On the mechanical treatment of chronic inflammation of the joints of the lower extremities : with a description of some new apparatus for producing extension at the knee and ankle-joints / by Lewis A. Sayre.

ON THE

MECHANICAL TREATMENT

OF

CHRONIC INFLAMMATION

OF THE

JOINTS OF THE LOWER EXTREMITIES,

WITH A

DESCRIPTION OF SOME NEW APPARATUS

FOR PRODUCING

EXTENSION AT THE KNEE AND ANKLE-JOINTS.

BY

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ON THE MECHANICAL TREATMENT OF CHRONIC INFLAMMATION OF THE JOINTS OF THE LOWER EXTREMITY, WITH A DESCRIPTION OF SOME NEW APPARATUS FOR PRODUCING EXTENSION AT THE KNEE AND ANKLE-JOINTS.

THE causes, pathology, and symptoms of the various diseases of the joints have been so accurately described by Brodie, Barwell, Guerin, Bouvier, and others, as well as in the numerous monographs upon the subject, that it would be superfluous to repeat their description. The fact, also, that chronic inflammation of any joint produces reflex contractions, causing deformity and severer pain, by increasing pressure on the diseased surfaces, thus making extension and counter-extension a necessary part of the treatment, has been so fully proved by myself and others who have written on this topic, and is now so generally admitted, that no further comments are necessary.

It is, in addition, acknowledged that the confinement, formerly necessary to produce the requisite extension and counter-extension, was so injurious to the general health of the patient, that the advantages were sometimes overbalanced, and exercise in the open air became a necessity in order to save life, even at the expense of a deformed limb. Moreover, the immense advantage given to patients with disease of the hip-joint, since the introduction of mechanical appliances, which allow exercise without discontinuing the extension, is so evident, that no one at all conversant with the disease and its proper treatment, will attempt to deny it.

The object of the present paper is, therefore, to show the practical utility of this very principle of treatment to the diseases of the knee and ankle-joints, even when they have extended to suppuration and caries; and to illustrate it by the narration of some cases which have come under my personal observation.

Before proceeding, however, with a description of the apparatuses

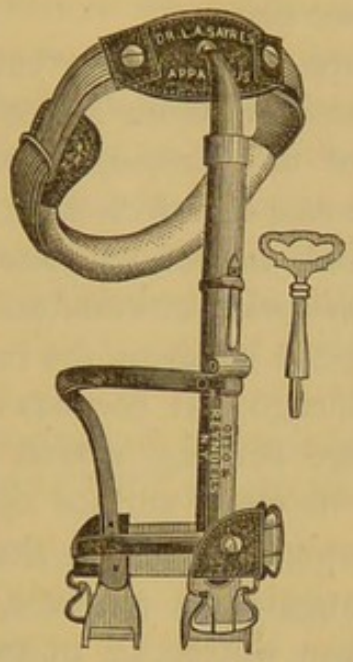
for the knee- and ankle-joints, it may not be inappropriate briefly to refer to the improvements made in the apparatus for the treatment of hip-disease, since the publication of my report to the American Medical Association, in 1860.

In the first and second stages of the disease—when the limb is apparently longer, and the knee and thigh both flexed—extension is kept up at night by a weight and pulley fixed to the foot of the bed, which is elevated some inches, in order to make the body a counter-extending force, and thus avoid the necessity of a perineal band. The weight is fastened to the foot either by a buckskin boot, laced snugly around the ankle, or by strips of adhesive plaster placed on either side of the leg, carefully secured by a well-adjusted roller, with pieces of webbing sewed to their lower ends, which can be folded under the stocking during the day. If the thigh is very much flexed, another pulley is placed over the first, at such a height as to allow the force to be applied from above the knee, nearly on a line with the distorted thigh: this pulley is lowered by degrees as the patient can bear it, until the limb is brought to a straight line with the body, or as nearly so as may be, when the new force can be dispensed with, and the weight applied to the foot alone. In the daytime, or while the patient exercises, the extension is continued in this stage of the disease by means of an extension splint applied to the thigh only, and which allows free motion at the knee-joint.

The instrument consists of a flange of very firm sheet-iron, three or four inches long, and one or two inches wide (according to the size of the patient), slightly curved, and which, when cushioned, fits directly under the crest of the ilium. At each extremity is a buckle to secure the perineal band, made in the centre, of buckskin stuffed with hair, and with ends of elastic webbing to attach to the buckles. On the outer side of the flange is a ball and socket or universal joint, to receive the head of the splint, which runs down the thigh to within three or four inches of the extremity of the femur, and is capable of being made longer or shorter by a cog-wheel worked with a key. Near its lower extremity is attached a branch, which, curving over the thigh, extends as far down as the main splint, and both terminate in broad ends with a roller over which the webbing attached to the adhesive plaster plays, and is secured to the splint by means of buckles near each lower extremity. (Fig. 1.)

To apply the splint, very strong adhesive plaster is required, or else two or three thicknesses of the ordinary plaster, cut in a fan

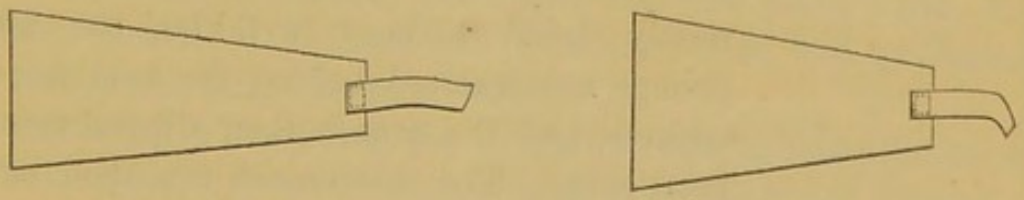
Fig. 1.



Sayre's splint for extension in morbus coxarius in the first and second stages.

shape (Fig. 2), and long enough to reach, on the inner side of the thigh, from the perineum to within three or four inches of the con-

Fig. 2.



dyle of the femur, and on the outer, from the trochanter major, to a point directly opposite the end of the inner plaster. These plasters are secured by a well-adjusted roller, and after pressing them well with the warm hand, to obtain a firm adhesion, the instrument is laid over the thigh, and the webbing, which is attached to the plaster, firmly fastened over the rollers to the buckles on the lower extremities of the instrument;—the perineal band is then buckled on, and the instrument is extended, with the key, to just such degree as is required to make the patient comfortable, and then locked by the slide.

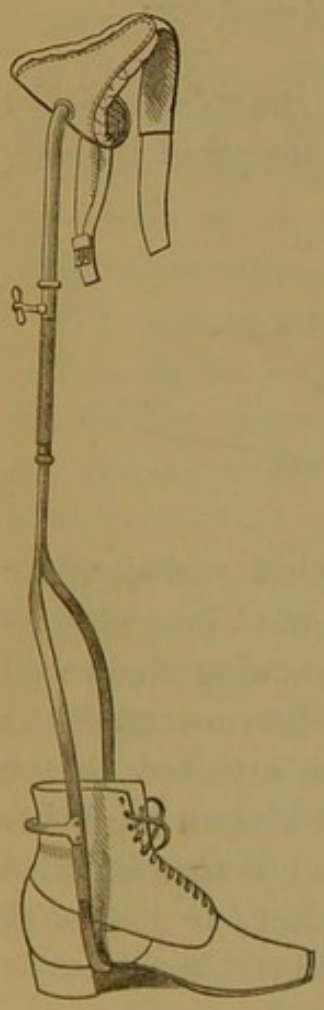
This instrument should be worn as a guard for some months

after the patient is entirely well, as I have seen many cases return from very slight causes, after being perfectly well for a long time. In order to prevent the limb from swelling below the bandage, it is necessary to support the circulation either by an elastic stocking, or by a roller and a knee cap.

These instruments are made with great perfection by Messrs. Otto & Reynders, Tieman, or Wade & Ford, of this city.

In the third stage of the disease, when the limb has become shorter and the patient can, therefore, walk with the stiffened knee without difficulty—which cannot be done in the first and second stages, without a very awkward circumduction—the same principle can be much better applied by using the instrument first described by Dr. Andrews, of Chicago. It consists of a crutch in the perineum, with a wide flange curving around the gluteo-femoral fold, a ball and socket on its under surface opposite the tuberosity of the ischium, a rod running from it, to the heel, capable of being elongated at pleasure, and terminating at its lower extremity in two branches—the lower extremities of which are rounded or knobbed, to fit into iron cups or sockets which are well secured into the heel of a nicely-fitting laced boot; a thick buckskin tongue lies over the instep, before it is laced, for protection when the extension is applied. The boot being neatly laced without wrinkles, the forked prongs are inserted behind the heel into the sockets, and the crutch then slipped into the perineum. The instrument can then be extended by the cog-wheel and key, until the patient can bear pressure without pain. Its great advantage is, that force can be applied without girdling the limb with a roller, as must be done when adhesive plaster is used, which is a very great desideratum.

Fig. 3.



I have used this instrument in many cases where the limb was shorter than the other, with very great advantage, and can therefore recommend it highly. Those I have used were made by Messrs. Otto & Reynders, 58 Chatham Street, after the annexed pattern, which, I presume, is so much like Dr.

Andrews' splint, that I think he is entitled to the credit of making the suggestion. (See Fig. 3.)

Of course, the mere application of mechanical force to overcome one of the effects of disease, viz., muscular contraction, is not intended to supplant or prevent the adoption of the well-established principles of treatment, but merely as auxiliary thereto; but as the object of this paper is simply to explain the construction and application of mechanical force, it is not deemed necessary to enter further into the general principles of treatment, and we shall, therefore, proceed to the narration of some few cases where this principle has been applied satisfactorily to diseases of the knee- and ankle-joints.

REPORT OF SOME CASES OF CHRONIC DISEASE OF THE KNEE AND ANKLE-JOINTS, AND THEIR TREATMENT BY MECHANICAL APPLIANCES.

CASE I. *Thomas B. Clark, Fourth Street. Strumous synovitis of knee-joint; suppuration; luxation; anchylosis; operation; recovery.*

This patient had scarlatina when two years old, following which he had inflammation of the left knee-joint of the strumous variety, commonly called white swelling. After about eighteen months, contraction of the muscles took place to such a degree as to cause subluxation of the tibia backwards into the posterior inter-condyloid notch. Eight or nine fistulous openings around the outer part of the knee led to carious bone and into the joint. Drs. R. K. Hoffman and R. S. Kissam had examined him, and pronounced amputation the only means of cure.

I was called to see him in the spring of 1853, in consultation with Dr. Batchelder, who advised compression by means of sponge, and gradual extension: this was faithfully persisted in for some months, but with no appreciable improvement in the position of the limb. The sinuses on the outer side of the knee were then laid freely open —connecting with the joint—giving exit to a large amount of pus, and some carious bone which seemed to come from the *external* condyle of the femur and the patella only. The joint was freely injected with warm water, and the wound kept open by tents of oakum saturated with Peruvian balsam. Small pieces of bone continued to exfoliate for some months, when the wounds gradually cicatrized, and the parts became perfectly healthy; but with no improvement in the position of the limb. All the constitutional symptoms improved from the time the joint was freely opened; his appetite increased, and his sleep was tranquil without narcotics.

In January, 1854, as his general health had become restored, I decided to attempt to improve the deformity by tenotomy of the hamstring muscles and *brisement forcé* of the knee-joint. Dr. Louis Bauer, of Brooklyn, saw him with me, and rendered me most valuable assistance in the performance of the operation. The boy was perfectly anæsthetized with chloroform, the tendons divided subcutaneously, the wounds carefully closed with adhesive plaster and a roller, and then the knee-joint forcibly broken—by flexion and extension, and internal rotation—until the limb was brought parallel with the other, and almost perfectly straight. A tight roller was applied from the toes up to near the knee; a large sponge placed in the popliteal space, and strips of adhesive plaster were applied over the sponge, and drawn *tightly* around the joint from the bandage below the knee, to some six inches above it. The roller was then continued over the plaster, snugly applied to the whole thigh. A piece of sponge about two inches in length, and about the size of the fore finger, having been placed over the track of the femoral artery—as is my usual custom in this operation—the roller was carefully applied to cause partial occlusion of the calibre of the artery, and thus diminish the supply of blood to the joint, without being so tight as to induce its complete strangulation. Two pieces of firm sole-leather, cut to fit the foot and limb in its entire length, having been softened by soaking them a few minutes in cold water, were applied on either side of the foot and limb, and secured by a bandage. Great care was taken to model the leather, to all the inequalities of the part, while it was still soft and pliable, and the limb was forcibly held in its improved position until the leather became dry and hardened, when it retained it as perfectly as any plaster mould could do.[1]

I wish to call especial attention to the principle involved in the dressing in this case, as I think it of cardinal importance, having witnessed its practical benefit in many serious operations. I mean the pressure on the main trunk of an artery leading to any part in danger of inflammation, in such manner as to diminish the supply of blood, to prevent inflammation by partial starvation. Great caution is, of course, necessary not to produce gangrene; but a

[1] Subsequent experience has taught me that it is better to close the wounds and retain the limb at perfect rest in its abnormal position until the external wounds have healed (which will generally be done in five or six days), before proceeding to break up the bony adhesions.

little practice, and close observation, will soon give the necessary tact of knowing how to *use* pressure, without *abusing* it.

In this case of young Clark, although the operation was very severe, and the force required to break up the adhesions very great, and continued for some time with rather rough manipulation in order to get the limb in good position, yet it was not followed by any constitutional excitement or irritative fever.

The boy took an anodyne the first night only, and from that time had no pain or trouble whatever. The limb was kept immovable in the leather splint, and was not disturbed in any manner for thirteen days. At the expiration of that time it was dressed and found perfectly satisfactory, the wounds all healed, with no inflammation about the joint. Our object being to obtain anchylosis, the limb was again re-dressed, but without the sponge over the femoral artery. At the end of two weeks, on again examining it, it looked so favorably that I determined to produce a movable joint, instead of anchylosis. Passive motion was tried, with great care at first, but afterwards continued with much more freedom, and finally resulted in a very useful joint, having about two-thirds the motion of a natural one.

The patella is very small—not more than one-third the size of the opposite one, the external condyle of the femur is very much reduced, there is paralysis of the peroneal muscles, from slough of the peroneal nerve, the foot is smaller, and the leg one inch shorter than the other. Yet, with a high heel, an elastic spring on the outside of the shoe, and an India rubber substitute for the peroneal muscles—running from the top of the fibula to the ankle, where it terminates in a cat-gut cord, which plays around a pulley, and is inserted at the outer margin of the sole of the boot near the toe—the boy walks, dances, runs, and skates with his playmates without crutch or cane.

CASE II. *Chronic synovitis of knee-joint, with angular contraction and probable ulceration of cartilages; tenotomy; extension by splint; recovery.*

Ann H——, Jersey City, aged 14; father healthy, but mother died of phthisis; fell, when nine years of age, on the side-walk, striking her right knee on the curb-stone, producing a severe inflammation of the knee-joint, which confined her to her bed for some weeks. Leeches, cups, poultices, and the usual antiphlogistic

treatment was adopted for some time, and finally resulted in a favorable recovery. For nearly a year she considered herself well, although she always had more or less pain in the knee-joint, after any very severe exercise; but it was not thought of sufficient importance to call for professional advice, as it generally subsided by a few days' rest, although her father had applied a blister to it occasionally. When about twelve years of age she again sprained the joint, by slipping on an orange-peel, which produced the most intense pain, immediately after the accident, and which continued until the time I saw her, two years after. She had been cupped and leeched repeatedly; blisters and issues had been applied for some months, but all without any benefit, until the agony became so intense and the general health so much prostrated, that the disease was decided to be incurable, amputation advised, and I was sent for to perform it. Dr. Wm. K. Cleveland went with me to assist in the operation. We found the girl sitting on a chair, with her knee flexed at an acute angle, the foot resting on a stool a little lower than the chair on which she sat, her body strongly bent forward, and both hands firmly clasped around the limb just below the knee, to prevent, as far as possible, any movement at the joint; at the same time she appeared to push, with considerable force, and stated that that was the only way in which she could get any ease. Her father stated that she had sat in that position most of the time—day and night—for the past three months; she would not let go her leg even to feed herself, and they had therefore to feed her. Whenever her position was changed, either to be put in bed or to attend to the necessary calls of nature, it produced the most intense paroxysm of pain, which frequently lasted some hours, and could not be relieved by any anodyne, although she took morphine in very large doses, constantly. Her knee was very much enlarged, almost transparently white, the irregular contours quite defaced by the general rounding out of all the parts. The leg below the knee, and the thigh above, were very much smaller than the opposite one. Her pulse was 160; her face very pale and emaciated, and her countenance bore the most marked expression of intense suffering that I have ever witnessed. It was impossible to walk about the room, or in any way jar the floor, without causing her to scream in agony.

When Dr. Cleveland took hold of her foot, to move her in position for the operation, she seized him by the arm with her teeth, and held on with the grip of a tigress, until I grasped her limb above

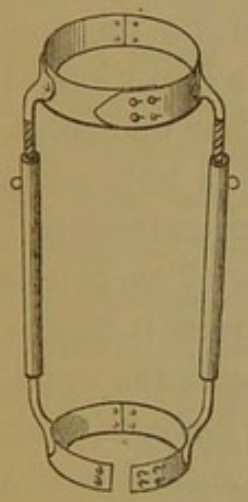
and below the knee, and by firm extension and counter-extension, to separate the bones from each other, gave her such relief that she let go her hold upon his arm. So long as I continued the extension she seemed comparatively quiet, and said it gave her great relief; but the instant that I relaxed at all she screamed in agony. This fact decided me not to amputate, until she had had the benefit of extension fairly tried. It was impossible to do this efficiently without first dividing the hamstring muscles, as the leg had been so long contracted. I therefore held the limb still while Dr. Cleveland put her under the full influence of chloroform, when I divided the outer and inner hamstring tendons subcutaneously, covering the wounds immediately with adhesive plaster and a roller. By a very slight force the limb was brought immediately almost straight. A long strip of adhesive plaster, about four inches in width, was secured to both sides of the leg by a roller, for the purpose of making extension; and in the loop below the foot a board was placed, wide enough to remove pressure from either malleolus. To this board a cord was attached, and run through a hole made in the foot-board and over a pulley, and to its other extremity I attached a smoothing-iron weighing about five pounds. Two bricks were placed under each post at the foot of the bed, to raise it higher than the other end, so that the body, constantly gliding in the opposite direction, would make a proper counter-extending force, without the necessity of a perineal band. This was all accomplished before she had come from under the effects of the chloroform; and when she recovered her senses, she said she felt perfectly easy. As she had already taken a large dose of morphine just before we arrived, nothing more was given her; but instructions left to administer to her twenty drops of Magendie's solution in the night if necessary.

She passed a more comfortable night than she had done for months, and from that time took no opiate nor other anodyne. Her appetite improved, and her bowels became regular, without the use of any cathartic medicine. Iron and quinine were the only remedies given, together with the most nutritious food that she could digest. A large coarse sponge, placed around the entire knee-joint, and secured by a very firmly applied roller, was thoroughly wet in cold water, and constantly kept so, by frequent irrigations day and night. The extension of the joint by the weight and pulley, and the compression by the wet sponge were continued about two months, after which I made extension by means of an apparatus I have been using for some years, and which allows

the patient to exercise in the open air at the same time that the extension is continued, which is so important in the treatment of all chronic inflammations of the joints. Although I have used this apparatus in many cases with most marked benefit, both in private practice and in Bellevue Hospital, for nearly seven years, yet I have never published or described it, except to the different classes of students in attendance at the Hospital. But having tested it thoroughly, I can commend it with confidence, in all cases where extension of the knee is required, and exercise at the same time necessary.

The apparatus is constructed in the following manner: Two bands or collars of firm sheet-iron, about an inch wide, embrace the limb—the one above the ankle the other at the upper third of the thigh—by means of a hinge on one side, and a lock on the other like a dog-collar, and connected, on either side, by a firmly-riveted steel rod, in the centre of which works a male and female screw, which can be retained at any given point by a small thumb-screw working in its side and fastening to the worm or thread of the larger screw. (See Fig. 4.[1])

Fig. 4.



Dr. Sayre's apparatus for extension at knee-joint.

To apply this instrument, adhesive plaster is required, spread on strong cloth and cut in strips one inch wide, and long enough to reach from just below the knee to near the ankle, and also from the knee for several inches above the joint, upon the thigh, as seen in Fig. 5.

These plasters are secured to within an inch of their extremities by a snugly-adjusted roller, as seen in Fig. 6. The instrument is then placed on the limb, the collars fastened sufficiently tight to be comfortable, and the loose ends of the adhesive plaster turned over them and secured by a roller. The connecting rods are extended by means of the screw, the articulating surfaces of the tibia and femur separated from each other, and the limb brought nearly straight, as in Figs. 7 and 8, until pressure can be made on the

[1] Since writing this paper I have made an improvement in this instrument by dividing the rings into two halves, which *slide* together in place of being hinged. The plaster has a strong loop of webbing sewed on each strip, and the separated ends of the rings can be passed through these loops before being locked, which is more neat than the former plan, and more easily readjusted.

foot without pain. A roller is applied over the foot and leg up to the instrument, to prevent œdema. A large coarse sponge is placed in the popliteal space, and other pieces of sponge completely surround the knee-joint; these are secured by a tight roller, and then

Fig. 5.

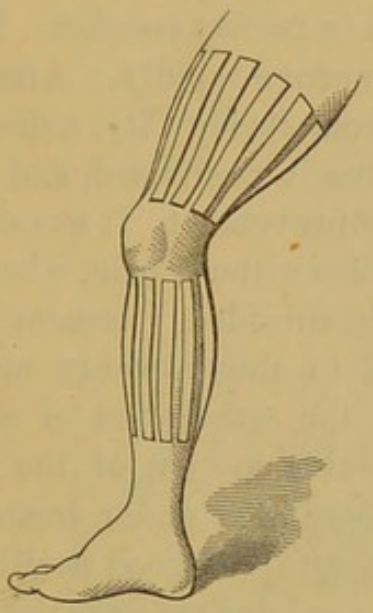


Fig. 6

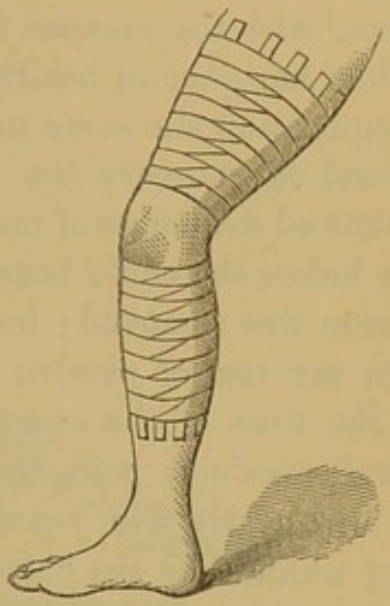


Fig. 7.

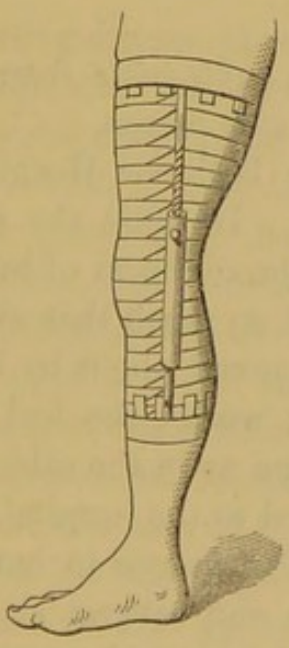
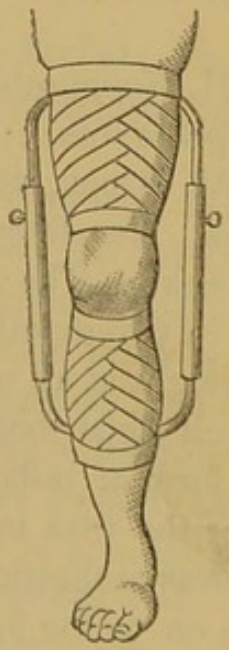


Fig. 8.



saturated with cold water. The cold water not only reduces the inflammation of the joint, but, by increasing the pressure of the sponge, promotes the absorption of the deposits that generally occur around and in a joint in this condition of chronic inflammation.

The instrument was applied in the case of Ann H——, in the manner described, and when the extension was exerted, she could bear almost her entire weight upon the limb; but when the screws were shortened so as to remove the extension, the slightest pressure upon the foot gave her the most intense agony. With the instrument properly adjusted, she could exercise in open air upon her crutches,[1] with the greatest freedom, and in perfect comfort. From this time her general health began to improve rapidly. After the first application she came to my office from Jersey City, a distance of several miles, every few weeks to have it readjusted, and each time showed evidences of most marked improvement. It was almost a year before she could bear much pressure without pain, when the extension was removed; but as this pain subsided, I became more free in my use of passive motion, and in about twenty months from the time of the operation, I had the satisfaction of seeing her walk without pain, and with tolerable motion of the joint. It is now nearly five years since this case was under treatment, during which time she has enjoyed uninterrupted good health, and at the present time the motions of her knee-joint are so perfect that no one but a critical observer would suspect that there had been any disease there.

CASE III. *Suppuration and caries of both ankle-joints from injury; double talipes-equinus; operation; recovery, with motion.*

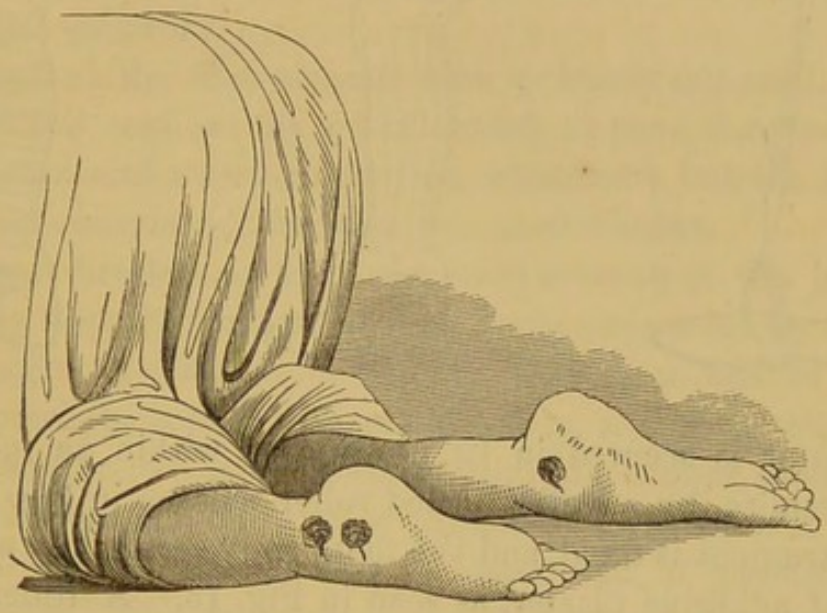
Elizabeth Bruen, æt. 16. Admitted to Bellevue Hospital, Jan. 29th, 1864. Her father died of phthisis. In 1862 she sprained her right ankle. The injury produced a chronic form of inflammation, and in two months it had increased so much that she could bear no weight at all upon it. She now moved about by hopping on the well (left) foot, and in about six weeks, she had excited the same form of inflammation, in that one as in the other. Two years after the first injury, when admitted to the hospital, her appearance was cachectic and miserable. The disease in her ankles had gone on to the formation of abscess, and several sinuses led into the joint, through which disintegrated bone had escaped.

The gastrocnemii of both sides were so contracted as to extend the foot nearly to a straight line with the tibia. She could not

[1] Young subjects, who are not so heavy, can walk without the aid of crutches. But with adults, or very heavy children, there is danger of tearing the plaster, or breaking the instrument, and, therefore, crutches are necessary to take off the superincumbent weight.

bear the slightest pressure on either foot, and could not use crutches, as she could not poise herself on the ends of her toes, which were the only points that could touch the floor when in the erect posture. She was, therefore, compelled to move about upon her knees, as seen in Fig. 9, which also shows the sinuses connecting with either joint.

Fig. 9.



All active disease about the joints had subsided; but the discharge from the various sinuses was considerable, and by probing them, several small pieces of bone escaped.

On the 17th of February, 1864, in the presence of the class at Bellevue Hospital, I divided subcutaneously the tendo-Achillis on both sides, and restored the feet to their natural angle with the legs. Leather splints were then applied, to retain them in this new position until I could have a pair of instruments manufactured, which I am in the habit of using to extend the ankle-joint.

This instrument consists of a firm steel, or hard rubber plate, made to fit the sole of the foot; at the heel is a hinge-joint, and attached to it a rod, slightly curved at the bottom, and extending up the back of the leg to near the knee. Over the instep is an arch, like the top of a stirrup, with a hinge joint at its summit from which springs another rod, which runs in front of the leg, of equal length with the one behind. These rods are made with a male and female screw, or ratchet and cog for extension, and connected at the top by a firm band of sheet iron, on the side of which is a hinge, and a lock on the other like a dog-collar. (See Fig. 10.)

The instrument is applied with firm adhesive plaster, cut in strips about one inch in width, and long enough to reach from the ankle to near the tubercle of the tibia, and placed all round the limb, as in Fig. 11.

Fig. 10.

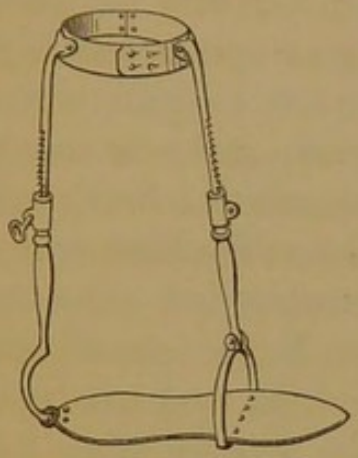


Fig. 11.

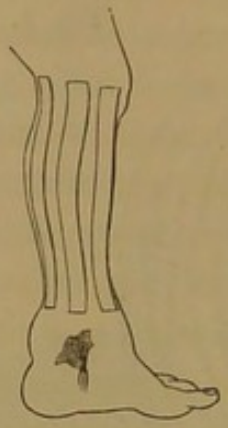
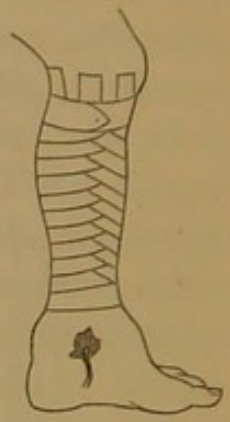


Fig. 12.



The plaster is secured in its position, to within an inch of its upper extremity, by a well adjusted roller, as seen in Fig. 12.

The instrument is fixed, and the foot firmly secured by a number of strips of adhesive plaster, as seen in Fig. 13. A roller should be carefully applied over this plaster to prevent its slipping, and the ends of the plaster at the top of the instrument turned over the collar, which has been previously locked, just tight enough to be comfortable, and secured by a turn or two of the bandage, as seen in Fig. 14.

Fig. 13.

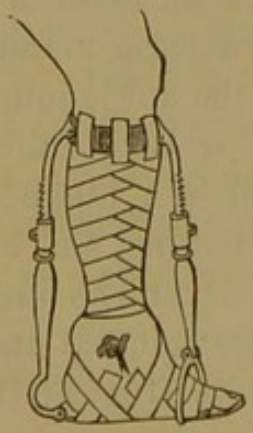
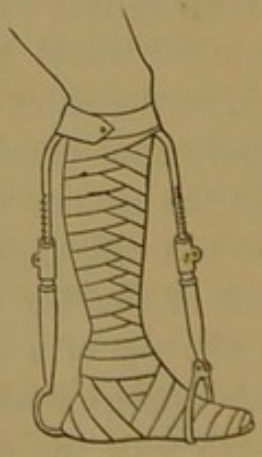


Fig. 14.



On the 24th of February, just seven days after the section of the tendones Achillis, these instruments were applied in the presence of the class at Bellevue Hospital, in the manner above described.

The sinuses were enlarged, and a seton of oakum drawn through the ankle-joint, as indicated in Figs. 11, 12, and 13. A wad of oakum thoroughly wet in cold water was placed over each ankle, and secured by a firm roller. The screws were extended, and the difference in the appearance of the ankle before and after is well represented by comparing Figs. 13 and 14.

These drawings were taken from life by Dr. Henry C. Eno, House Surgeon of Bellevue Hospital, and are as accurate as any photograph could be.

As soon as the instruments were properly adjusted, she stood upon her feet, without the aid of crutch or cane, for the first time in two years, and without any pain whatever; but the instant the screws were shortened, the pain was most intense.

She was directed to have the oakum around the joints kept constantly wet with cold water, and firmly supported by a bandage and changed as often as necessary. The seton was to be pulled through, and the soiled part cut off daily, and to be continued as long as any bone was exfoliating, until the matter should change from its sanious condition to a consistent pus, when it was to be removed, the wounds allowed to heal, and, if possible, passive motion made. If motion could not be attained, then the feet were to be anchylosed in their natural position, deeming that a stiff ankle was better than an amputation.

The following notes of the case, copied from the hospital records, which were taken by Dr. Irving W. Lyon, House Surgeon, now of Hartford, Connecticut, will show the progress and the result of the treatment:—

"*February* 28. She is very comfortable, and there is no pain about the ankles.

"*March* 15. Has been out of bed most of the time since the operation; but remained sitting at the bedside until to-day, when, with the aid of crutches to balance the body, she walked about bearing her *entire weight* upon the feet; the extension made by the instrument being so perfect as to prevent pressure upon the joint surfaces.

"*April* 6. Apparatus removed from both feet, and motion made at the ankle-joints, which are perfectly free and movable, but pressure is yet *very painful*. The apparatus is reapplied. It should be stated that the patient was put upon the best diet the hospital could afford, together with cod-liver oil and iron.

"*May* 7. The adhesive plaster having become disarranged, necessitated its readjustment. It was now discovered that the sinuses had all closed completely; but pressure while extension was off still gave her some pain. Her general health very materially improved.

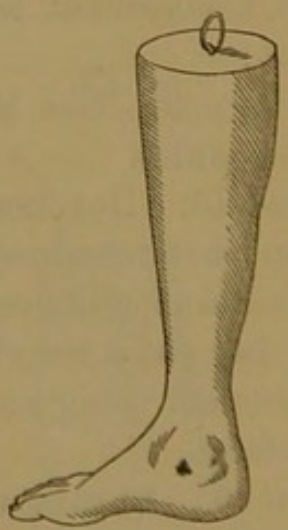
"*July* 20. All extension being removed, she is able to stand erect without pain in either ankle; but attempts at walking occasion a considerable amount of pain and uneasiness. The motions of the ankles are all unimpaired. Her health is thoroughly restored, and she has not only grown taller since her admission, but has also grown much more fleshy, and will weigh at least thirty pounds more now than in February. The splints are reapplied, and will require to be worn a little while longer to complete the cure."

In a foot-note I find the following record: "It should be mentioned that since the 15th of March (the date of her commencement to walk upon the shoes) she has continued to walk upon her feet, bearing the entire weight of her body upon them, and only needed crutches to supply the place of the muscles of the leg, which, on account of being confined by the apparatus, were unable to balance the body."

Dr. Lyon left the hospital about this time, and I can find no further notes of the case on the records of the Institution. She wore the instruments, however, until about the middle of January,

Fig. 15.

Fig. 16.



1865, when they were permanently removed, and a plaster cast taken of both her legs and feet, from which Figs. 15 and 16 are copies. The motions are almost perfect, and she can walk without pain.

CASE IV. *Caries of the ankle-joint; seton; recovery.*

B. W., aged 7, of healthy parents, and whose brothers and sisters were all healthy, had himself always enjoyed good health, until in the summer of 1854, when he injured his left ankle by a fall.

The joint swelled immediately, and was quite painful; but still did not confine him to his bed until after four or five days. It then became so painful as to prevent motion, and for a number of days he was treated by perfect rest, and alternate applications of hot and cold water. As he made no improvement, after a few weeks his ankle was blistered, and this was repeated every eight or ten days for a great number of times, but without any improvement in his ankle.

His general health became much affected, with loss of appetite, and of sleep; he became greatly emaciated, and suffered intense pain constantly, which was greatly aggravated at night by frequent spasms, or "jerkings of his foot" as he described it.

The development of the leg and thigh on the affected side became arrested, the ankle and foot very much swollen and shapeless, a number of sinuses formed leading into the joint, and the bones crepitated when the joint was moved.

Dr. Valentine Mott saw him in July, 1855, and advised amputation as the only means of saving his life. The mother, however, would not consent to the operation, and I was called to see him in consultation with Dr. David Green in October, 1855. Several sinuses then existed, leading into the joint, through which the probe was passed without difficulty, but coming in contact with carious bone in almost every direction.

On the 21st of October, 1855, I opened the joint freely on either side by connecting some of the sinuses, and found the joint carious throughout.

Two setons of oakum were passed through the joint, the one laterally, and the other antero-posteriorly; and the foot extended in the instrument as in the case of Elizabeth Bruen, above described. As the seton was pulled through, a number of small pieces of bone were drawn entangled in its meshes.

When he recovered from the effects of the chloroform he could bear pressure on the foot without pain, and would permit it to be handled in any direction without complaint, although before its application he would not permit it to be touched, and it was im-

possible to move it in any direction, even in the most careful manner, without giving him the most intense agony.

He slept quietly the night after the operation without any anodyne, although he had been compelled to use anodynes freely for many months, and never resorted to them again during the time he was under treatment.

His general health began to improve almost immediately from the time of the operation and the application of the instrument, his appetite returned, and he was able to ride out in the open air with comparative comfort. The setons were pulled through daily and the soiled parts cut off; and the whole ankle constantly surrounded with oakum saturated in cold water, and sustained by a tight bandage.

For two or three months small pieces of bone were frequently found entangled in the fibres of the seton, when pulling it through; but the discharge gradually diminished in quantity, became more consistent in character, and, as it did so, the setons were gradually reduced in size, until finally they were a mere thread or fibre. At the end of eleven months from their first insertion they were removed entirely, and the sinuses closed up in a short time after, never to be reopened.

The extension was continued for nearly two years before it was removed permanently, although he had walked about for many weeks before the instrument was removed. As soon as the sinuses had become closed and he could bear moderate pressure upon the foot, when the extension was off, without suffering pain, I commenced passive motions daily, by acting on the anterior and posterior screws alternately, thereby imitating the natural motions of the joint. In about two years from the first operation, the instrument was removed permanently, when he could walk without difficulty, having considerable motion in the affected joint. This motion has very materially increased, and is now (nearly ten years after the operation) almost as perfect as the other. The foot is smaller than the other, and about half an inch shorter, but he supplies the deficiency by a thick sole inside his boot, and can run and skate with any of his playmates without the deformity being detected.

Drs. Mott, Stephen Smith, and other surgeons of this city saw this case when under treatment, and, therefore, know that the setons passed through the ankle-joint; but as there has been some question about it, by others who have not seen the case, I have had his foot daguerreotyped on both sides by Mr. Gurney, and the cicatrices on

either side, giving the entrance and exit of the setons, show conclusively that they did pass through the ankle-joint. (See Figs. 17 and 18.)

Fig. 17.

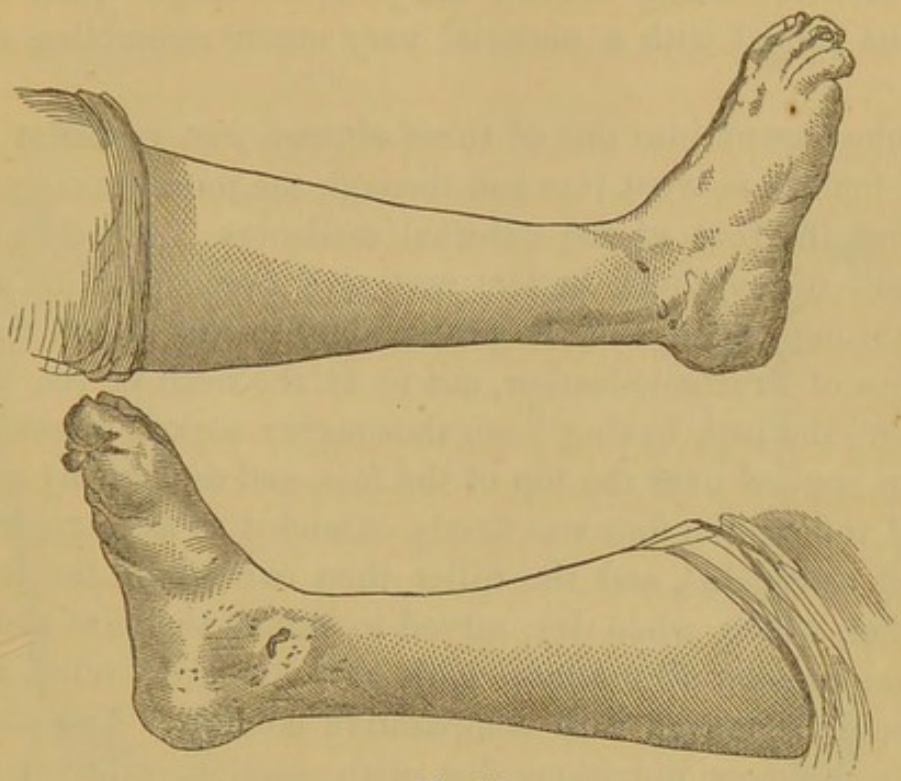


Fig. 18.

CASE V. *Suppuration and caries of the ankle-joint; operation; seton; extension; recovery with motion.*

In January, 1855, I was sent for by Dr. L. C. Ferris to amputate the leg of Ella Stanley—aged 5 years—for disease of the right ankle-joint. In March, 1854, ten months previous, she had fallen from a chair, striking her right ankle against the sharp corner of a bedstead. The injury was immediately followed by considerable swelling and very great pain. The pain soon subsided, but the swelling continued.

For two or three weeks she seemed tolerably well, but at the end of that time she began to limp badly. She was then put upon crutches, and various lotions applied to the foot and ankle.

The disease, however, continued to progress, her general health became much affected, with loss of appetite and sleep, and she was greatly emaciated. The limb was much smaller than the other, but the foot and ankle were swelled into a shapeless mass. In November she began to have repeated chills and hectic fever, and in the early part of December the ankle opened in several places, giving exit to a large amount of ill-conditioned or strumous pus.

Her general health became much impaired, and in January, 1855, I was sent for to amputate the limb. Her suffering was most intense; she would not permit the limb to be handled until she was under the influence of chloroform, when crepitus was readily detected; several sinuses around the joint discharged quite freely a curdy pus mixed with a material very much resembling quince-jelly.

A probe passed into one of these sinuses, just posterior to the internal malleolus, went into and through the joint, making its exit at a point in front of the external malleolus. A strip of linen (in default of anything better) was torn from the child's dress, passed through the eye of the probe, and drawn through the joint.

A piece of firm sole-leather, cut to fit the front of the leg, and dorsum of the foot, having been thoroughly soaked in cold water, was then applied over the top of the foot, and secured by a nicely-adjusted roller; the foot was firmly extended so as to separate the tibia and astragalus, and the roller then carried up the leg, over the leather, which, when dry, served to extend the joint and at the same time prevent all motion. This gave her great relief, and her limb could be moved with comparative comfort. The child was put upon the most nutritious diet, with quinine, cod-liver oil, and iron.

The dressings were removed and changed as often as they became soiled with pus, and in the progress of the case, compression with sponges and cold water was resorted to. Her improvement was most marked and rapid. At the end of a few weeks the instrument was applied, as in the other cases, and with the same happy results, enabling the patient to walk with crutches and obtain the benefit of out-door exercise, which added materially to the improvement of her general health.

The setons were retained nearly ten months, being gradually reduced in size as the bone ceased to exfoliate and the pus became more healthy, until for a number of weeks they were hardly larger than a single thread. When they were finally removed, the sinuses healed in a few days, and passive motion was commenced as in the other cases. The patient continued to wear the instrument for nearly a year after she was perfectly well, as a means of prevention against accident, and then left it off entirely.

It is now eleven years since this case was operated on, and she is as well in the one leg as the other, and the motions are almost as perfect. The foot is one size smaller than the other, and the leg

a little shorter; but the limb is perfectly developed, as represented in Figs. 19 and 20, which were taken from a plaster cast of her limb, and which also represent the cicatrices where the seton passed through the joint.

Fig. 19.

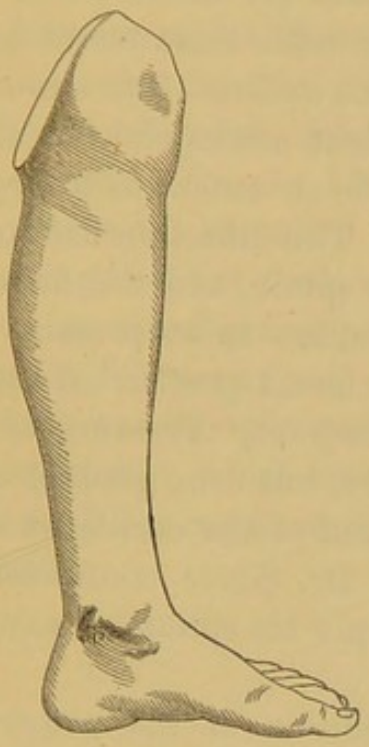
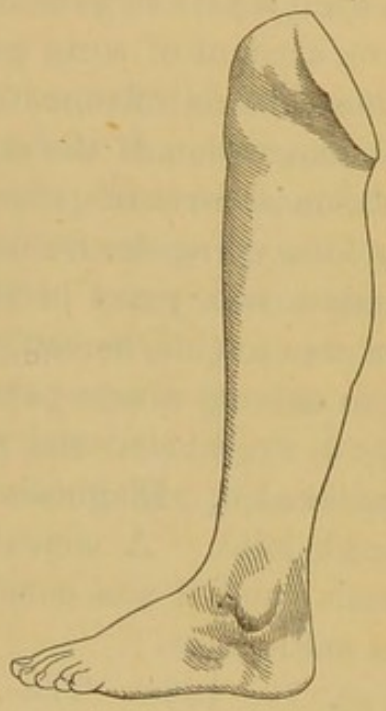


Fig. 20.



I have treated fourteen cases of the ankle- and nine of the knee-joint, where the disease had extended to suppuration, like those just described, and with equally satisfactory results, and have now under treatment two others, with setons through the joints, that are progressing favorably; but as they differ but little from those described, which I have selected as typical cases of the so-called strumous suppuration of the joint, I have not thought it necessary to report them in detail, as it is only a repetition of the same general principles of treatment, and adds unnecessarily to the length of my paper without conveying any new ideas.

I have also treated an immense number of cases of chronic inflammation of both the knee- and ankle-joints, that had not yet progressed to suppuration, by means of the instruments only, with the most satisfactory results, and have taught for a number of years that others should do the same. I will close this paper by quoting the report of a case furnished me by Dr. Robert Newman, of this city, who had treated it according to my suggestions, and, as it

represents many other cases treated in the same way, will save the necessity of further repetition.

CASE VI. "*Chronic inflammation of the right ankle-joint; talipes equinus; operation; recovery.*

"Kate Dooley, 279 West 39th Street, æt. 17, single, presented herself in June, 1864, wishing to be treated for rheumatism. She came upon a pair of crutches, and even with these could hardly move on account of sores produced in the axillæ. She was suffering from chronic inflammation of the right ankle-joint, which had caused contraction of the muscles to such an extent as to produce the extremest form of talipes equinus. This affection had existed nearly four years, the result of a severe sprain, and the deformity had lasted two years in the same position as at present. The patient was unable, herself, to move the foot, any effort on her part to do so causing severe pain in the ankle-joint. Pressure or rotation both aggravated the pain intensely, but firm, gradual extension relieved it. Diagnosis: inflammation of the cartilages within the ankle-joint. A consultation with Dr. Sayre confirmed this diagnosis; and it was concluded to apply his splint for extension of the ankle-joint.

"*July* 19, 1864. The general condition of the patient was bad, she was very anæmic, and suffered from loss of appetite, headache, and constipation; her right foot and leg were both atrophied. The contraction of the gastrocnemius had existed so long as to render extension of it impossible without first dividing the tendo Achillis, which was accordingly done by Dr. Sayre, subcutaneously, without the loss of any blood, and the wound covered with adhesive plaster. The foot was then brought to a right angle with the leg, and the splint applied.[1]

"After the application of the instrument, the patient could stand on her feet immediately in a natural position, without any aid.

"For the next two days and nights she complained of soreness and some pain. There was scarcely any febrile movement present.

"*July* 22. She had passed a comfortable night, and felt well.

"*August* 1. She has been perfectly comfortable, and free from

[1] My usual custom is not to apply the instrument until several days after section of the tendon, or until the external wound has entirely healed; but in this case I could not make a second visit, and therefore applied the instrument immediately after the operation.

pain since the last note, and to-day got up and walked about the room without any assistance, even of a crutch or cane.

"27*th*. The instrument was reapplied. The patient walked to my office with the assistance of a cane, and the same day went to the country.

"*May* 19, 1865. The patient has improved steadily since the last note. Great annoyance has been occasioned by the breaking of the instrument, which was not strong enough to bear her weight, and which once caused a slight relapse.

"Since October last, she has done all her own house-work, and many errands. On the 15th of May, while the instrument was being repaired, I surprised her by an unexpected visit, and found her walking about at work, with not even a bandage upon her foot. She had not the slightest pain, though after being a long time on her feet she felt very tired. All the motions of the joint were perfect; but it was thought more judicious to reapply the instrument for a few months, which was accordingly done.

"The limb has regained its natural size, and her general health is perfect."