I find, on examination, no remaining appearance of injury; he has no pain, and the motions of the foot are perfect.

The practical conclusions to be drawn from this case are, that although rare, this dislocation is not impossible; that when it does occur it is not difficult of detection, neither is there any peculiar difficulty in its reduction; also, that in the absence of any complication from more extensive injury to the structure of the tarsus, than in this case, must have existed, we may venture to anticipate complete recovery, notwithstanding the injury to, and probable laceration of, the astragalo-scapoid and calcaneo-scapoid ligaments, as well as of the tendon of the tibialis posticus muscle, which are the necessary conditions of such a complete dislocation of the scaphoid bone as I have here described.

ON A NEW SWINGING APPARATUS

FOR THE

TREATMENT OF FRACTURE OF THE LEG.

By S. JAS. A. SALTER, M.B., LOND., M.R.C.S.,

LATE HOUSE-SURGEON TO KING'S COLLEGE HOSPITAL, &c.

(Read before the King's College Medical Society.)

GENTLEMEN,—The subject of *swinging apparatus*, for the treatment of fracture of the leg, I have this evening brought before you, because I wish to exhibit and to explain a plan which I devised last winter for the treatment of a case in the hospital by this means, during the time that I there held the office of House-Surgeon, and because I believe that the apparatus I then invented had some, and not unimportant, advantages, over those already in use; and because, moreover, I am sure that the plan of swinging broken legs in their treatment is attended with great benefit and immense comfort to the patient. The subject is interesting also in its history, as it exhibits a gradual development of mechanism in the different arrangements adopted, and as it shows, from the very number of those various plans, how much the want of some efficient swinging apparatus was felt by surgeons, in the treatment of fractures of the lower extremity below the knee. It is my intention, in the following remarks, to enumerate the different swings that have been in use at various times; next, to describe my own apparatus in detail; and, lastly, I shall give you a brief account, as far as it relates to the subject before us, of the very interesting case (that of Mr. B., the Guinea merchant, which I dare say you recollect in the hospital,) on which it was first tried, and which appeared so much benefitted by its use.

In the various swings I am about to mention, other attempts have been made besides swinging the leg, and allowing the limb, as well as the body, a certain amount of motion. Various splints and extensive apparatus have formed essential parts of some of these

combinations; and their elaborateness and complication have, in some cases, reached a most marvellous extent.

These are the different apparatus I have been able to discover in the various works I have consulted:—

I. *Prael's apparatus*.*—The only principle attempted in this device is that of swinging. The apparatus is a horizontal beam attached to the ceiling, from which the leg is suspended by cords, which pass through pulleys at the extremities of the beam. There is no particular splint belonging to this arrangement. It was first published in 1801.

II. *Schmidt's apparatus*† is like Prael's, with the addition of a fracture-box, supplying the place of splints. At the extremities of the fracture-box are some straps and screws, by which prolonged extension of the limb can be effected. This was first described by Schmidt in Loder's *Journal für de Chirurgie*, 1805.

III. *Hecker's apparatus*.‡—Hecker's apparatus consists of an arched iron bar extending transversely across the bed over the patient's legs; from the centre of this arch depend four chains, which are attached to a fracture box in which the leg is placed. There are two smaller arches of iron attached to the extremities of the fracture box and arching over the foot and knee, which serve the purpose of an ordinary cradle to keep off the bed-clothes. The bed-clothes cover over the whole of this apparatus, in this respect differing from those previously described. The fracture box is furnished with an extension arrangement similar to Schmidt's. This apparatus was described and figured in Gräfe's *Journal der Chirurgie* in 1823.

IV. *Nusbaumer's apparatus*.§—This is simply a modification of Prael's, in which the inventor endeavoured to accomplish an alternate lateral posture, as well as the swing. It is a very complicated impracticable affair. First described in 1825.

V. *Dornbluth's apparatus*.||—This differs from Prael's no further than this, that the horizontal beam, from which the leg is suspended, is connected to the ceiling by an elastic coil of wire, instead of an inelastic cord, as in Prael's. The coil of wire is stiff and elastic, one end is attached to the ceiling and the other to the centre of the beam, and it is enclosed in a box for protection. Published in 1829.

VI. *Mr. Grantham's apparatus*¶ is a contrivance

* Verbesserung der Löfferschen Fusschweben zur Heilung der Schienbeinbrüche von dem Herrn Leichirurgus Prael. In *Arneman's Magazin*, vol. iii., part 2nd, page 170, illustrated by four plates and twenty-four figures.

† Beschreibung einer Fusschweben mit einem Ausdehnungs Apparat von tirm Freidr. Anton, Gottl. Schmidt. In *Journal für die Chirurgie von Christian Loder*, vol. iv., page 458. Illustrated by two plates.

‡ Die Gräfesche Beinbruchschweben Beschreibung von Dr. Hecker. In *Journal der Chirurgie und Augen-Heilkunde, herausgegeben von C. F. Gräfe und Ph. v. Walther*, vol. iv., part 2nd, page 197. This is a very learned and elaborate paper. It gives the whole literary history of the subject; and several forms of apparatus are mentioned, which I have not been able to examine, as the works containing an account of them are not to be found in any of our London libraries.

§ Nusbaumer. *Annalen für die gesammte Heilkunde*. Karlsruhe, 1825. Vol. ii., part 1st, page 90.

|| Beschreibung und Abbildung eines neuen Lagerungs und Schweben apparatus, &c., von Alb. Ludw. Dornbluth. Berlin und Stettin. 1829. Illustrated with figures.

¶ Apparatus for fractures below the knee, by J. Grantham, in *Medical Gazette*, vol. xii., page 739; also vol. xvi. page 724. Illustrated by two figures.

consisting of a rest, in form not unlike a Macintyre's splint, having a thigh-piece, a leg-piece, and a foot-piece. On this the leg is placed (after splints have been applied) and strapped on. It is then swung by two ropes, one passing under the rest at the ham, and the other under the ankle. These ropes are attached to "anything which may be contrived at the top of the bed or over a couch." Published 1833.

VII. *Mr Luke's plan** consists "merely of a leg-rest, two splints, and a cradle." The "leg-rest may be made either of wood or sheet iron, the upper surface of which is hollow and roughly shaped to the form of the back of the leg. The rest is of sufficient length to reach from the foot to about five inches above the knee on the posterior surface of the thigh, and so fitted to the ham, as to afford support to the extremities both of the tibia and femur. The two (side) splints and the cradle being similar to those in ordinary use, need not any description. In applying the apparatus to its proper use, the leg-rest and splints being sufficiently padded, the fractured limb is adjusted on the former and secured by the latter, placed one on each side, and fastened by tapes carried around the whole in the usual way. This being accomplished, the rest, &c., is suspended by means of two other tapes, passed under it and over the middle bar of the cradle, now put in a convenient position over the limb. One should be

placed near the ankle-joint, and the other a little below the knee." This is a simple and efficacious plan, and one very easily applied. It was first described in 1841.

VIII. *Torbock's apparatus*.†—This device consists of a very strong iron vertical rod, which is fixed to the side of the bed by a clamp screw; this rod is capable of being elongated by rack-work, which is worked by a key. From the summit of this vertical rod a horizontal one stretches across the bed, attached by one end to the vertical rod, and free at the other. The horizontal rod rotates upon the vertical, so that its attached end is the centre of a circle of which it is a *radius*, and the line described by the movement of its free end an *arc*. Its form is like that of a sign post of a country inn. The horizontal beam is a polished rail, upon which two wheels run (adding thus a second motion to the apparatus,) and these are connected to a crib below, in which the leg is placed, similar to the one used in my apparatus. The crib is underneath the bed-clothes, and the iron frame-work external, so that they are connected by an intervening portion, the motions of which are almost wholly prevented by the contact of the bed-clothes.

IX. I now, Gentlemen, have to ask your attention while I give you a detailed account of my own apparatus, which is before you. It consists of a cradle, similar in form but rather larger than the one ordinarily used for fractures of the leg; and it performs the office both of

a protecting cradle and of a swing, thus far resembling Mr. Luke's but no farther.

There are two iron arches, connected by six horizontal rods; the rods connecting the extremities of the arches are flat and heavy, so as to make the cradle rest firmly upon the bed. The lower of the two rods connecting the summits of the arches, is a rail of polished steel (*b*) on which run the wheels *c* that are placed on it, all pressure of the bed-clothes on these wheels being prevented by the rod (*a*) which extends over the rail. The *train* consists of two brass wheels, and, from the axes of these, iron plates extend down on each side to a swivel hook (*d*) underneath the rail. This train readily moves up and down the rail. From

the hook hangs a chain (*f*), consisting of several links, and attached below to the summit of an arched piece of iron—the *span* (*e*). The span is a narrow strip of iron, bent in a semicircular form, having at the extremities two buttons on each side, by which it is attached to the remaining portion of the apparatus—the *crib*. The crib is composed of two flat laths of mahogany, from which hangs a sort of bag of jean for the reception of the broken limb; attached to the strips of wood are two little plates of brass, perforated so as to admit the buttons at the extremities of the span, and by this means the sides of the crib are kept sufficiently near, and also kept sufficiently apart to form a convenient receptacle for the leg.

* Suspensory apparatus by J. Luke, in *Medical Gazette*, vol. xxvii., page 652, illustrated by a figure. I would recommend the reader to peruse this sensible paper from the pen of Mr. Luke, to whom, as it seems to me, we are indebted in this country for bringing prominently into notice this plan of treatment.

† I am not aware of the history of this invention, or whether there is any published account of it. I have seen it under the name of "Torbock's apparatus" in King's College Hospital. It is manufactured by Mr. Joseph Wood, of York.

Now, nothing can be simpler or easier than the application, removal, or readjustment of this apparatus. It is not meant as a substitute for splints, but after the application of splints the limb is placed upon the expanded crib, which is laid out on the bed underneath it, the sides of the crib are then brought up and buttoned on to the extremities of the span; the cradle now being placed over the leg, the span, and with it the leg, is raised, and its hook inserted into one of the links of the chain, that link being chosen the height of which best suits the patient. The adjustment of this contrivance is the work of a moment. It is a matter of indifference what splint is used, for the swinging is quite independent of the setting of the leg and adjustment of splints, and is superadded to it. A single or double side-splint, with a foot-piece, may be employed; or, what I prefer, the lower part of a Macintyre's splint, with the thigh-piece, extension-screw, and foot-rest removed. This receives the leg and foot very comfortably and firmly, and they may be bandaged up in the ordinary way, and independent of the swinging apparatus, which is applied afterwards.

The mechanical advantages, which it was my object to gain by the apparatus I have now described, are partly common to other forms, and partly peculiar to itself, and are principally these:—Complete protection from the bed-clothes, so that they shall not interfere with the motions of the leg. In all the other apparatus I have mentioned, excepting Luke's and Hecker's, one extremity of the cord, by which the limb is swung, is external to the bed-clothes, while the other is within. The effect is, that in passing into the bed almost all motion is prevented by the entanglement of the blankets and the arrangements which are necessary to keep the clothes from pressing on the foot and leg, so that the object of the contrivance is pretty nearly neutralized thereby. I may enumerate the facility of application and simplicity, and the graduation in height of suspension, as advantages which my apparatus possesses.

The running of the train upon the rail which supports the leg, allows a very considerable amount of motion without disturbing the relation of the parts; the leg may be moved *en masse* eighteen inches without altering the relative height of the heel or knee, so that the patient may completely alter his position in bed without disturbing the adjustment of the leg. From this circumstance, when the leg is thus swung, the patient can sit up in bed to take his meals, or to read or write; and I must here observe, that when an invalid sits up in bed, that act does not consist in merely assuming the sitting posture—in bending the trunk upon the thighs—but he always instinctively, as it were, draws himself up towards the head of the bed a foot or so, so as to rest his loins against the pillow and bolster, from which he receives no small amount of support. This you may easily see for yourselves, by telling the next patient you visit to sit up in bed; you will see how he involuntarily draws himself up, and rests his back against the pillow, so as to place his buttocks where his shoulders were previously, when he was lying down, just below the pillow. Now, the motion of the

train upon the rail, and with it the crib and leg, just allows this posture to be assumed at pleasure by the patient. In the other swings placed under the bed-clothes, (Hecker's and Luke's), this is prevented, and the amount of movement very limited, from the fact that the upper attachment of the suspending cord or chain is fixed, and the only motion that the limb enjoys is the swinging in a small arc of a circle, of which the suspending cord is a radius, and its upper attachment the centre.

From the action of the swivel hook the patient gets another movement—he can shift his body from one side of the bed to the other, while the foot moves in the opposite direction, the leg moving in the same plane upon the axis of the swivel. I cannot understand that this movement is allowed in Mr. Luke's arrangement, at least to any appreciable extent, as the tapes by which the leg is swung are at both extremities of the leg, and would seem to me to counteract such a motion; whereas, if the tape were single, and attached to the centre of the leg, the twisting of this tape would be equivalent to the rotation of the swivel.

I need scarcely point out to you the great advantages which arise from any apparatus or arrangement which allows a patient, confined to bed, some change of posture—some relief or change of pressure from those parts of the body on which he rests when lying down. Any one who has seen the most moderate amount of hospital practice, must have observed the distressing consequences which are entailed upon those patients who, through a protracted illness, are confined to bed in one posture, without any change or shift of position. The accumulation of filth and moisture under the patient, the inconvenience and difficulty with which he passes his evacuations, the obstacles to changing his bed-linen, and, above all, the horrid bed-sores, are to be attributed to this circumstance. Bed-sores are pre-eminently the destruction of the bed-ridden, and result from protracted pressure upon some unrelieved projecting spot—the sacrum, the hips, the scapulæ; and whether it results from paralysis, where the patient does not feel pain in the part pressed upon, and therefore does not care to move his position, or where, from loss of motor power, he cannot change posture if he did feel it; or whether it results from the patient being tied down to his bed by a fixed immovable splint, the result is the same—the skin of his back becomes gangrenous from pressure, a slough comes away, and an unmanageable sore is left, only to be enlarged by the still existing cause. How common is it for a patient who has to pass through the tedious weeks or months which are required to cure a *compound fracture* of the leg, especially if his case be complicated, as too often happens, with *necrosis*, *exfoliation*, *abscess*, or even *erysipelas*—his leg being fixed all the while in an immovable splint—to sustain bed-sores; but, swing his leg, put him in circumstances where he can sit up when he likes, or lie down when he likes, so that he can pass his evacuations with cleanliness, and be kept dry, and relieve the pressure on any particular spot, and then you will find the cause of the bed-sores removed.

Let me, gentlemen, conclude my paper with a short account of Mr. B.'s case, as far as it relates to the question now under consideration; for him I devised my apparatus, and to him it was of so much service.

Mr. B. was a gold merchant from the coast of Guinea; he was a man of colour. He was thrown from an omnibus in the Strand, and sustained a compound fracture of the left leg, in the latter part of December, 1849. Mr. B. is a tall slim man, of delicate frame, about 48 years of age, and healthy. The accident happened very near the hospital, and he was immediately brought into the house. It was then found that the left tibia was broken at the junction of the lower with the middle third, and the upper fragment, as is usual, was thrown forwards and overlapped the lower, and it protruded through the skin at least three inches. The laceration of the integument was not very great. The fibula was broken high up, and the fracture was simple. The patient being put to bed, the leg was placed in a Macintyre's splint, the parts having been previously restored, as nearly as possible, to their natural position.

From that time till he left the hospital, this patient exhibited almost every kind of varied complication which can follow such an accident. It was just one of those difficult cases, which require so much skill in treatment on the part of the surgeon, and all that judgment and tact, which, I need scarcely tell you, it received at the hands of Mr. Partridge, under whose care Mr. B. was placed.

The limb was at first kept in the Macintyre's splint; the wound poulticed twice daily, and sponged softly at each dressing. This was continued for three weeks, during which the patient progressed favourably. He now began to complain that his back felt tender from pressure upon the sacrum, and Mr. Partridge determined to use a swinging apparatus, and Torbeck's was employed. The plan that was adopted was this:—A splint was employed, consisting of the leg-piece and foot-piece of a Macintyre's splint, the thigh-piece and screw beneath for extension being removed, and the rest beneath the heel, for the support of the foot, was also cut off. This splint was padded with flannel, and covered with oil-silk. Previous to placing the leg in the splint, the limb at each dressing was raised, and well sponged on the under surface, dried, and then clothed with broad straps of lint, thickly spread with simple dressing, so as thoroughly to protect it; it was then carefully let down into the splint placed underneath for its reception, and fixed by stocking bandage at the foot and at the upper part of the leg, the wound being left bare for the poultice, which was changed twice daily. The leg was then swung.

It was found that this mode of procedure answered well, excepting that the movement of the leg in the swing was very limited. There was the greatest difficulty with Torbeck's apparatus to employ any cradle to keep off the bed-clothes, and the adjustment of the cradle and bed-clothes pretty nearly prevented all motion of the leg, entangling and fixing the suspending chain which passed through them. The apparatus before you was devised to obviate these difficulties.

It is not my intention to enter minutely into the details of Mr. B.'s case: suffice it to say that he suffered severe complications. He was attacked repeatedly with erysipelas; he had several deep-seated abscesses in the leg and thigh. At one time there was enormous effusion into the knee-joint, and on three separate occasions considerable exfoliations took place from the tibia. Those of you who did not see him, must needs think how perilous was his condition, and will not wonder at the fear we entertained lest this lean worn-out patient should suffer bed-sores; but from the cleanliness of the nurse, and the facility to cleanliness and change of posture which the swing afforded, this evil was warded off.

It was with great satisfaction that I often witnessed the comfort and convenience that were afforded Mr. B. by the swing. I have frequently watched the manner in which he would assist himself; he would shift himself to one side of the bed, reach over and take up the *pot de chambre*, use it, resore it to its place, and again get to the centre of the bed, with great alacrity, his broken leg swinging about under the cradle in accordance with the movements of his body, moving altogether and without concussion or injury, which could not have been effected without the swing. In the same way he would raise himself in bed and sit up, leaning his loins against the pillow unassisted, take his book from an adjacent table, or his paper and writing case and write. Again, any blow that struck the bed could produce no concussion of his leg, and any start he might make in his sleep would not displace its parts. All swung easily and lightly and all moved together.

Mr. B. remained in the hospital four months, and left it ultimately quite restored.

I must mention that my apparatus was manufactured by Mr. Matthews, Portugal Street, Lincoln's Inn, and it was well put out of hand, at a moderate charge.

CASE OF UNUNITED FRACTURE.

By J. H. HOUGHTON, Esq., M.R.C.S., DUDLEY.

On the 21st of January, 1850, whilst at his work, Daniel Simmonds, a fine-made hearty miner, sustained a simple fracture of the left tibia and fibula. I reduced the fracture without difficulty a short time after it occurred. A little opium was given at intervals as it seemed necessary, and the bowels were regulated till the end of about four weeks, (during which time his health was excellent,) when on examination I found that union was exceedingly imperfect. Anxious, however, to disturb the bones as little as possible, I again applied the splints without minutely examining the state of the union, and desired him to keep perfectly quiet. In about four weeks, again the fracture was carefully examined, when it was found that very little, if any union, existed.

The limb was now enclosed in three gutta percha