Description of an apparatus intended to facilitate the treatment of fractures of the lower extremity / by T.M. Greenhow.

DESCRIPTION

OF

AN APPARATUS

INTENDED TO FACILITATE

THE TREATMENT OF FRACTURES

OF

THE LOWER EXTREMITY.

BY T. M. GREENHOW,

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TO

THE GOVERNORS

OF THE

NEWCASTLE INFIRMARY.

In the course of my professional duties in the Newcastle Infirmary my attention having, in a particular manner, been directed to obviate the formidable difficulties which present themselves in the treatment of the more serious kinds of Fracture of the Leg and Thigh—and knowing how earnest is their desire to mitigate the sufferings, and ensure the utmost degree of comfort to the patients admitted into that excellent Institution, I feel that it is with peculiar propriety that the following description of an apparatus intended to conduce to these purposes, is inscribed to its Governors, by

Their faithful and obedient Servant,

T. M. GREENHOW.

Eldon Square, Newcastle upon Tyne,
July 25, 1833.

PREFACE.

To the experienced practical Surgeon, who has had occasion frequently to grapple with the untoward circumstances which arise in practice, the Author needs offer no apology for inviting attention to a new and efficient Apparatus for Compound and other Fractures of the Inferior Extremity: but it is not unknown to him that, in the minds of some persons, whose opinions and judgment on many subjects he would receive with the utmost deference, prejudices exist against the employment of mechanical agents, either in the reduction of fractured limbs or for their preservation in that state of perfect rest, as regards the relative position of the extremities of the injured bone, which so greatly conduces to complete recovery. The human hand, it is maintained, is the most

delicate and effectual agent for the accomplishment of the first of these objects, and the simpler the means by which the second is attained the better. If the truth of these positions were proved by the practical experience of Surgeons accustomed to the management of such accidents, the Author would be the last to propose less simple means for fulfilling the indications to be attended to in their treatment; ut as the annals of surgery abound with proofs of the occasional, if not frequent, failure of the means referred to, and, indeed, of any means hitherto employed, in ensuring in all cases a perfect recovery, and in preventing much suffering during the treatment, the Author deems himself not only justified, but bound by the most sacred ties of duty, to lay before the public the mode in which the employment of an additional mechanical power may be resorted to with more than ordinary certainty of success.

Nor is it wonderful, when we reflect on the condition of a fractured limb, that it should require the most diligent efforts of the human mind, guided by the purest principles of mechanical science, to devise the most effectual means of controlling the various disturbing causes which are called into

operation, during its progress towards recovery.—It forms a part of an ever-acting mechanical engine made up of levers, pulleys, and moving forces of very considerable power, which the will of the individual mind, whose organ it is, becomes unable to command in consequence of the altered relation of its parts. The severed portions of bone are acted upon by these forces, as well as by position and weight, in a manner that can only be counteracted by mechanical forces of equal or superior power; and why, after the experience of ages has proved that one set of mechanical agents is unequal to this end, the assistance of one yet more powerful should be rejected, the Author confesses himself unable to discover.

The screw, it is true, is a mechanical agent of nearly unlimited power, but it is also one capable of the most exact and delicate adjustment; and it is these two properties which render it so peculiarly fitted to fulfil, in the most perfect manner, the several indications of treatment in cases of fracture. The superior qualities which it possesses over the hands of several assistants, which rarely act with a tolerable degree of consent or co-operation, will be readily acknowledged by those

who have witnessed the ease and precision with which it is capable of reducing the fractured bone, as well as of maintaining it in its proper position with undeviating exactness.

It must not be assumed, then, that, because the immense power of the screw might, by possibility, lead to mischievous results when injudiciously used, it is not, therefore, well fitted for surgical purposes. Its excellency is greatly dependent upon its power, and it is the duty of every Surgeon to employ it, in common with every other surgical agent, with a due degree of intelligence and caution. The lancet, the scalpel, or the saw, are agents of fearful mischief in the hands of empirical rashness and ignorance, but of undeniable benefit when directed by science, judgment, and practical skill.

DESCRIPTION, &c.

NOTWITHSTANDING the numerous varieties of apparatus, of a more or less complicated character, which have been employed in the management of the several kinds of fracture to which the lower extremities are liable, and, though the ingenuity of many eminent Surgeons has been exerted to obviate the various difficulties which are met with in the treatment of many of these accidents, it will, I doubt not, be admitted that they are too frequently unsuccessful, with whatever degree of care and skill they may be applied. This is more especially the case in compound fractures of the leg, attended with extensive injury of the soft parts, and in fractures of the upper portion of the thigh-bone; and when they occur near the trochanters, or in the neck of the bone, it is scarcely possible to prevent some degree of deformity, or to ensure bony union. That the causes of failure are to be found principally, or entirely, in the impossibility of

maintaining the complete and unvarying apposition of the fractured surfaces and the necessary extension of the limb, is, I believe, generally admitted; and if these two circumstances could be easily and completely effected, much would be done to ensure in every case of fractured femur a favourable result. It is in the invariable accomplishment of these indications that I entertain very confident hopes, that the apparatus, which I am about to describe, will be found more advantageous in its application than any that has heretofore been proposed. Nor are these the only benefits to be derived from it; it will be found to effect the degree of extension and counter-extension required for the reduction of the bone, with greater ease and certainty than can otherwise be attained; it will admit of those movements, on the part of the patient, which may be necessary for his comfort, or for effecting the natural evacuations, without hazard of deranging the fractured bone; and will altogether be found to contribute very largely to his ease and well-doing during the irksome confinement which must unavoidably attend his recovery.

Without entering into any detail of symptoms, causes, or diagnosis, or describing the various modes of treatment which have been recommended by other Surgeons, all of which are, no doubt, sufficiently known, I shall proceed to a simple description of the construction and application of the apparatus, which it is my object to propose as their

substitute, on the ground of its superior efficiency and ease of application. In the construction of the several parts of this machine, I have availed myself of the powerful mechanical agency of the screw. It is by the screw that extension is produced, regulated to the greatest degree of precision, and maintained without hazard of injurious retraction; and it is by the same power that the leg is suspended, or slung, at such a height from the bed as may be found most consistent with the ease and safety of the patient.

The first part of the apparatus to be described is a stand, to be placed upon the bed for the purpose of suspending the leg in an easy sling. This is formed of iron, and is of an oblong figure, with an upright pole at each corner; a moveable framework, consisting also of four upright extremities, connected by a longitudinal beam at bottom, and having slides at each corner which play upon the four poles of the lower part of the stand, admits of being raised or depressed as occasion may require, by means of a perpendicular screw placed in the centre of the longitudinal beam. In this way the height may be varied from twelve to eighteen inches. The poles are furnished with hooks at the top, between which is suspended a cross strap at each end of the stand, and on these straps is supported that part of the apparatus on which the fractured extremity is to be placed. This sling, though sufficiently strong, is neat and light in its

appearance, and will stand steadily upon the bed, provided the lower end be supported by a string attached to the bed-poles.

The advantages of slinging a broken leg or thigh are very great. It will be well, perhaps, in this place, to notice the more striking of them. 1. The greater certainty with which we can command the relative position of the pelvis and the injured limb. When the latter is immoveably fixed, it is well known that any movement in the former, however slight, must occasion a greater or less degree of displacement of the extremities of the fractured bone.— But by having the leg thus supported in a sling, it is permitted, with perfect safety, a degree of freedom which enables it to accommodate itself to any movement of the pelvis : it makes a corresponding movement which preserves completely their relative position. 2. It is by the consent, thus established between the pelvis and extremity, that the patient's bowels may be easily evacuated without injury or danger, while the greatest degree of cleanliness may be observed. 3. In compound fractures of the leg, the sling is remarkably useful in maintaining the horizontal position of the leg, while the knee is bent at that angle which is found most compatible with comfort. By this position the weight of the stream of blood is prevented from pressing upon the injured part, while the most perfect rest is ensured, and a degree of coolness which cannot be obtained when the leg is

closely surrounded by pillows. 4. As regards the general feelings of the patient, it will be found that the sling contributes in an extraordinary manner to his ease and comfort.

The remainder of the apparatus may be considered as a species of splint,* though differing essentially in its form and principles of application from any hitherto described. The knee is received into a deep hollow, where the part appropriated to the leg is united to that which is fitted to the thigh, at an angle of about 35 degrees. This forms a permanent flexion of the knee joint, at that angle which I have found most comfortable to the patient, which places the largest number of great muscles in a state of relaxation, and which enables it to be made an undeviating fixed point in performing and maintaining extension either of the leg or thigh. From the upper margins of the hollow for the knee proceed downwards two bars of iron at a distance of six inches from each other; these are united at the bottom by means of a cross bar placed at a distance of twenty-two inches from the knee. The space between these parallel bars

* Those parts of the apparatus which come in contact with the limb are well padded; the padding being made of materials which will admit of being removed for the purpose of washing, and refitted to the apparatus with the greatest ease. But to defend either the padding or the sling for the leg from being soiled by the discharge attendant on compound fractures, I should advise a piece of oil-silk, or India rubber cloth, to be laid over them.

is vacant, except for about three inches below the flexure on which the knee rests. A screw plays through the cross bar at the bottom, by means of which is moved a foot-piece which slides along the parallel bars with a steady motion. To the foot-piece is affixed, by means of straps, which regulate accurately its height, &c., a shoe made of soft materials, and provided with straps and buckles for fixing it firmly to the ancle and instep.

It will appear obvious that in fractures of the leg, whether simple or compound, when the knee is made a fixed point and the foot properly fixed in the shoe, extension to any degree can be made with ease by means of the screw which acts upon the foot-piece. When turned in the proper degree, the screw is prevented from further motion by means of nuts which are brought close to the cross-bar through which it plays. Though perhaps all this may seem complicated in description, it is perfectly simple in its operation. The fractured bone is thus effectually reduced and secured from displacement; but it will be found to be fixed and supported at the extremities only, while the central part is in an insulated state between the two parallel bars which stand at a considerable distance on either side.

The nature of the accident must now determine our further proceedings. If it be a simple fracture, side splints may be applied to the leg, and fixed by straps, tapes, or in such manner as incli-

nation may dictate. The bars are furnished with a number of studs, at distances of two inches from each other; to these must be affixed a back support for the leg, made of strong ticking, which, by means of buckles, can be made to apply with a comfortable degree of tightness to the back of the leg, without making any unpleasant pressure on the calf or other parts. It is in compound fractures of the leg that this arrangement is found peculiarly advantageous. By dropping the sling, which has just been described, the leg becomes insulated from the ankle nearly to the knee, so that the dressings and bandage may be removed, and the greatest attention to cleanliness observed without the slightest hazard or disturbance. We are thus furnished with facilities for the management of accidents of this description which have hitherto been unattainable, and which will be found to tend greatly to a favourable result; while they relieve the practioner from much of the solicitude and anxiety which have necessarily arisen during his attendance upon them.

In a case of compound fracture of the tibia which lately occurred in the Newcastle Infirmary, I have had an opportunity of putting to the proof the many advantages of this mode of treatment.—A young man, of about 19 years of age, had his leg broken by a sort of low wheeled waggon, (called a rolley,) used to convey corves of coals in the pits, the wheel of which passed over it.—

The fractured ends of the bone protruded to a considerable extent, and a portion, which was completely detached, was removed. The periosteum was destroyed for several inches, and the external wound extended nearly from the ankle to the knee. It was a large gaping lacerated wound; and altogether the accident was of so severe a character as to render it doubtful whether an attempt to save the leg could be made with prudence or a reasonable chance of success. After some consideration it was determined to give it a trial. I, therefore, placed the limb upon the apparatus, rendered the knee a fixed point by means of the straps above and below it, fixed the foot in the shoe, and by acting upon the foot-piece with the screw, the overlapping portions of bone were brought back to their places with ease and precision. The wound was so wide that the edges were drawn together with strips of plaster, a many-tailed bandage was applied, the sling was adjusted, and the patient was left in a more comfortable state than could have been expected. In consequence of the general bruises which he had received, leeches were applied to the abdomen, and an anti-phlogistic plan of treatment was pursued. In three or four days the dressings were removed and the wound thoroughly cleansed; which operation has been repeated on every second day since, quickly and easily; and the progress of the cure has gone on uninterruptedly. A portion of the bone, which

was denuded of periosteum, must be thrown off by exfoliation; but this process appears to be going on in the most favourable manner; while the general aspect of the wound is clean and healthy, and its extent daily diminishing. The constitutional disturbance has been greatly less than I have ever before known to arise from such an accident; and I am assured that this has in great degree arisen from the easy position in which the limb was slung. The adaptation of the bone has been maintained with unvarying precision.* It is true that this is but a single case, but it is one of the strongest character; and if the success of the apparatus has been thus complete where the difficulty and danger were so considerable, surely we

* The only incovenience that has arisen in the treatment of this patient was occasioned by the imperfect construction of the shoe, which, about six weeks after the accident, began to produce irritation and excoriation of the heel. To prevent this accident in future, I have had a shoe constructed on better principles, and of softer materials, which, if carefully fitted, I doubt not, will be found to answer well. If, however, a similar accident should be threatened, I should advise a cushion of elastic gum cloth, partially filled with water, to be placed on the sling for the leg to rest upon. The equable support afforded by this hydraulic pillow must necessarily obviate all hazard of the partial pressure by which excoriation is occasioned. In the case above noticed, at the end of eight weeks, bony union is so complete (although some dead portion must yet be thrown off by exfoliation), as to admit of the limb being removed from the apparatus, and the treatment conducted as if for a wound of the soft parts only. The great extent of the wound is rapidly diminishing, and it presents a very healthy appearance.

are justified in concluding that in less formidable cases its employment will not be found less efficacious.

In fractures of the thigh, especially in the upper part of the femur, the difficulty of maintaining extension and perfect apposition of the fractured surfaces of the bone, by any means in general use, is well known. The arrangement of the instrument for these purposes is simple and efficient.—The limb must be placed upon the apparatus, supported upon the sling, the height of which must be regulated according to the length of the femur, by turning the perpendicular screw. The knee must be rendered a fixed point as before, by buckling the straps above and below its flexure. The back portion of the apparatus must be made (by means of the moveable slide) to reach to the tuberosity of the ischium ; and the outer portion, which passes on the outside of the thigh, parallel with the bone, and has an iron loop at the upper end for the reception of a groin and a pelvis strap, must be extended by the screw to the degree required. Of course, the groin strap must be properly adjusted before the extension is made. The power of this screw will be found very great, but it can be used with so much caution, and so gradually, as to exclude all hazard of mischief. When the proper degree of extension has been accomplished, the pelvis strap ought to be applied, by means of which, in fractures of the neck of the femur, or

in the neighbourhood of the trochanters, the broken surfaces can be pressed together with any degree of force that may be required. The position of the iron loop to which the pelvis and groin straps are fixed, standing off, as it does, from the general course of the outer line of the apparatus, and projecting above the great trochanter, renders it a most advantageous point for effecting both counter extension and co-aptation by compression.— A splint* may now be applied to the anterior surface of the thigh, and the whole bound down by the straps which pass through the apertures in the back part of the apparatus When this application of the instrument is made with care and accuracy (and it may at the same time be done with the greatest ease), it will be found that the limb has been placed in a state of unusual security from the influence of the various disturbing causes by which it is liable to be deranged : and, as its movements accommodate themselves readily to those of the pelvis, it will appear evident that the patient may be permitted to relieve himself by a slight change of position without danger, and that the difficulty of removing the natural discharges usually experienced, and so irksome to the patient,

* For this purpose, and for applying to the leg, within the parallel bars, when thought expedient, I have had some splints constructed of elastic steel, well padded, which appear to me to possess the advantages of firmness and precise adaptation to the form of the limb, while the irritation of partial pressure is entirely avoided.

will be entirely obviated. The moveable portion at the upper part of the femur, together with the screw which acts upon it, can be altogether separated from the other parts of the apparatus, when not required, as in fractures below the knee, and will admit of being fixed to either side, so as to be adapted to the corresponding extremity.

In addition to the accuracy and perfection with which this instrument appears calculated to answer every indication in the treatment of all descriptions of fracture of the lower extremity, I may add that the security is so great, that, in all cases, I believe, the patient may be taken out of bed occasionally (as was done with the patient whose case has been referred to within a week of the accident); and in cases of simple fracture of the leg, or of the thigh when not in the upper part of the bone, he may soon be permitted to sit up daily without danger, and, before long, to make use of crutches.

The parts of the apparatus will easily be understood by referring to the accompanying drawing.

Messrs. Weiss and Son, 62, Strand, London, have been furnished with a model, from which they will manufacture the instrument for the supply of hospitals, or of those surgeons who may be disposed to make use of it in private practice.

I cannot permit myself to conclude this description of an apparatus which, whether or not it may

be admitted to exhibit in its construction the application of a new mechanical power to the purposes of surgery, is at least novel in the arrangement and adaptation of its several parts, without expressing my warm acknowledgements to those eminent members of the profession who have taken the trouble to inspect it during my recent visit to London, and have favoured me with the following testimonials of their approbation of the scientific principles on which it is constructed, and the completeness with which it is calculated to accomplish its intentions :—

Conduit Street, June 26, 1833.

My Dear Sir,

I had much pleasure in examining your invention for the Treatment of Fractures, which is ingenious and well adapted to answer its purpose in preventing deformities in union. The screw must necessarily be the steadiest mode of inducing a regular and gentle extension of the limb.

I am, your's truly,

ASTLEY COOPER.

To T. M. Greenhow, Esq.

2, New Basinghall Street.

Dear Sir,

From a careful examination to which I have submitted the instrument of your invention for the support and adaptation of the bones in Simple and Compound Fracture, I have much pleasure in expressing my approbation, and opinion of its general utility and application to the most complicated of those accidents.

Your's, very truly,

GEO. LANGSTAFF.

To T. M. Greenhow, Esq.

Bruton Street, June 26, 1833.

I have been much pleased with the Apparatus for Compound Fracture of the Leg shewn to me by Mr. Greenhow, of Newcastle. It appears to me to combine the essential objects of position, security, and adaptation by extension, more perfectly than I have before seen them combined, and thus to offer the advantage of ease to the patient, and at the same time to remedy the inconvenience of partial pressure on the affected limb, if not to supersede altogether the confinement of splints. It is right, however, to state that this is only a theoretical opinion, the correctness of which I shall take an early opportunity of ascertaining.

BENJ. TRAVERS,
Sen. Surgeon to St. Thomas's Hospital.

To T. M. Greenhow, Esq., with Mr. Travers' compliments.

Golden Square, June 27.

DEAR SIR,

I have been so much gratified by seeing the Apparatus for Fractured Leg and Thigh, that I cannot refuse myself the pleasure of expressing it. The additional comfort it must afford to patients so circumstanced is so great, that I hope you will not omit the most effectual means of making it generally known.

I am, Dear Sir,
Your's, very truly,
THOS. COPELAND.

To T. M. Greenhow, Esq.

DEAR SIR,

I thank you for your kindness in showing and explaining to me your ingenious, and very efficient Apparatus for Fractures of the Leg and Thigh. It is the only one, which I have ever seen, that enables the Surgeon to bring the whole circumference of a

broken leg into view, after it has been set, without the least movement or disturbance of any part of the limb. This, as every man of experience knows, is a great advantage in the treatment of compound fractures, where the application of dressings to the wound sufficiently often, the prompt discharge of abscesses, the preservation of the parts in a cleanly state, and the opportunity of inspecting the position of the ends of the fractured bones in the early stages of the formation of the callus, are objects contributing very essentially to the favourable progress and termination of these accidents. I see, also, much to approve of in the simple contrivance which you employ for supporting and fixing the injured limb, as well as for making permanent extension, if judged necessary, either of the leg or thigh. Your invention appears to me to deserve the immediate attention of the surgical profession; and I shall take the first opportunity of pointing out its merits to the gentlemen who study surgery under me at the London University.

I am, Dear Sir,

Your's, very truly,

SAMUEL COOPER.

7, *Woburn Place, Russell Square, June* 28, 1833.

To T. M. Greenhow, Esq., Newcastle upon Tyne.

Dear Sir.

I had an opportunity of examining your Apparatus for Fractures of the lower Extremity, which I like very much. The principle is just, and the mechanical ingenuity very great, by which the same machinery is adapted to the different kinds of fracture. I hope you will tax your ingenuity further to make the machine simple and cheap: a low price is a most essential consideration.

I am, dear Sir,

Your very obedient,

CHARLES BELL.

29th June, Brook Street.

To T. M. Greenhow, Esq.

Dear Sir,

I have much pleasure in expressing my entire approbation of the Apparatus you have constructed for the Treatment of Fractures, and which, I have no doubt, will be found eminently useful in practice.

I am, dear Sir,

Your's, very truly,

HENRY EARLE.

George Street, July 1, 1833.

To T. M. Greenhow, Esq.

Office of the Army Medical Department, 2nd July, 1833.

My Dear Sir,

I have been much gratified by seeing the model of your invention for the setting and Treatment of Fractures of the Extremities. After the testimonials of approbation which you have received from the most eminent Surgeons who are in the exercise of their profession in the Metropolis, it is superfluous, if not presumptuous, in me to say anything; I may, however, be permitted to add, that in my humble opinion, your Apparatus seems to possess advantages for stationary military Hospitals, which no other that I have seen does.

Believe me, my dear Sir,

Most truly, your's,

J. M'GRIGOR.

To T. M. Greenhow, Esq.

Dear Sir,

I beg to thank you for having shewn me the Apparatus which you have invented for the Treatment of Simple and Compound Fractures of the Thigh and Leg. It combines many advantages, especially for the management of compound fractures, in which

it is equally difficult to apply an adequate force of extension, and to have the means of perfectly cleansing and making various local applications to the injured part. But your Apparatus is excellently adapted to both these objects. It has, besides, the recommendation of cheapness. I hope that you will leave a model in London, in the hands of some of our instrument makers.

I remain, my dear Sir,

Your's truly,

HERBERT MAYO.

19, *George Street, Hanover Square, July* 2, 1833.

To T. M. Greenhow, Esq.

My Dear Sir,

You must think it very extraordinary that I did not perform my promise, in communicating to you my conviction of the *general* application of your splint in Fractures of the lower Extremity, I will not say *constant*, because I believe no Apparatus can be made which can be rendered applicable to all the concomitant circumstances of these accidents; but this I will say, I never saw one better suited to combat most of the difficulties.

I remain, dear Sir,

Your's, very truly,

BRANSBY B. COOPER.

New Street, Wednesday, July 3.

To T. M. Greenhow, Esq.

2, *Berkeley Street, July* 3, 1833.

Dear Sir,

Your Apparatus for Compound Fracture of the Leg, &c., which you were so good as to shew me yesterday, will, I think, answer extremely well, and admits of being applied with ease, and, I believe, comfort to the patient. In very bad cases of compound

fracture it seems likely to be a more convenient Apparatus than any other now in use.

With regard to that for the Thigh, the alterations you have proposed to make will render it more perfect; and, if on trial, the whole is found to answer, and to make the extension and counter-extension in an easy and effective manner, a great desideratum will be supplied.

Believe me, my dear Sir,

Your's, very truly,

G. J. GUTHRIE.

To T. M. Greenhow, Esq.

London, 36, *New Broad Street, July*, 1833.

My Dear Sir,

Allow me to express to you how much I have been gratified by the inspection of your Apparatus for Compound Fractures, &c., which appears to me to accomplish the double purpose of fixing the limb, and allowing it to be dressed as often as may be required, without in the slightest degree disturbing it. As far as I can judge, without having witnessed its effects at the bed side of the patient, I should think, too, it must conduce to the ease no less than to the security of the limb; and that it will be found to lessen pain and prevent deformity.

I am, very faithfully, your's,

SOUTHWOOD SMITH.

To T. M. Greenhow, Esq.

14, *Saville Row, July* 2, 1833.

My Dear Sir,

I thank you for the opportunity which you have afforded me of inspecting the Apparatus which you have invented for the Treatment of Compound Fractures. The construction of it is at

the same time ingenious and simple; and I have no doubt that we shall find it an important addition to the means which we possess of managing cases of this kind of accident.

I am, dear Sir,

Your faithful servant,

B. C. BRODIE.

To T. M. Greenhow, Esq.

DESCRIPTION OF THE PLATES.

PLATE I.

FIGURE 1 represents the stand for slinging that part of the apparatus more immediately connected with the limb.

A, the lower part which rests upon the bed; B B, the moveable part which slides upon the upright poles at C C, so as to regulate the height of the sling.

D, the screw, by means of which the moveable part is raised or depressed.

E E, the straps, suspended by rings from the hooks at the extremities of the upper part, on which the limb is slung. These straps admit of being lengthened or shortened, by means of the buckles, so as still further to accommodate the height of the sling to the particular case to which it is applied. In compound fractures of the leg, the horizontal position will always be preferred; but in fractured thigh, the apparatus can easily be placed in the position of a double inclined plane, if thought advisable, by lengthening the strap which supports the lower end of the apparatus. It will be observed that one end of the stand is narrower than the other; the narrow end is intended to be placed next to the knee, that it may interfere less with the opposite leg of the patient, while the greater breadth of the lower end enables it to stand more firmly: greater steadiness is ensured by fixing a tape to the part F, and attaching it to the bed-poles.

Figure 2 represents the principal part of the apparatus.

A A, the parallel bars which pass on each side of the leg, at a distance of six inches from each other; they are furnished with a number of studs to which is affixed,

B, the support for the back part of the leg. This is made of strong ticking, and admits of being nicely adapted to the form of the leg by means of the straps C C, which hang upon the studs, and can be lengthened or shortened as may be required by means of buckles.

D, the foot-piece, which slides between the parallel bars, and is acted upon by the screw E, which plays through the cross-bar F.—When extension has been carried to the proper degree the screw is secured from further motion by the two nuts which must be screwed against the cross-bar.

G, the shoe, furnished with straps and buckles, by means of which it will admit of being fitted to any ordinary-sized foot; the shoe is suspended by a strap which passes over the top, and is received into a buckle at the back of the foot-piece. Two other straps pass through

apertures in the foot-piece and buckle behind, so as fix the shoe more firmly in its place.

H H, the part of the apparatus which is adapted to fractures of the femur.

I, the moveable portion on the outside of the thigh, which admits of extension to the requisite degree by means of the screw K.

L, the iron loop at the upper end of the moveable portion, which admits of being fixed to the pelvis by means of two straps M M, one of which passes round the pelvis, and the other by the groin, embracing the tuberosity of the ischium.

N N N, other straps for fixing the apparatus firmly to the limb; they pass through apertures at the lower side of the iron work.

O, the screw, by means of which the sliding portion at the back of the thigh is fixed, when lengthened, so as to make it press against the tuberosity of the ischium.

P, screws for detaching the upper moveable portion of the apparatus when the fracture is below the knee, or for fixing it to the other side when the opposite thigh requires its application.

Figure 3 represents the key for acting on the screws E and K, Fig. 2, in producing extension either of the leg or thigh.

PLATE II.,

Represents the apparatus as applied to the limb in fractures either of the leg or thigh.

Previous to the application of the apparatus it is advisable to pass a few turns of a flannel roller round the knee, to protect it more completely from partial pressure than can be done by padding alone, however carefully it may be fitted. It will be found useful to employ the same precaution for the protection of the foot previous to fitting on the shoe, which nevertheless is constructed with great care and of very soft materials.

The iron loop for the reception of the groin and pelvis straps, by means of a very obvious contrivance, admits of being turned upwards in the direction of the superior spinous process of the ilium on either side, so as to give the most effectual bearing on the pelvis in producing counter-extension by means of the screw.

It has been thought unnecessary to represent in the plate the elastic steel splints which form a part of the apparatus. Their construction is peculiar, and will be found well adapted to their purpose. In compound fractures of the leg, it will frequently be found better not to produce irritation by the application of any splint next the limb itself,

as it will be steadily supported by the shoe and parallel bars, if properly applied. In other cases two of these splints may be applied with advantage; and in fractures of the femur, one may be placed on the front, and a second on the inner side of the thigh. The straps represented in the plate will fix them firmly in their places.

It is due to Messrs. Weiss to express my high approbation of the complete and elegant manner in which they have constructed the apparatus from which the drawings for the plates have been taken.

Fig. 1.

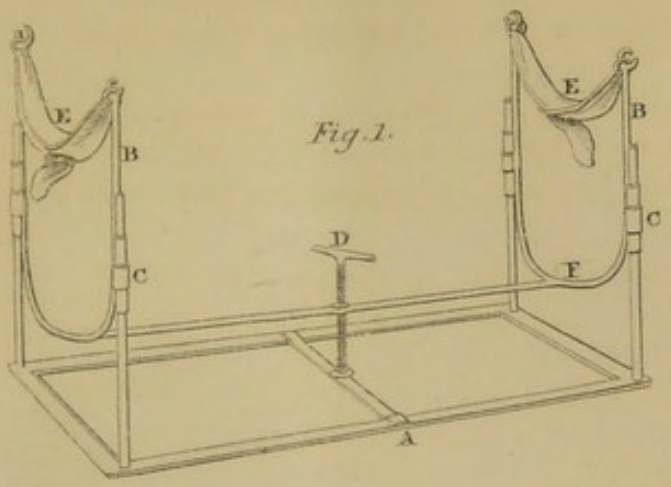

Fig. 2

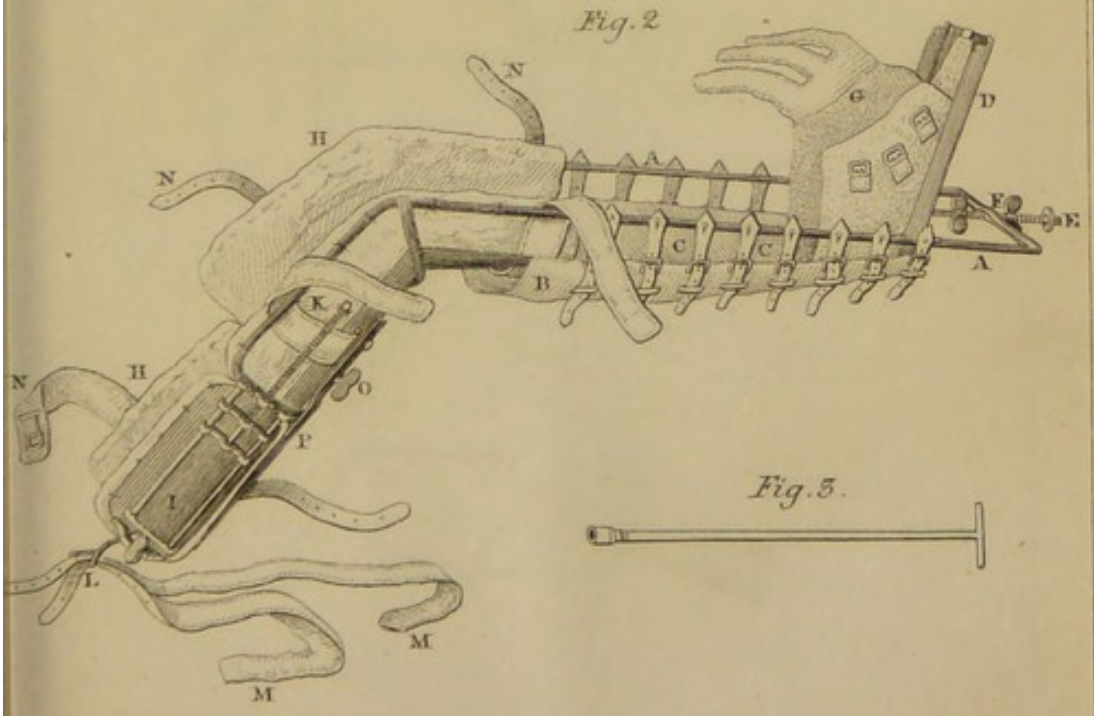

Fig. 3.

Engraved by W. Clerk