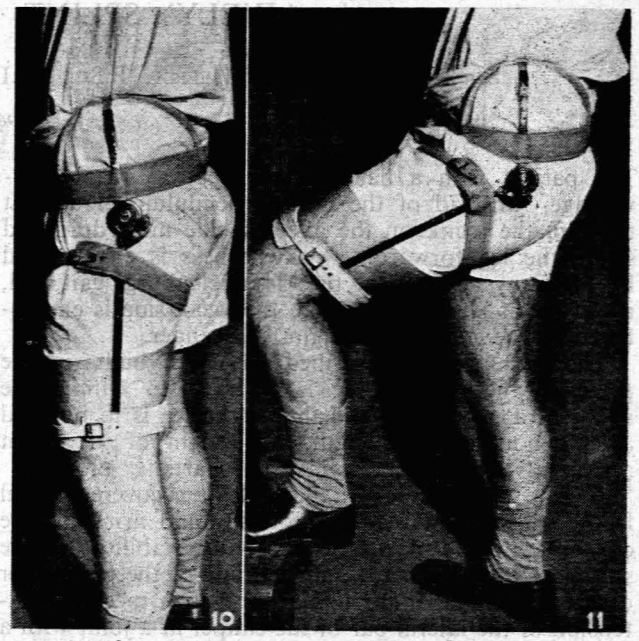


Fig. 8 shows the stability that the flail limb can achieve in this appliance.
Fig. 9. This patient has had her foot stabilized by operation. The appliance, therefore, is shorter, and controls only the hip and knee. At the time the photograph was taken the spring was released.



Figs. 10 *and* 11 show a short splint which can be used for a flail or weak hip with good thigh muscles. It is also useful in some instances after arthroplasty of the hip in re-training the patient in walking.

Weakness of Extension of the Hip

One finds an occasional patient who cannot stand properly because of weakness of extension of the hip. This may follow isolated muscle paralysis from polio, or long-standing fixed flexion deformity. For such disability, as a support during the rehabilitation period, I have used the short type of splint shown in Figs. 10 and 11, but with the spring reversed. This means that the spring is tensed by flexing the hip and the recoil promotes extension and supports the patient when standing straight. It may be uncomfortable after sitting for a length of time and may then have to be removed, but should be worn for exercise periods and when the patient is up. We have not yet perfected a release mechanism. The short splint may also be used in the rehabilitation of patients after arthroplasty of the hip.

It is interesting to record that patients suffering from poliomyelitic weakness of the muscles of the hip and who have dragged themselves about for years on an ordinary caliper, do sometimes show a remarkable recovery of power in these muscles after walking for a time with the 'lively' splint. They are of course now exercising the muscles without overloading.

To give the spring a stable base on which to work it is essential that the pelvic brace should fit firmly and snugly. Otherwise the brace slips when the patient walks and the recoil of the spring loses much of its effect. The spring is a flat coil of the type used in motor-car windows.

The splints have been constructed for me by Mr. Hodges and Mr. Krumbock of Messrs. A. H. Hodges and Co. and by Mr. T. Davies of the Provincial Orthopaedic Workshops, and whose help I acknowledge and greatly appreciate.