A SPRING EXERCISER FOR ARTHROPLASTY OF THE HIP JOINT

JOHN CHARNLEY and J. K. WRIGHT, MANCHESTER, ENGLAND

We have been dissatisfied with the mechanical efficiency of the apparatus in common use for mobilisation of the hip joint after arthroplasty in that none of them allows flexion and abduction movements with equal facility, and all are severely hampered by high friction losses in the cords and pulleys which operate them. The "roller-skate" attached to the foot of a Thomas's splint allows only abduction and adduction; the various methods which

Fig. 1

Fig. 2

Figs. 1 and 2—Flexing and extending the hip and knee. The column rotates freely in its socket at the bed-head and allows a wide range of abduction-adduction movement.
allow flexion of the knee and hip on the Hamilton Russell principle make it difficult to perform abduction or adduction.

In the apparatus described here the leg is suspended from a spring-loaded overhead beam which allows the limb to float effortlessly above the bed in all directions and with practically no mechanical resistance against exercise. The apparatus therefore comes into that category which Capener has aptly termed the "lively" splint, and we have been impressed by the enthusiasm which patients have shown on being transferred to it from other, cumbersome, methods.

The sole disadvantage of this method is that it cannot be combined with any form of continuous traction; for this reason after cup arthroplasty we first apply a Thomas's splint with fixed strapping extension for three weeks after the operation and after this time the spring exerciser is applied.

The apparatus consists of a vertical column which is attached to the bed-head by making use of the sockets usually provided to hold the crane by which patients are able to lift themselves up for nursing purposes. The top of the column carries a spring-loaded hinge to which a tubular aluminium-alloy beam is attached. The short arm of the beam receives the spring, the tension of which can be adjusted by means of a hand screw and by moving the spring attachment to different holes in the beam. Rotation of the vertical column, allowing abduction and adduction, takes place in the sockets attached to the bed. All parts of the hinge must be ruggedly constructed because leverage is very great, and an extremely powerful spring is required. The great leverage is necessary in order to allow a wide arc of movement without rapid increase in tension in the apparatus, which might otherwise check the excursion.

In order to facilitate knee flexion a light padded plaster is applied below the knee and a sling of sorbo rubber is passed behind the knee. The sling and the plaster are connected to the ends of a short length of cord, the middle of which passes over a pulley attached to the overhead beam. As the hip flexes and the knee bends the cord slides through the pulley and equalises the tension on the foot and the knee.

An interesting mechanical feature of the method is that it is possible to encourage the important movement of abduction by tilting the vertical column towards the affected side. In this position the overhead beam exhibits a natural tendency to swing sideways under the weight of the limb depending from it.

The first of these spring exercisers has now been in continuous use in this department for eighteen months, and has proved so successful that a second model has recently been constructed.