A device was employed at the operation which may well serve as an adjunct to the ingenious and effective technique of Haines.² I cannot find in the literature a reference to this method, and as any plan which will strengthen the abdominal wall in these extreme cases may prove helpful, it seems worth while recording it.

The patient, Mrs. W., was a multipara, aged 58 years. Operation was preceded by three weeks' rest in bed, restricted diet, purging, and abdominal kneading. The abdomen showed the usual deep hollowing of the upper half, and the recti were obviously displaced to the extreme outer edges of the hernia.

On July 26th, 1918, a transverse incision, curving downwards, was made, midway between the umbilicus and pubes, from the outer border of one rectus to that of its widely separated fellow. A crescentic piece of skin was excised and the flaps carefully dissected up and down. Here a feature that is usual in cases following sepsis was recognized—that is, considerable thickening of the rectus sheath, so that the muscle was "hide-bound," as it were.

In the Trendelenburg position the intestines, covered by the translucent transversalis fascia and peritoneum, still bulged forward, and the recti remained immovable.

FIG. 1.—1, Skin. 2, Subcutaneous tissue. 3, Rectus in sheath. 4, Transversalis fascia. 5, Peritoneum.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

A longitudinal incision through the anterior layer of each rectus was made close to and parallel with the outer border (A A', Fig. 2), the flaps dissected off the muscle and turned inwards (B B', Fig. 3). The muscles were freed also on their posterior aspect nearly up to their outer margin, and by pulling firmly on the flaps these could now be made to overlap, and the recti could be drawn inwards almost to the middle line.

Protrusion of the bowel proving rebellious to pressure, the peritoneum was opened, the intestines pushed upwards and kept back by a flat swab; by pulling on the stout fascial flaps the peritoneal edges were reunited with fine catgut. In more favourable cases this step may prove unnecessary. This detail does not affect the principle involved in the operation.

On one side (at c) it was necessary to peel outwards the diaphragm layer of combined transversalis fascia and peritoneum from the posterior layer of the rectus sheath, and in the angle the free edge of the flap B' was fixed by a series of interrupted stitches of No. 2 catgut. The opposite flap was similarly treated, the two forming a firm bed, on which a McGavin filigree was placed, for it was found that the edges of the recti could not be brought into contact without tension. It is possible that implantation of the filigree was superfluous, but it was felt to be the more prudent course. The rest of the operation was completed on familiar lines.

An important rule, sometimes disregarded and not sufficiently emphasized in the textbooks, is the preservation of the anatomical integrity of the parts adjoining the

linea semilunaris. If the rectus be completely dislocated and displaced inwards, a gap of merely fibrous tissue is left between its outer edge and the strong line of junction of the transversalis with the oblique muscles. By using the method advocated in this paper, the muscle planes in their normal relations are drawn as near to the middle line as is practicable, and any gap that remains is in the middle line, where it can be the more easily bridged by a filigree or controlled by a belt.

Advantages gained by this simple device are:

1. The hide-bound muscles are freed from the strangling effect of contracting scar tissue.
2. The denuded anterior aspect of the rectus comes to lie covered by subcutaneous fat, which tends to prevent reformation of excessive scar tissue.
3. Release of the muscles from dense scar tissue allows of improved blood supply and development.
4. The stout flaps raised from the anterior surface of the muscles give purchase whereby the recti can be drawn inwards.
5. There is no interference with the nerve supply entering the outer border of the muscles.
6. The overlapped flaps form a firm bed on which a filigree may be planted if deemed necessary.

The patient made an uneventful recovery, and now walks well.

The drawings, based on the excellent figures given by Haines, are diagrammatic; sutures are omitted for the sake of simplicity.

REFERENCES.

- ¹New York State Med. Journal, 1916, xvi, p. 511. ²New York Med. Journal, January 10th, 1917.

BOOT HEELS AS A CAUSE OF FLAT-FOOT, SOLDIER'S HEART, MYALGIA, ETC.

BY

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In a normal barefooted man the balance of the body is so perfect that practically no effort is required to keep erect. The weight rests on the heels and outer sides of the feet, not on the arch or inner sides of the feet.

If the heels are raised from the ground by boot heels even a quarter of an inch thicker than the soles the outer side of the foot is removed from the ground and the weight falls on the arch. The centre of gravity is also thrown forwards, and in a man of 5 ft. 7 in. the head is thrown nine inches off the vertical by a heel three-quarters of an inch high. To remedy this, and to prevent falling forwards, the back muscles and the extensors of thigh and foot come into action. The peroneus longus and brevis, while extending the foot, also evert it, and the tibialis anticus which supports the arch and inverts the foot gets elongated and ceases to act. Thus, when an ordinary boot is used, even with a low heel, three influences tend to flatten the arch, namely:

1. The weight of the body, resting on the arch, instead of on the heel and the outer side of the foot.
2. The peroneus longus and brevis pulling the arch down.
3. The tibialis anticus is out of action, and no longer supports the arch.

A strongly formed foot is able to resist these influences, so that when the boot is removed the arch appears perfect, but if skiagraphed with the boot on, and off, flattening and lowering of the arch are evident. Unfortunately, when a foot is examined by a medical man he does not see what goes on inside the boot, and when weight is put on a bare foot the arch is not flattened as with the boot on. Even when a foot is able to preserve its arch, the elasticity of the arch is lost while the boot is worn, as the peroneus longus and brevis anchor the foot in the everted position, and the tibialis anticus is idle. The muscles concerned in preserving the erect position are in continuous contraction, and get spastic, or "muscle bound," and the calf and back muscles are consequently most affected in "myalgia." With average heels (three-quarters of an inch thicker than the soles) the calf muscles contract three-quarters of an inch, even when standing, leaving

only a very limited amount of further contraction possible. Hence the fact that so many men cannot jump the trivial height of 3 ft. In some cases the strain on the peroneal muscles gives rise to painful spasm. When the boot heels are discarded the spasm is relaxed and operative treatment of the peroneal tendons is rendered unnecessary. In a flat-footed person, with ordinary boots, the peroneal muscles pull on the flattened arch, tending to produce a downward convexity, and causing pain by pulling the flattened arch against the sole of the boot. With heelless boots the peronei are no longer in continual contraction, and as the weight is no longer on the arch, the strain is removed from the plantar muscles and ligaments, and the arch gets a chance to recover. With heels the spastic condition of the calf muscles makes the front of the foot point downwards, and in walking the knee has to be lifted to let one foot clear the ground and pass the other. An American Indian is not handicapped in this way; he slightly dorsiflexes his foot and glides it past the other, swinging the leg from the hip-joint and not requiring to raise the knees. His foot scarcely leaves the ground, so that there is no jar when his heel again touches the ground, and consequently no need for rubber heels. He uses the pendulum movement recommended in "Infantry Training," a movement which is rendered impossible by boot heels. Hence the reputed "superior stamina" of the Indian. With heeled boots he would have no more stamina than a white man. His flat feet (caused by his method of carrying weights) do not handicap him, as his moccasins are heelless. A soldier of 5 ft. 7 in., weighing 154 lb., and wearing a heel three-quarters of an inch thicker than the sole, has to exert strength enough to be constantly lifting 56 lb. from the ground in trying to retain his balance.* In a man loaded with 60 lb. equipment this means that he has to support 116 lb., nearly doubling the weight he is supposed to carry. This is doubtless one factor in the etiology of soldier's heart, as every heart, even if healthy, is not equal to this strain.

A woman of 5 ft. 6 in., with an arch six inches wide, and wearing a heel two inches high, is thrown two feet off the perpendicular. Muscular effort cannot bring her back to the normal vertical line, and accordingly she keeps the tarsal and metatarsal bones in line with the tibia, and uses the metatarso-phalangeal joints as a heel, the boot heel being chiefly used to assist balance and not to support weight. This involves much strain, and to preserve the lumbar curve without overtaxing her back muscles she is obliged to use corsets. The use of waist belts by men is similarly explained. The waste of neuro-muscular energy in retaining an erect posture when wearing heels is very great, and must play a large part in producing hysteria, neurasthenia, and possibly refraction troubles. Heels are also partly responsible for hammer toes, the long flexors of the toes being supplied by the same nerve as the calf muscles, and getting spastic with them.

Sprained ankles, the stoop of old age, asthma, varicose veins, weak back, and spinal curvature may also be partly due to the effect of heels. Cycling and tiptoe exercises tend to produce flat-foot, as they develop the calf muscles and peronei, and neglect the tibialis anticus which is the most important muscle concerned in preserving the arch.

A rational boot should have the soles and heels of the same thickness. Under the arch of the foot the sole should be curved with a convexity upwards, but not so convex as to cause pressure on the sole. The leather could be reinforced by spring steel from the heel to the ball of the foot. The inner edge of the boot should be straight, so as to allow the big toe to be in line with the inner side of the arch, as in American boots. The front part of the sole should not be curved up, but flat; with "pendulum" gait the toe of the boot does not hit the ground. A boot as suggested, with an arched sole and heel of the same thickness, is in appearance almost indistinguishable from an ordinary boot. The arching of the sole is not necessary to cure flat-foot, but it looks better, and allows the boot to be laced firmly, thus compensating for the loss of muscular sense that occurs in a foot when any sort of footwear is used. In hopeless cases of flat-foot a boot with no heel will at least be more comfortable than the present day boot. The spastic calf muscles will not

relax immediately the boot heels are discarded, and consequently at first some awkwardness will be felt in walking. Very soon, however, the tibialis anticus develops, the ankles get stronger, the legs straighter at the knees, the foot gets shorter as the arch recovers, and any tendency to eversion disappears. The figure gets more erect, the chest capacity increases, and walking becomes a pleasure, and as the neuro-muscular energy (wasted in neutralizing the forward tilt caused by boot heels) becomes conserved, the health, strength, and stamina improve.

SUMMARY.

1. To cure flat-foot the heel and sole should be of the same thickness.
2. Arch supports and thickening inner side of sole and heel fail to cure because the os calcis is raised from the ground with the aforementioned results.
3. Boot heels rob the arch of its elasticity instead of supporting it.
4. Exercises should aim at developing the tibialis anticus, and not the calf muscles as hitherto taught.
5. A heel even a quarter of an inch thick is harmful.
6. Flat-foot is no disability if heelless boots are worn, except in hopeless cases.
7. Boot heels help to produce soldier's heart, myalgia, and numerous other ailments.
8. With heelless boots women would not require corsets.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

A SIMPLE SPLINT FOR FACIAL PARALYSIS.

In the case of injury to a motor nerve—for example, the radial (musculo-spiral)—the muscles supplied by it are paralysed and the contraction of opposing sound muscles, aided in the above case by gravity, when splinting is not resorted to, overstretches the flaccid paralysed muscles.

It is universally recognized that where recovery is going to take place it will be delayed and rendered imperfect if this overstretching is permitted to take place. In the limbs this overstretching is easily corrected by appropriate splints. In injury to the facial nerve of one side, with resulting facial paralysis, overstretching of the paralysed muscles will be caused by the contraction of the muscles of the opposite side, especially when the latter muscles are put into use, as in smiling, laughing, talking, and during mastication. Moreover, the sound muscles will be placed at a disadvantage, as their points of attachment are drawn nearer to the point of origin. Not only is one side paralysed, but the sound side is hampered in its range and power of action. Consequently, the patient experiences a double difficulty in talking and masticating.

To avoid this, the following simple yet effective appliance has been invented and brought to my notice by Miss Jennings, who is assistant in the electrical and massage departments at No. 1 Australian Auxiliary Hospital at Harefield. It was used by her before the war, and has been in use at Harefield for over two years. It consists of a piece of malleable German silver wire, bent so as to hook into the corner of the mouth and over the ear of the affected side, like the curl side of a spectacle. It is easily adjusted by bending the ear piece till the tension is correct and comfortable. Its advantages are: (1) Simplicity and lightness; (2) prevention of overstretching of the paralysed muscles, and so rendering recovery more rapid; (3) it gives the sound muscles a fixed point to work against and by preventing shortening renders them more effective in action; (4) it is greatly appreciated by the patients, who state that they feel more comfortable and can masticate much better. If properly adjusted there does not appear to be any tendency to make

* This can be proved roughly by using a log of this weight, tilting it by a block of wood three-quarters of an inch thick to represent the boot heel, and attaching a rope to the centre of the log, and leading it over a pulley and attaching weights.