

The conductor and containing splints, or, A description of two instruments, for the safer conveyance and more perfect cure of fractured legs : to which is now added, an account of two tourniquets upon a new construction ... / by Jonathan Wathen.

Contributors

Wathen, Jonathan, 1729-1808.
Sharp, William, active 1766-1767.
Royal College of Surgeons of England

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So all Sharp from the Auth

A
DESCRIPTION
OF
TWO MACHINES,
FOR THE
CONVEYANCE AND CURE
OF
FRACTURED LEGS.

THE THIRD EDITION,
With considerable IMPROVEMENTS.

[Price One Shilling and Six-pence.]

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2.

T H E
Conductor and Containing Splints ;
O R, A
D E S C R I P T I O N
O F
T W O I N S T R U M E N T S,
F O R T H E
S A F E R C O N V E Y A N C E
A N D
M O R E P E R F E C T C U R E
O F
F R A C T U R E D L E G S :

To which is now added,

An Account of Two TOURNIQUETS upon
a new Construction.

T H E W H O L E

Illustrated with COPPER-PLATES ; representing the
several Instruments treated of.

By JONATHAN WATHEN, *Surgeon, F.A.S.*

L O N D O N :

Printed for T. CADELL, in the Strand.

M.DCC.LXXXI.

Conductor and Conductor's Splines

DESCRIPTION

TWO INSTANTANEOUS

EVERY CONVEYANCE

MORE PERFECT CURVE

FRAGILE AND LIGHT

A Series of Two Instantaneous

the new

Improved with Conductor's Splines; representing the

ALONZO W.

Printed by T. C. C. in the Strand.

INTRODUCTION.

SOME years ago, I published a description of two machines; one for carrying, another for the more easy cure, of a fractured leg.

The acknowledged utility of both these inventions has induced me to pay a further close attention to their structure; which has led to the discovery of very considerable improvements in each of them. For this reason, I have now printed a third edition of that little tract, with a particular account of the improvements made in the machines of which it treats. To this is added, the representation of two new invented Tourniquets; constructed in such a manner, as to be easy of application, and capable of being instantly slackened, tightened, or removed, at pleasure.

In these properties, they possess all the advantages of M. Petit's Tourniquet; without the incumbrance of its high handle, or the hazard, thereby occasioned, of an undesigned alteration, by the motions of the patient or of by-standers.

They are also so manageable by the operator himself, in amputations, as to render the turnstick needless; and, consequently, preclude the necessity of an additional assistant, which the turnstick always calls for.

Some, perhaps, may think, that if either of these do effectually compress the artery, which is the intention of them, there is no need of the other contrivance for the same purpose. This is true: but as I know not which of the two deserve the preference, I have presented both to the judgment of the public. The purchase of either of them does not exceed that of Mr. Petit's.

It will not admit a doubt, that in the army and navy a much greater number

of Tourniquets are required, than the surgeons of those departments are usually provided with; for, though wounds, attended with violent contusions, do not always immediately bleed, even when capital arteries are included in the breach of continuity; yet we have been publickly assured by a surgeon in the navy, that, in an engagement, where many happen to be wounded about the same time, not a few of them lose their lives by hæmorrhage, from a delay attending the application of the Tourniquet: which can only be prevented, by encreasing the number of those instruments *. Besides the immediate security which this would afford to the patients, it would also prevent the necessity of amputation; which

* See "Observations and Remarks respecting
 " the more effectual Means of Preservation of
 " wounded Seamen and Marines on board of his
 " Majesty's Ships in Time of Action; by James
 " Rymer, Surgeon of the Royal Navy."

the surgeon is often obliged instantly to perform, when the bleeding has commenced, to prevent its becoming fatal. Whereas, if the hæmorrhage is effectually suppressed and stopped by the Tourniquet, the patient may then be safely left till the engagement is over: when the surgeon, being at leisure to attend to the nature of every case, may find, that, in many of them, the operation for the aneurism is all that is necessary: or, perhaps, that some of them are curable by common means, without either of those operations. This observation is not intended as a reflection upon the army and navy surgeons; but rather for the information of those, who suppose, that a surgeon, during the terrors of an engagement, the shrieks of the wounded continually brought to him, and the hurry and ignorance of those about him, should be able to think, determine and act, as if he had only to do with a single patient in a private room; where he is
 liable

liable to no such confusion of thought, and has every convenience and assistance, that can be wanted, ready at hand.

It is under the former circumstances, that the use of the Tourniquet is of the highest importance: for, by the application of it, the patient is secured from the danger of a mortal hæmorrhage; and the surgeon relieved from the necessity of hastily performing an operation, in the midst of so much disturbance, and when he is not sufficiently provided for the purpose.

I have not given a particular description of these Tourniquets, because a view of the annexed plates, if a sight of the instruments themselves is not to be obtained, will afford a better idea of their structure and use, than could be conveyed by any merely verbal account.

It is evident, they are formed upon the same principle as that of the Conductor.

ductor. And it is not unworthy of notice, that the mechanism of this last named instrument admits of various modifications ; some of which, being properly applied, have been of great service, to the wry neck, incurvated spine, crooked legs, &c.

I.

OF THE CONDUCTOR.

THIS instrument is designed for the safe and easy conveyance of a broken leg, from the place where the accident happened, till the patient is laid in bed; and is intended to serve this purpose not only in simple, but likewise in all compound fractures whatsoever.

The chief alterations made in the structure of the CONDUCTOR, since its first publication, are in the stiles and canulas. These, instead of being square, are now round; by which new form, the weight of it is reduced near two-thirds, without any diminution of its strength.

This is the only difference to be allowed for in the plates: from which, in every other respect, a compleat idea may be formed of the Conductor now recommended.

When

When a fracture happens to the leg, so that both bones are broken, its inferior part becomes pendulous and flexible every way: notwithstanding which, the patient must be removed to his own habitation, generally up one or more stories; or, if indigent, to the nearest hospital. Nor was it possible, in any of the modes of conveyance before known, but that the inferior portion of the fractured limb should be frequently and variously contorted and bent; and the parts, surrounding the bones, bruised, pricked, and irritated, by the extremities of the fractured pieces. Hence must arise pain, swelling, inflammation, suppuration, convulsion, mortification; and even death itself, unless prevented by a timely amputation of the leg.

The fracture was at first, perhaps, merely simple, the contusion small, and the teguments entire; if so, the early application of the Conductor would have effectually prevented the whole
train

train of bad consequences above enumerated.

If, on the contrary, the fracture was originally complicated, oblique, or, the bones were forced through the skin; the injuries, sustained by the former modes of conveyance, must have been encreased and aggravated, in proportion to the violence originally committed: all which mischiefs are, likewise, now effectually prevented, by the timely application of the Conductor. This instrument is to be applied upon the fractured leg, in its short or unopened state, without removing either the shoe, stocking, or boot, if there happens to be one on the leg at the time of the accident.

Its largest band is to be buckled immediately below the knee, but above the top of the boot; and the smaller one, just above the ankle.

The band under the knee being kept fixed there, by hand; the surgeon lengthens the Conductor by pulling the lower band downwards: observing to

C

keep

keep the stiles and canulas in a straight direction. By these means the instrument is lengthened : but, as the bands cannot advance, either beyond the knee or ankle ; the fractured bones are necessarily extended by it, in a proportion similar to that of the Conductor. If the stretch of the limb should be now more than is sufficient ; it may be instantly diminished to the degree required, by touching the springs either alternately, or together, within side the canulas.

When the Conductor is thus fixed upon a broken leg, of whatever kind, simple or compound, crooked or twisted ; it is thereby instantly restored to its natural length and shape : and it will preserve it in that state, as long as may be required.

The leg and the instrument are now so closely fastened and united to each other, that they may be considered as one piece, or compact body ; admitting large and general motions of the whole : without affecting, or operating in the least, upon

any distinct, or particular part. The exceeding great usefulness of the Conductor arises from this very circumstance. For whatever be the motion of the fractured limb at large; the fracture itself is not in the smallest degree disturbed or affected by that motion: so that whatever pain the patient suffered from that cause before, he never fails to express the sense of relief, as soon as the Conductor is thus fixed upon his leg.

If the patient be but at a small distance; he may either be helped home, by leaning upon the shoulders of two men, or taking the assistance of crutches, the fractured leg being slung in such a manner, that his foot may not touch the ground: or, he may be put into a chair, coach, waggon, or any kind of carriage; only taking care that his foot be not exposed to pressure, strokes, or other violence. He may thus be conveyed many miles without any kind of hazard, or pain; excepting from the pressure of the bands round the knee and ankle, and

even that may be easily prevented, by the intervention of a little cotton, wool, &c.

The Conductor should be kept upon the leg until the patient is placed in bed, bleeding, glyster, &c. administered, as shall be thought necessary; and the apparatus provided for treating the fracture, as circumstances shall require. And here is seen another very important advantage of this instrument; for as it restored the fractured bones to their natural position, at its first application, all further extension is thereby rendered unnecessary*. If the patient has a boot upon

* In the Mem. de l' Acad. Roy. de Chi. tom 2, M. la Faye has given a description, with plates, of two machines: the one for the more easy portation and dressing of a fracture of the leg and thigh; the other to keep the leg extended in oblique and complicated fractures, by means of a pully and stop-winch.---On these I shall make no remarks, but submit it to others, who shall compare them with the Conductor, to determine as to the comparative merits of each, both as to simplicity and usefulness. There is

upon his leg; all that part of it, which is above the lower band of the Conductor, must be cut away, whilst the instrument remains on. This being done: the remainder of the boot, or, the shoe, the stocking and Conductor, are then to be taken off from the leg and foot with the greatest caution, so as not to disturb or misplace the fractured pieces; which must be retained by hand, as exactly as possible, in the same situation, till they are secured by *Splints*. But these, as well as almost every part of the apparatus for the cure of a fractured leg, were, till lately, so very deficient, that a compleat and sightly cure was not to be effected, without the utmost degree of attention, uncommon skill; and the most indefatigable pains, on the part of the surgeon.

is another ingenious contrivance for the extension of the thigh and leg at the same time, invented by Mr. Layman, of North Walsham, Norfolk. But the business of this instrument does not interfere with the Conductor. Gooch's Survey, vol. i. p. 315.

II.

OF THE CONTAINING SPLINTS.

THE apparatus for setting, retaining, lodging, and defending, a broken leg, formerly consisted in short splints or færulæ, long ones called junks, fracture boxes, cradles, pillows, bolsters, and bandages, besides various other machines. And they who, in the cure of fractures, have practised on the old plan, need not be reminded of the immense trouble which they have found to be occasioned, both to the patient and themselves, by the frequent removal and renewal of the deligations, dressings, &c. from all which they will be relieved by adopting the late improvements, while the salutary ends proposed are also hereby more certainly and effectually answered. Mr. Gooch, of Norwich, was, I believe, the first who observed that “ it is scarcely
 “ possible for a fractured limb to be kept
 “ steady, unless whatever is made use of
 “ for

“for that purpose passes over the joint
 “above and below the fracture;” and,
 upon this principle, he recommends,
 instead of the short splints and fracture
 box, a machine of his own invention*,
 which must be allowed to be far better
 calculated for the purpose, but is by
 experience found to be as much inferior
 in point of ease and utility to the long
 splints, since introduced by myself or
 others, as that was to the short splints
 and fracture box.

In order to what is called setting the
 leg, or putting the fractured extremities
 of the bones in exact apposition, we are
 directed by the late improved method †,
 in the first place, to bend the knee ‡.

* Gooch's Cases in Surgery, vol. i. plate 11.

† See first edition of the Conductor and containing
 Splints. The Splints of M. W. Sharp; and M.
 Pott, on Fractures, page 16, &c.

‡ 'Tis true that M. Petit, in his *Traité des Mala-*
dies des Os, tom 1, *De la Cure des Luxations*, orders,
 in general, the muscles to be relaxed before and
 during the extension of the limb, p. 51. And he
 repeats the same in his Chap. sur les Fractures,
 tom 2, page 30; but says nothing about preserving
 the fractured leg in that posture afterwards.

The muscles of the leg, being relaxed by this position, will make less resistance to the necessary extension of the bones : so that if the Conductor has not been before applied, which will ever preclude all other exertions, the hands alone, in general, will be found sufficient. But if any impediments render this mode of extension ineffectual, the Conductor must be put on as before directed : by which the end will be accomplished without further trouble. The fractured portions being now made as straight as any other part of the limb ; the Conductor may be suffered to remain on, whilst the circumstances of the injury are minutely enquired into. If the fracture be compound or complicated ; the splinters, which are loose, should be extracted, sharp and projecting points cut off ; the wound, if necessary, dilated, and dressed, and the whole enclosed in a six-tailed bandage ; which I generally find to be sufficient, and therefore prefer to one that is wider, because it is used
with

with the least trouble. The whole of this process, or whatever else is thought needful, may be performed with much greater ease, both to the patient and surgeon, by the assistance of the Conductor, than when the leg is suspended by hand.

It was once the universal, and it still is a frequent practice, when the leg is much swelled, &c. to wait till it subsides, before any attempt is made to replace or retain the fracture. But as the dislocation and distortion of the injured parts were the true causes of the tumour, &c. the restoration of the parts to their natural place and figure, and their preservation in that state, will more effectually prevent or remove those complaints, with all their dire effects, than can be done by Fetus's cataplasms, &c. alone, in a much longer space of time. For this reason, none of the symptoms, which are seen to accompany a fractured leg, in any state, short of that which requires immediate amputation, can be

a just objection to the application of the splints; and especially as Fodus's cataplasms, &c. are, at the same time, equally admissible, and are even rendered more beneficial by being used with, than they possibly could without them.

Every thing necessary being done to the fracture, whilst the Conductor remains upon the leg; the patient is then to be laid in bed, near the edge, and on the side of the body on which the fracture is, as admitting an easier access to the part. The splints being prepared with soft bolsters, the Conductor is to be very gently and gradually taken off; whilst the limb is held, by hand, exactly in the same situation as when that instrument was upon it, till it is lodged in the lower splint, and covered by the upper: both which must be fastened on the leg, by straps and pins, as may be seen in the plate *. The patient's body

* I generally use the splints without either pins or straps, and with extemporaneous ligatures only,

is to be kept on the side of the fractured limb for a few days only, if the case be simple; but for a longer time, if it be compound or complicate, for reasons too obvious to be mentioned: the leg being all the while a little bent, and laid upon a pillow, as its easiest and safest position. Afterwards, the patient may be turned on the other side: but must never lie on his back, whilst his leg and foot are inclined on either side; because that would occasion a little twist in the fracture, and a final defect in the cure. For, it is a certain fact in dislocations, as well as in fractures, that as the future usefulness of the injured member is greater or less, according to the degree in which the natural conformation is restored; so that is with certainty to be judged of from the degree in which the limb recovers its natural appearance. When the leg is turned on the opposite side, it must be supported with pillows from above the knee and below the foot; so as to keep the whole upon a level with the upper

side of the body. The advantages derived from the inflection of the knee in setting, and especially during the earlier period of the cure, have been noticed, and that posture recommended by several practitioners of late years *. It is however a little surprizing, that a practice of so much utility should have been so long neglected ; though it had been enforced and recommended by the most celebrated surgeons of the last century. Fabricius Hildanus says, “ that in
 “ fractures of the leg many surgeons
 “ are guilty of great error, by placing
 “ it so, that the weight of the limb
 “ rests upon the heel, which occasions
 “ more suffering in that part, than in
 “ the fracture itself, by means of the
 “ large tendons inserted into it. Surgeons, therefore, should not be so
 “ solicitous to preserve the limb in a
 “ posture, so injurious to the patient ;
 “ but, on the contrary, the leg, as well

* This was noticed in the first edition of this tract : by M. W. Sharp, in his account of a new method of treating fractured legs—by M. Pott, and others, on fractures.

“ as the patient’s body, should be
 “ placed, sometimes in one posture,
 “ or on one side, and sometimes on
 “ the other, by which many evils are
 “ avoided *.”

Aquapendens is still more particular,
 and insists that “ You must in the posi-
 “ tion of the fractured limb, as well as
 “ in the extension and deligation of it,
 “ have due regard to the true figure of
 “ the member; whereby you will pre-
 “ vent pain, and keep the muscles
 “ entire on both sides. This is the
 “ middle figure, or that position, where-
 “ in each member stands or lies in the
 “ state of nature when at rest; for in-
 “ stance, the angular figure of the cubit,
 “ and the straight in the carpus; as be-
 “ ing an intermediate position, between
 “ the extreme motions of each mem-
 “ ber. Unless you be careful in ob-
 “ serving this position, the muscles
 “ will grow painful soon after †.” He

* Observ. 93. De situ fracturarum cent. prima,
 pag. 71, edit. 1682, Francfort ad Mænum.

† Chirurgia universalis, Lib. 4. cap. 5.

repeats and strenuously urges the same precautions in the deligation, and collocation, of luxations; and advises always to keep the limb in a middle position *.

Whenever it is necessary to inspect the injured part, the patient must be placed again on the same side, and in the same situation, as at first. Sufficient time having been given for the separated parts in some degree to cement and consolidate; the splints may be pulled downwards, the upper one a less way, but the lower or outer one so far as to project behind the heel: and both are to be thus fastened again upon the leg. After this, the patient may be permitted to lie on his back, only taking care that his knee be still supported in the bended posture, by pillows properly placed under it. The heel will be sufficiently defended from all pressure by the now projected state of the outer splint; and if the bed-cloths should at all incommode the foot by their weight,

* Chirurgia universalis, Lib. 5, cap. 2 & 5.

a single

a single pillow will be sufficient to remove that incumbrance.

The usefulness of long splints, of the inflected position of the knee, and of the lateral posture of the leg and body, where both the tibia and fibula are broken, are points in practice, at least so far as I know, now so generally assented to, as to be usually adopted in the cure of accidents of that kind.

I shall therefore proceed to give some account of the improvements which these splints have received since my first publication on the subject. But that they may be better understood, I beg leave to recommend to the reader's particular attention, the two following preliminary observations :

1. If there be a circumstance of more than ordinary importance in curing a broken leg, it is that of securing the immobility of the foot, as well as of the fracture itself; the latter of which is in a great measure dependant on the former.

2. The

2. The foot, in this case, that is, whilst wholly at rest, may be considered as a dead weight, which can have no effect at all : but if it moves, which it is very liable to do, unless properly secured, by the action voluntary and involuntary of the numerous muscles and tendons inserted into it, will greatly affect the fractured parts, not only by means of its own weight, but also by the additional force that it will derive from the flexibility of the intervening ankle joint.

I have before observed, that the propriety of the inflected position was seen, and that posture of the broken leg recommended, so long ago as the middle of the last century. I cannot, however, conceive, how the apparatus then in use could have been made effectual for this purpose ; and I am persuaded, that the want of a better was the true reason why the advice was not followed. But this posture of the leg is not only admitted by these splints, but it is by them rendered

rendered the most convenient of all others, and beneficial to the patient.

We have learned, by long experience, that the old method, of short splints, fracture boxes, cradles, &c. was inadequate to the end of securing and keeping the ankle and foot from motion, even when it rested upon the heel.

Mr. Gooch, myself, and others, sensible of the insufficiency of the former apparatus, for the completion of a design so important and necessary, did, as was before observed, recommend long splints, extending from above the knee to below the ankle, as a remedy for those defects; and they were found greatly to excel, in point of utility, those shorter ones, which were generally used before that time *. But there appeared to be still need of further improvements: for, none of the long splints, first invented, were so sufficient to confine the foot

* Gooch's Surgery, Vol. i. First edition of the Conductor, &c. Sharp, Pott, and others, on Fractures.

from motion, as to prevent the fracture from being occasionally disturbed. In order, therefore, to secure the immobility of the foot more effectually; I have since found it necessary to extend the extremity of the outer or lower splint underneath the sole, and the inner or upper one over the instep; and to fasten these lengthened portions upon the foot, by a distinct ligature or strap. I have also substituted thin iron plate, covered with fustian; which I prefer to the leather ones first in use, because equally light, and more lasting.

It is by these additional pieces alone, that the foot is certainly secured from all motion. For, it may be justly said of these lengthened splints, as was before observed of the Conductor, that, by means of them, the leg, foot and splints, are made one compact piece or body; the position of which may be altered, at any time, without producing the least particular commotion in the fracture itself. It is observable in compound
and

and complicate fractures of the leg, that the worst injuries, such as wounds, lacerations, swellings, &c. are produced chiefly by the lower extremity of the upper portion of the fractured tibia; and that they consequently affect the inner side of the leg, more than any other part of that member. The usefulness of these splints, in such cases, is especially obvious: for, the under one, in which the leg is lodged, is of itself sufficient to keep the fractured portions in a fixed state; whilst the upper splint is removed to give opportunity for fomenting, dressing, &c. as there shall be occasion, and is then again replaced. But if, on the contrary, these compound effects should arise from a fracture of the fibula, the outside of the leg must then be treated in much the same manner. This, however, seldom happens, in comparison of the former: and when it does, requires no other difference in the management of it, but that the patient must then lie on the side opposite the

fracture ; the ligatures must be tied on the outer, instead of the inner, splint ; and the knee, leg and foot, must be supported by pillows, &c. of an equal height with the upper side of the body. By these means, the outside of the leg will be rendered accessible to the surgeon, with nearly the same ease to the patient, as when the inside of the leg is the principal seat of the injury.

From what has been said of these splints ; of the advantages of the inflected posture of the knee ; and of the lateral position of the body, leg and foot, especially in the first stages of the cure of a broken leg ; it is probable, that junks, fracture boxes, cradles, circular and spiral bandages, &c. &c. will, for the future, be but seldom used, in the treatment of accidents of this nature.

EXPLA-

E X P L A N A T I O N

O F T H E

P L A T E S.

P L A T E I.

Shewing the Skeleton of the Conductor,
separated into two Portions.

FIGURE I.

The Knee-Band (*a*) made of Tin, a little bent; divided by four Joints (*b*) that it may fit any Limb, great or small; Holes (*c*) for fixing the Buckle and Strap; others (*d*) round each Margin, for sewing on the Padding; two Tin Canulas (*e*) grooved on the Outside, and furnished on the Inside with Brass Springs (*f*) and Catches (*g*); small Holes (*h*) through which the Catches pass to meet the Serræ of the upright Portions, when they are within the Canulas.

The Figure in the Middle represents the Inside of the Tube with the Groove.

FIGURE

EXPLANATION, &c.

FIGURE II.

The Ankle Band (*a*) constructed as the Knee-Band, but less; Shoulders (*b*) to support and render the ferrated Portions parallel to the grooved Canulas; both of Brass.

By compressing the Springs, the Catches are raised, and admit the whole length of the upright, ferrated Portions within the Canulas; reducing the Conductor to near half its length: from which reduction of the instrument, by the disposition of the Catches and Serræ, the Canulas are retracted without difficulty; but cannot be returned the same way, unless the Catches are elevated by compressing the Springs. By this means, when the Conductor is fixed, the extension hereby given to the Leg, whatever it be, is secured with the greatest certainty, though alterable with the utmost ease.

PLATE II.

The same Instrument covered with Leather; that it may fit easy on the Limb.

PLATE

EXPLANATION, &c.

P L A T E III.

The Conductor applied to a compound fractured Leg ; by which the Limb is fitted for Conveyance.

P L A T E IV.

FIGURE I. and II.

The Splints applied upon a broken Leg ; so that the Foot Pieces are plainly to be seen on both sides.

FIGURE III.

The Rack Tourniquet upon the Thigh.

P L A T E V.

FIGURE I.

The Check Wheel Tourniquet upon the Thigh.

FIGURE II.

The Rack Tourniquet, as large as the Instrument itself.

FIGURE III.

The Check Wheel in the same Proportion.

N. B. These Instruments are sold by M. PEPYS, Surgeon's Instrument-Maker, in the *Poultry*.

F I N I S.

EXPLANATION

PLATE I
The Conductor's position is shown in the
figure 1, which is the first of the
series of figures.

PLATE II
The Conductor's position is shown in the
figure 2, which is the second of the
series of figures.

PLATE III
The Conductor's position is shown in the
figure 3, which is the third of the
series of figures.

PLATE IV
The Conductor's position is shown in the
figure 4, which is the fourth of the
series of figures.

PLATE V
The Conductor's position is shown in the
figure 5, which is the fifth of the
series of figures.

PLATE VI
The Conductor's position is shown in the
figure 6, which is the sixth of the
series of figures.

PLATE VII
The Conductor's position is shown in the
figure 7, which is the seventh of the
series of figures.

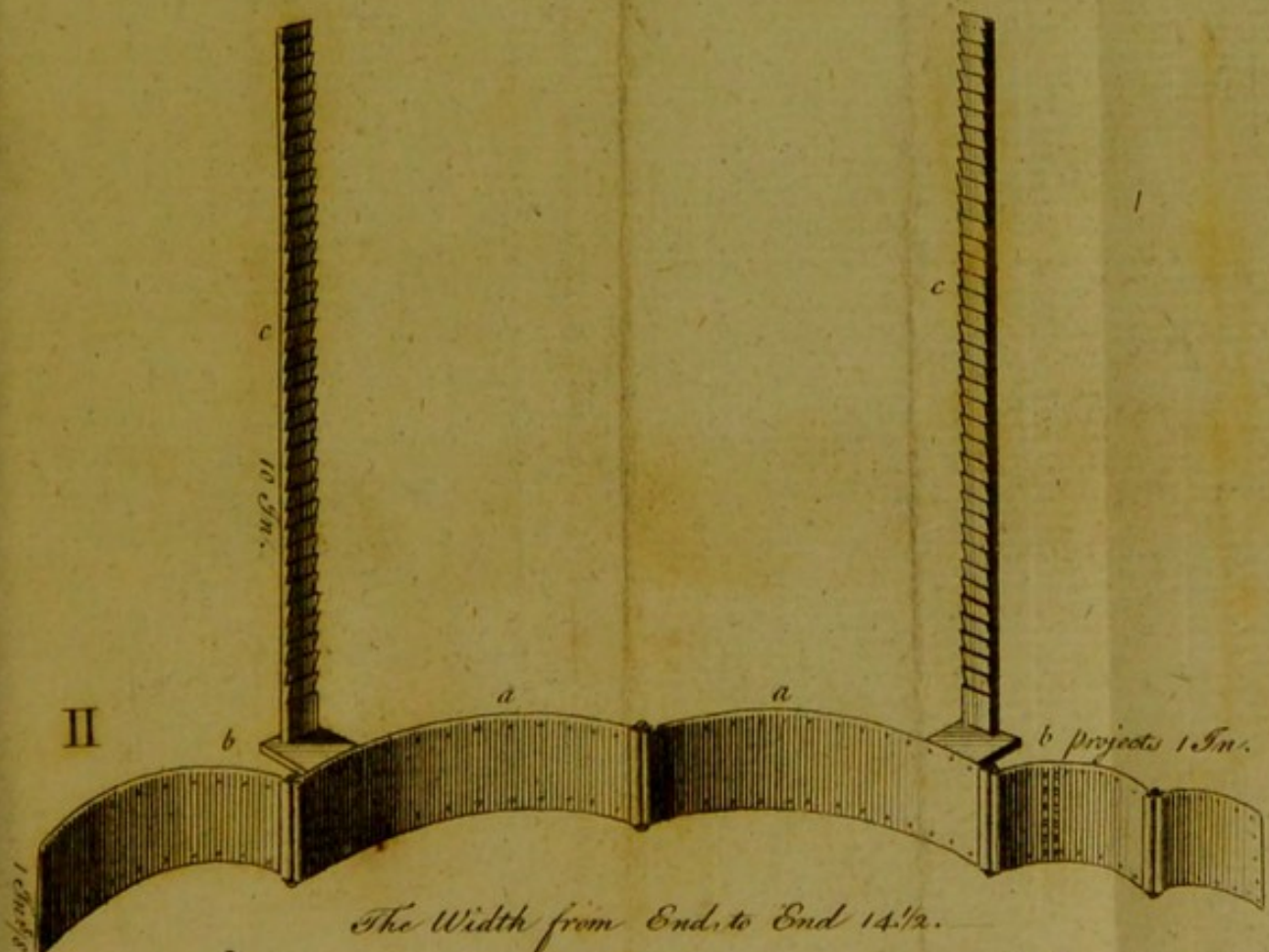
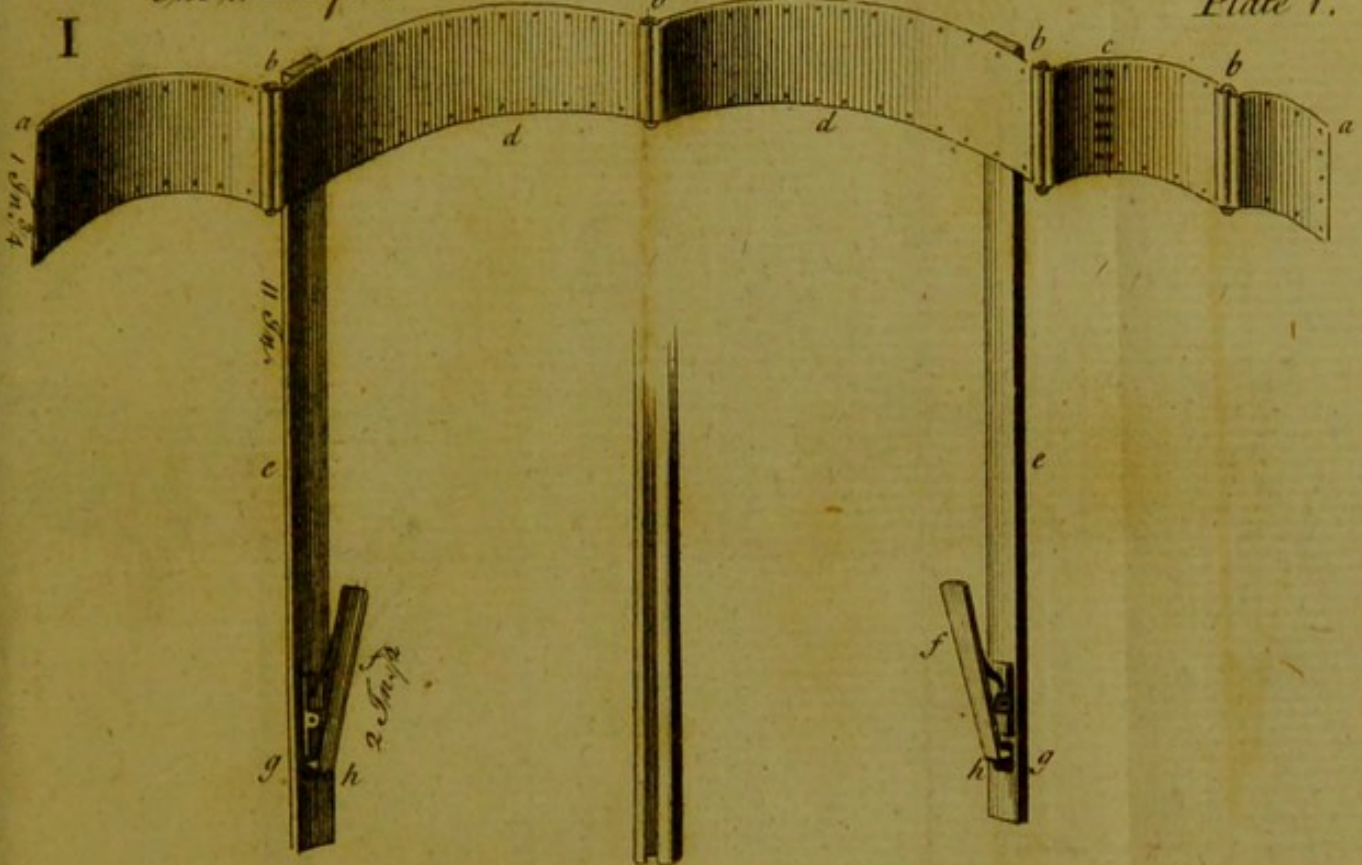
PLATE VIII
The Conductor's position is shown in the
figure 8, which is the eighth of the
series of figures.

PLATE IX
The Conductor's position is shown in the
figure 9, which is the ninth of the
series of figures.

PLATE X
The Conductor's position is shown in the
figure 10, which is the tenth of the
series of figures.

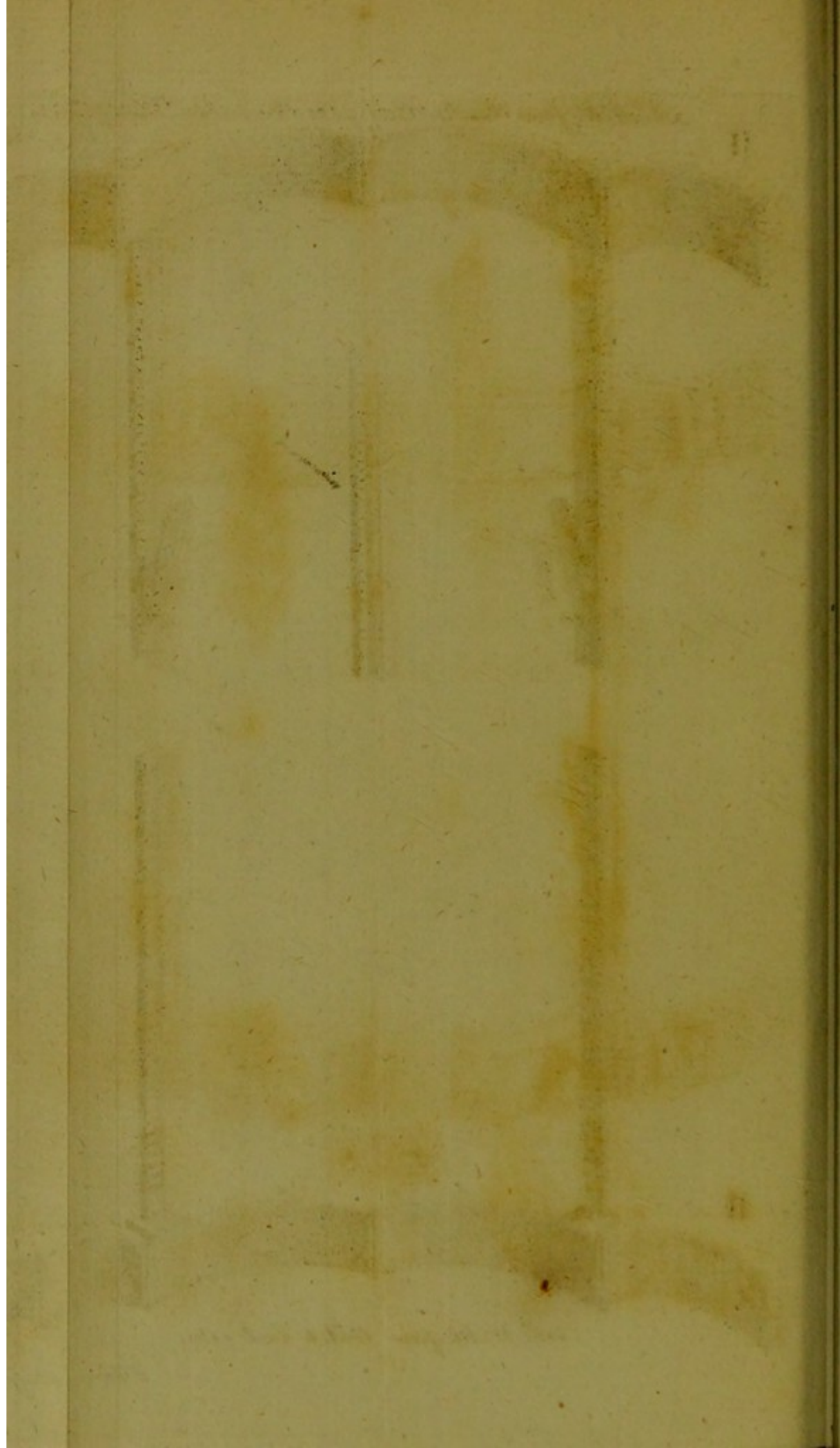
The Width from End to End, in the View as here Drawn, 18 In.

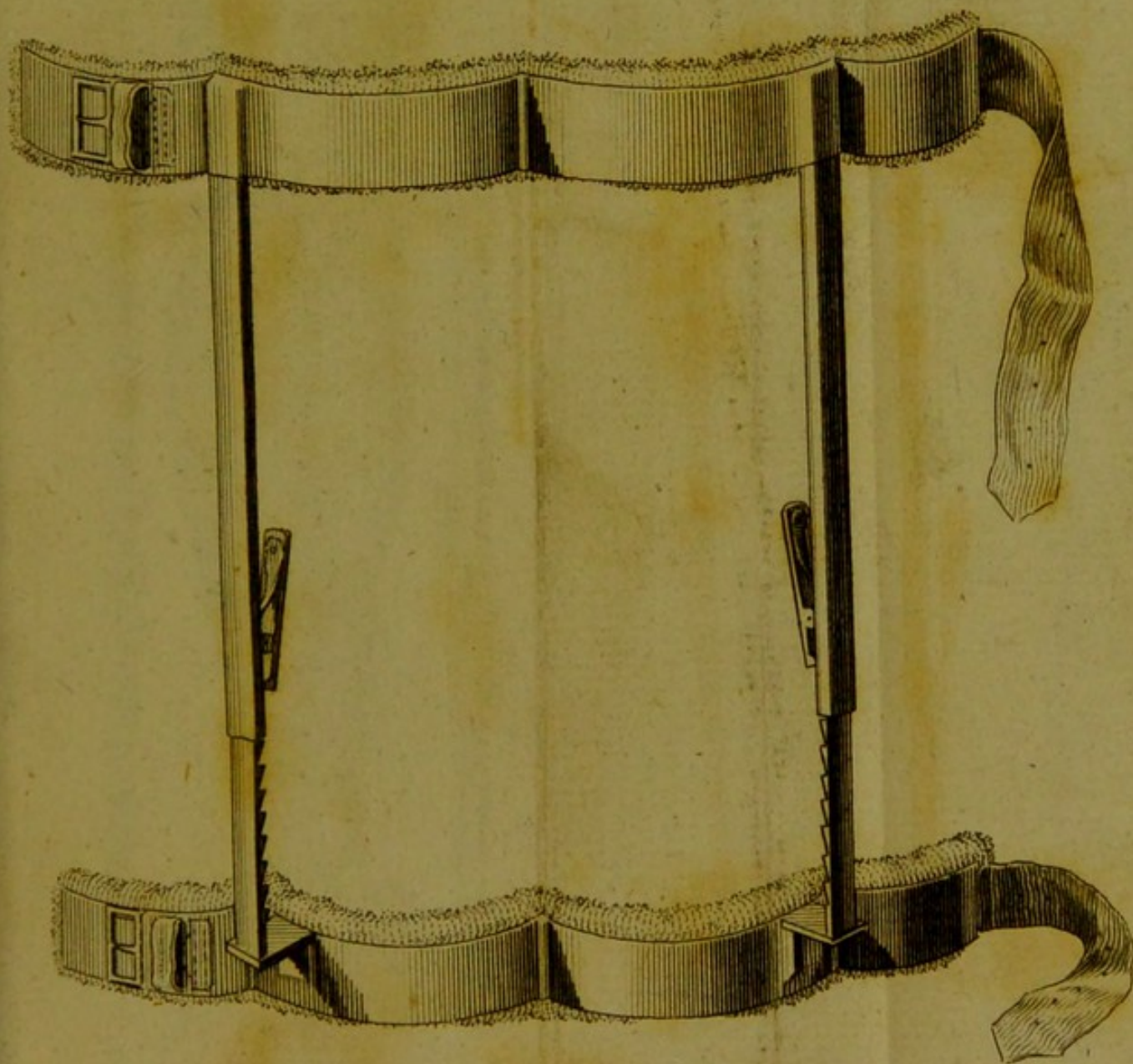
Plate 1.



The Width from End to End 14 1/2.

J. Bonner del. et sculp.





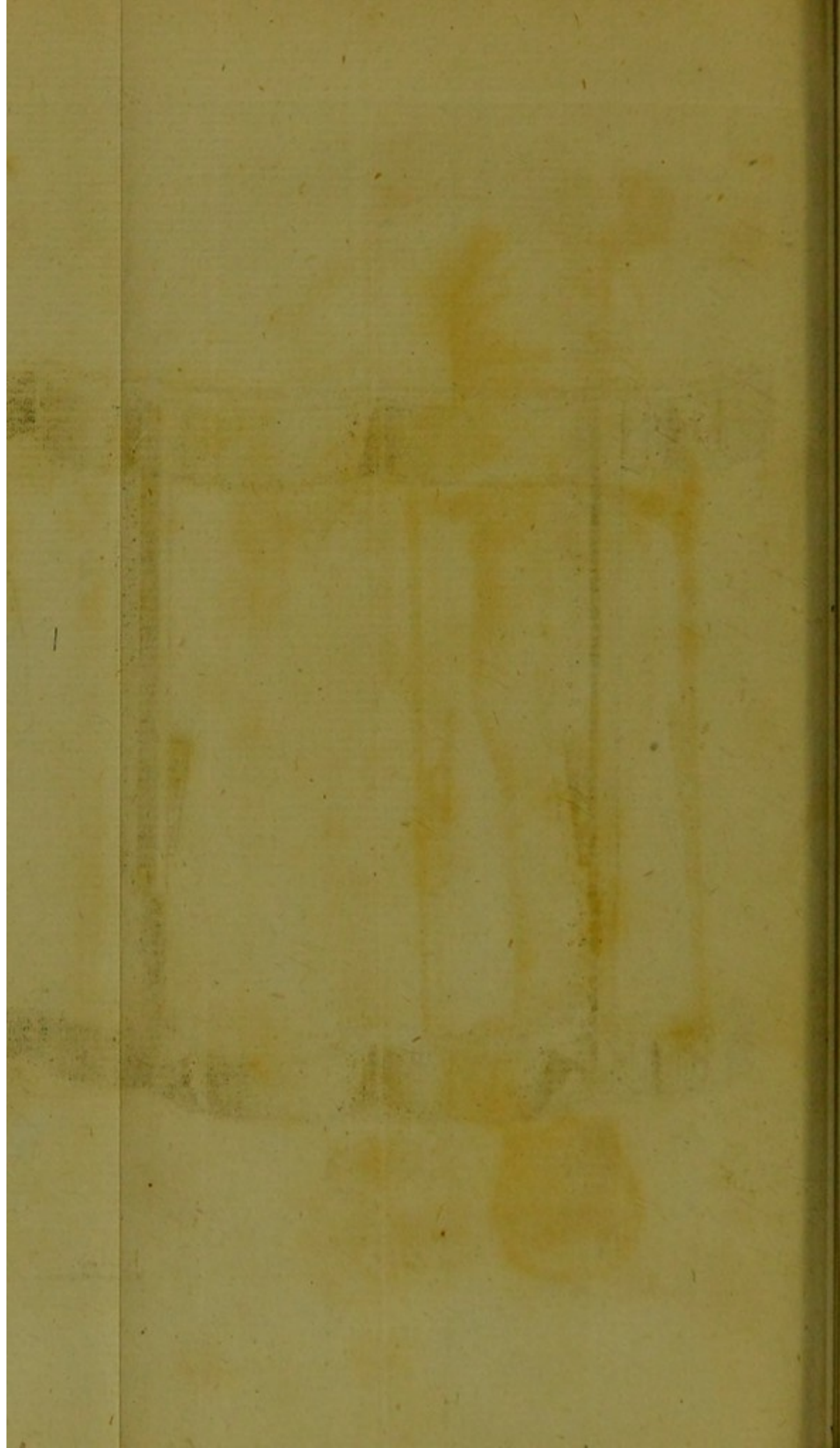
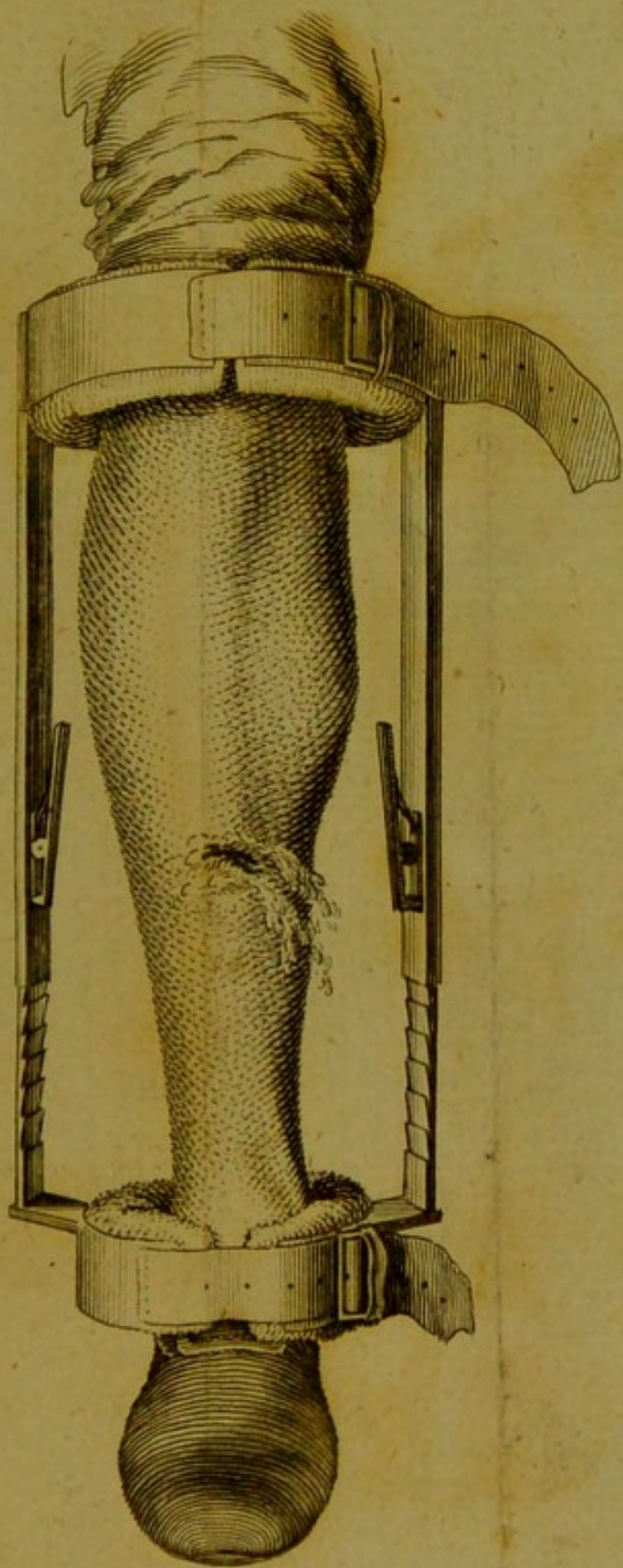


Plate 3.



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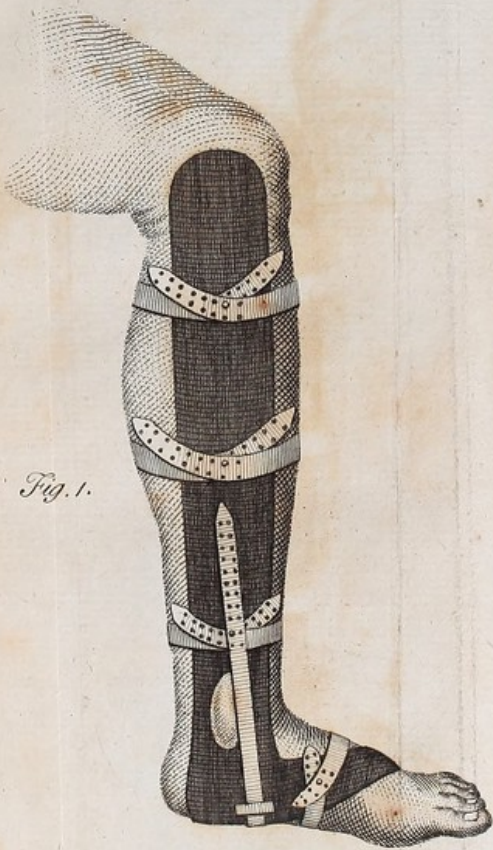


Fig. 1.

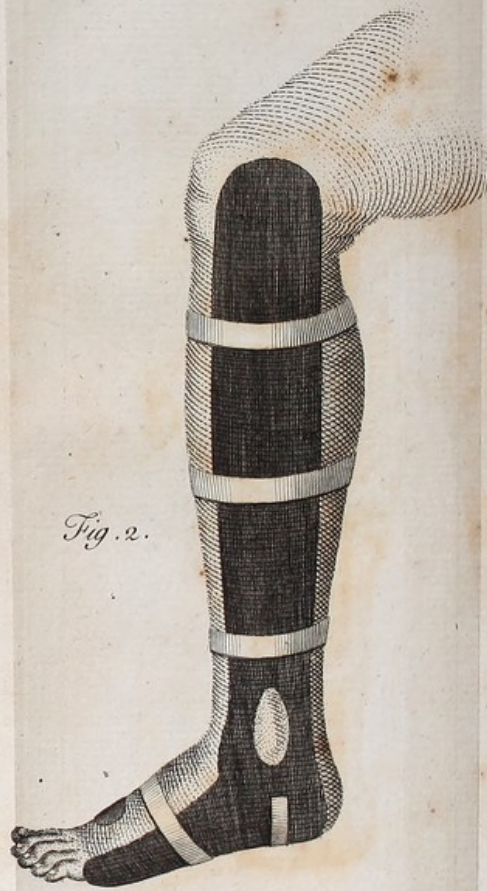


Fig. 2.

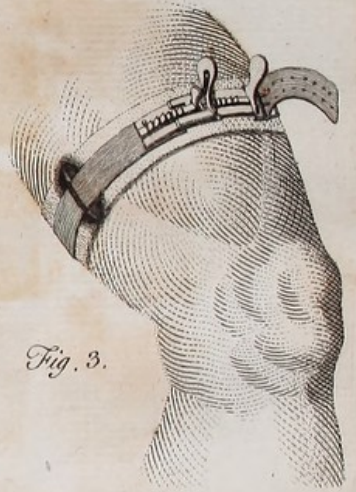


Fig. 3.

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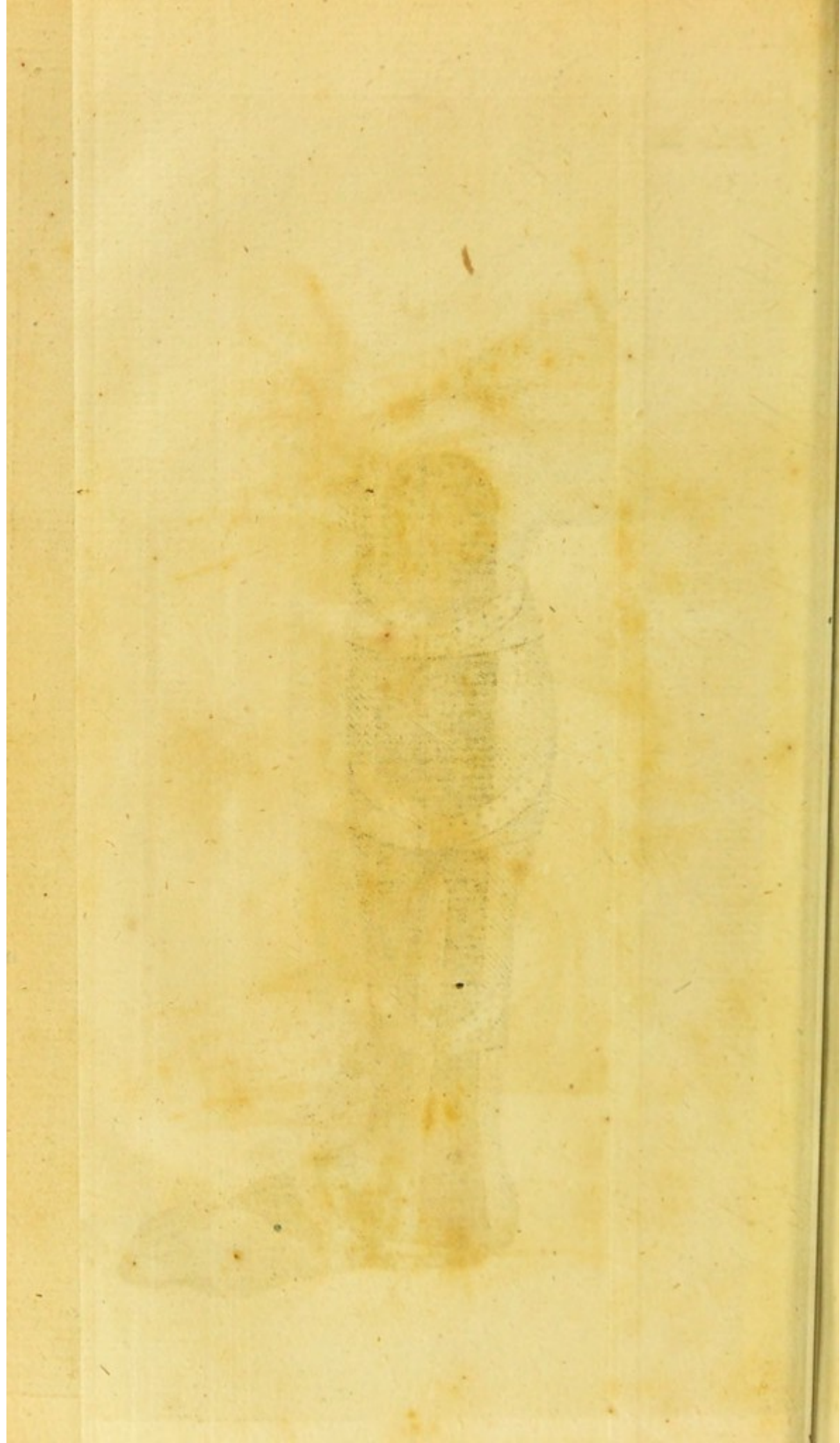


Fig. 1.

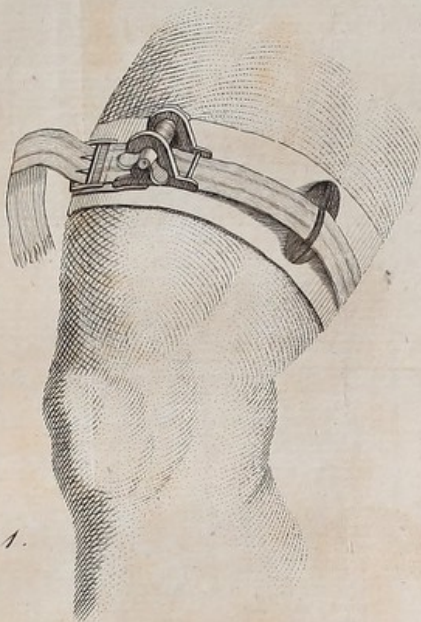


Fig. 2.

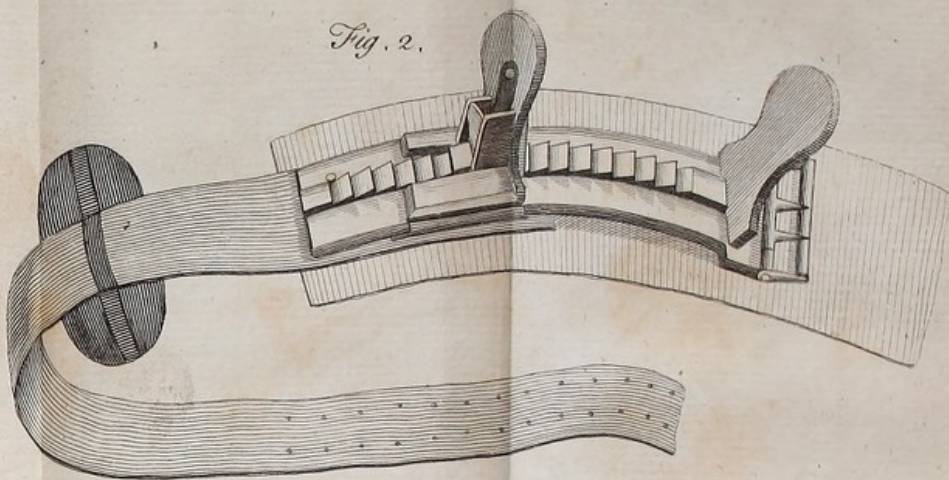


Fig. 3.

