A treatise on the science of muscular action / by John Pugh.

A

TREATISE

ON THE

SCIENCE

OF

MUSCULAR ACTION.

BY JOHN PUGH,

ANATOMIST.

LONDON:

PRINTED FOR C. DILLY.

1794.

Explanation of the Vignette.

ÆSCULAPIUS is represented leaning upon a knotty baton or staff, pointing out the difficulty of the HEALING ART, *and our dependence on the Creator. The Serpents entwined around the baton indicate the vigilance which the Art requires, the longevity it brings, and the turns and windings used in employing the means with which man is furnished for his own preservation and relief.*

ÆSCULAPIUS *holds on the altar the cup and incense by which he sacrifices for the revelation of the Healing Art; on the other side is a representation of the Author, who first discovered, and has fully demonstrated, the great benefit capable of being derived from topical Muscular Action, being peculiarly adapted to the different circumstances of patients morbidly affected.*

A

Physiological Theoretic and Practical

TREATISE

On the Utility of the Science of

Muscular Action;

FOR

Restoring the Power

OF

the Limbs.

Loſt in Laſsitude lay all the Man! POPE.

By John Pugh

ANATOMIST.

TO

Sir GEORGE BAKER, Bart, M.D.

PHYSICIAN TO HIS MAJESTY,

AND

PRESIDENT OF THE ROYAL COLLEGE OF PHYSICIANS, LONDON.

SIR,

TO whom could I dedicate a Work like this with more propriety than to one whoſe literary and medical abilities the world ſo juſtly holds in the higheſt eſtimation—to one whoſe character and candour ſtands ſo univerſally con-

feſſed? 'Tis therefore to you, Sir, I preſume to offer theſe my labours, particularly as they have been ſanctioned by your approbation. Gratitude compels me to pay this tribute due to your generoſity, happy in the liberality of publicly confeſſing the obligation, and ſubſcribing myſelf, with all due deference,

SIR,

Your greatly obliged and

Moſt obedient Servant,

JOHN PUGH.

Feb. 25, 1794.

The Author is much obliged to the following eminent Gentlemen of the Faculty, who have liberally permitted him to publiſh their Teſtimonies in Confirmation of the Importance and real Efficacy of his Syſtem.

From Sir GEORGE BAKER, *Bart.*

I AM of opinion that Mr. PUGH's Apparatus, which I have inſpected, is highly beneficial in caſes of contracted muſcles.

G. BAKER.

Sackville Street,
January 22, 1793.

From JOHN HUNTER, *Esq.**

SIR,

Leicester Square, March 16, 1792.

I HAVE a good opinion of exercise, as in many cases it may be said to finish where the healing art had done its utmost. I regret very much that your art is not more generally known and practised.

To restore action lost by disease, when the disease has been removed, is the ultimate of our desires; or to produce relaxation in involuntarily contracting muscles, is much to be wished for, which your mode certainly tends very much to effect.

So far as I have seen, or so far as my judgement goes, I think your Apparatus is well calculated for the above-mentioned purposes; and it appears that your attention to the human figures has not been wanting; I wish you success, and whenever opportunity serves, my endeavours shall not be wanting.

Signed JOHN HUNTER.

* The original copy of this letter, under Mr. Hunter's own hand, is in the Author's possession; and his verbal approbation to Sir George Baker, a living evidence, is a farther proof.

From Doctor LETTSOM.

I HAVE examined Mr. PUGH's Syſtem, and the ſeveral Machines made uſe of by him for Muſcular Action, in relieving and reſtoring the ſtrength of the limbs, when weakened by accidents, chronic diſeaſes, and paralytic cauſes, which I think ingeniouſly contrived, and of great practical utility to anſwer theſe deſigns, from the benefit derived by Gentlemen of my acquaintance.

JOHN COAKLEY LETTSOM.

Baſinghall Street,
London, Jan. 3, 1793.

From J. HEAVISIDE, Eſq.

I HAVE examined the principles of Mr. PUGH's Apparatus, and mode of treatment for Contracted Limbs, &c. &c. I think it does him much credit, and is well deſerving the attention of the faculty in general.

J. HEAVISIDE.

George Street, Hanover Square,
January 8, 1793.

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INTRODUCTORY AND EXPLANATORY

PREFACE.

THE Author of the following work thinks it a duty incumbent upon him to inform his Readers that he dwells ſolely on the limited ſubject it treats of, without advancing into the various branches of medical and chirurgical knowledge, any further than appertains to the peculiar treatment of MUSCULAR ACTION, ſo juſtly recommended by celebrated medical writers, ancient and modern.

He has given a general conciſe deſcription of the action, extenſion, relaxation, uſe and mechanical operation of the muſcles, in a method explanatory of the principles, and demonſtrative of the reaſonableneſs of the ſyſtem laid down for affording relief in the various caſes to which it is applicable.

The eaſe, convenience and good effects which the apparatus will afford to the ſedentary, arthritic and paralytic, as well as to children of weak, ricketty and protuberant limbs, will convince every rational and impartial mind of its unequalled utility; as it promotes, without fatigue, a genial glow and animated circulation; gives tone to the muſcles, eaſy motions to rigid joints, and healthful action to the fluids—advantages conſtantly recommended by celebrated writers on the human animal œconomy.

The limbs ſuffer great debility and contraction from miſmanagement at the decline, and after the termination of acute complaints; and although the diſeaſe be removed, the effect moſt obviouſly requires a removal alſo, which the means generally adviſed could not effect without ſuch topical application; indeed, the reaſon which firſt induced him to undertake and purſue the inquiries which led to the formation of this ſyſtem, was his too often ſeeing with regret a number of perſons labouring under an incapacity or difficulty of uſing their limbs.

Upon converſing with ſeveral perſons of the medical profeſſion reſpecting the multiplicity of chronic complaints which generally affect the limbs, he found that recreative exerciſe was by no means adequate to complete a recovery,

becauſe the parts locally affected, thereby, received no benefit—nay, ſo far from feeling any of the impulſive powers, the limbs were often put into ſituations rather tending to increaſe than mitigate the complaints, particularly in the exerciſe of riding, by the compreſſure of the ſaddle againſt the already-contracted muſcles.—The ſame remark applies to a long continued ſitting in gouty-wheeling chairs, which may be called a *ſtatue* movement—the uſing of crutches—wearing of high-heeled ſhoes—and application of irons—ſtraps—wood, and other injurious ſtrictures—which impede the circulation, and waſte and contract the muſcles. To obviate the apparent neceſſity for theſe inſtruments of diſtreſs, the Author is induced to propoſe the uſe of his apparatus, ſuited to the peculiar caſe and ſtrength of each patient; and in confirmation of the happy effects propoſed to reſult from the perſevering uſe of the means ſuggeſted by him, the reader is referred to the ſubſequent work, written more with a view to public utility than elegance of ſtile.

Perſuaded, from the opinions of the beſt authors he had read and the lectures he had heard, that ſtrength, vigor and activity were to be given to the muſcular ſyſtem by general exerciſe, he was alſo conſcious, from repeated experience, that partial exerciſe would relieve and remove local complaints, and in recent caſes of injury or debility,

reſtore the limbs to the full performance of their proper functions.

The ſpecial kind of exerciſe proper for the different caſes that may occur, *when* and *how* to be applied, and in *what degree*, can hardly be the ſubject of any direction univerſally applicable; therefore the aid of ſuch an apparatus as is here propoſed, with practical inſtruction for the application, will be found highly uſeful, if not abſolutely neceſſary.

To this work are added FIFTEEN beautiful figures of the human muſcles (drawn from dead and living ſubjects) as they diſtinctly and ſeverally appear in different points of view, and engraved in the moſt maſterly manner—demonſtrating with preciſion how capable the ſeveral limbs and their reſpective muſcles, joints and ligatures are of being acted upon by proper means, in moſt caſes of debility—contraction—or articular enlargement: and the great probability of muſcular action being uſeful in a variety of caſes which have not yet fallen under the author's inſpection, but which may be adverted to with ſucceſs by eminent medical gentlemen, who, being acquainted with the cauſes of diſeaſes, are proper judges of the appropriate remedies, by inveſtigating their mode of operation under different circumſtances. The following elucidation and explanation of the plates may not be unacceptable.

PLATE I.

Shews ſome of the muſcles of the neck in a ſtate of pain and rigidity; to relieve which, the head ſhould be gently moved in various directions, extending the rigid ſide of the neck, while the arm of the ſame ſide ſhould be ſtretched downwards, and the painful muſcles preſſed with care by the ſoft part of the thumb.

PLATE II.

Shews the front muſcles of the thigh, or the thick part of the ſhoulder, which, when in pain, the patient ſhould endeavour to throw himſelf into the poſition of this figure, placing ſomething ſoft under the knee.

PLATE III.

From conſidering this view of the leg and foot it will appear, that, as in gouty caſes, the extenſion of the feet and inſtep chiefly ſuffer, by bending and exerciſing the toes by means of the apparatus, the ſuppleneſs of the ankle may be reſtored.

PLATE IV.

From this view it will appear, that the performance of the action repreſented in PLATE III. will not be adequate to accompliſh the deſired end, without the additional action of the ſide muſcles of the feet, both internal and external, as well as the back and front muſcles of the ankles, which may be readily done, as the ankle in a great degree is capable of the action of the wriſt.

PLATE V.

When the muſcles of the lower extremities are weakened, particularly thoſe of the thighs, by rheumatic pains, colds, &c.—an hour's exerciſe every day, throwing the muſcles into the ſame action as herein repreſented, will prove eſſentially beneficial; but in contractions it will prove injurious.

PLATE VI.

When the tendons of the hams, and the muſcles of the back part of the thighs become rigid, this figure points out the mode of giving a full extenſion to the bellies of thoſe powerful muſcles of the lower extremities, from whence in theſe caſes, great utility is derived.

PLATE VII.

People who lead ſedentary lives, and are conſtantly ſitting, are apt to be afflicted with gravelly complaints and coſtiveneſs, in ſome meaſure, perhaps, owing to the abdominal muſcles falling into a ſtate of too great relaxation from that mode of life.—By putting the body in the direction repreſented by this plate, and ceaſing to breathe during micturition, patients have repeatedly found conſiderable benefit, and been relieved from uneaſy ſymptoms ariſing from theſe cauſes.

PLATE VIII.

Conſiderable weakneſs in the lower extremities, even without contraction of the muſcles, often renders them unable to bear the weight of the body, which ſhould not preſs upon the muſcles during the time of giving them action.—The method here repreſented ſtrengthens the diſabled muſcles, and throws them into action without fatiguing the patients, and thoſe which have been kept in a ſtate of flexion, or long compreſſed by ſitting in a ſtate of full extenſion.

PLATE IX.

As the arms, or other parts of the body, confined for a conſiderable time in a crooked poſition, would cauſe the muſcles, even free from any complaint, to contract.—It is an abſurd, and even dangerous practice, to have the arms put into ſlings, except when they are broken, or ſeverely ſprained: in order, therefore, to give ſtrength and activity to the muſcles, this plate exhibits the mode of accompliſhing the purpoſe, by extending the flexors, or inward muſcles of the arm, and thereby throwing the extenſors, or outward muſcles into action.—But when the arm is contracted and fixed in the ſtate repreſented by

PLATE X,

the muſcles muſt not only be put into the actions above ſpecified in PLATE IX. but alſo have a rotary motion.

PLATE XI.

This ſhews the dangerous effects of riding on horſeback when the ankles and knees become ſo contracted that the patient has no power of uſing them; for, from this ſituation, the knees and principal muſcles of the thigh are compreſſed againſt the ſaddle, and their action by that means prevented, which impedes too much the circulation of the blood.

PLATE XII.

It is well known that the action of many muſcles, particularly thoſe of the arm, when in a ſtate of torpor, may be loſt for want of proper means being uſed to regain their wonted power. Now if this figure is cloſely attended to, its poſition imitated, the difficulties will be conquered, and ſome cauſes alſo of indigeſtion removed.

PLATE XIII.

Exhibits to our view the very injurious conſequences of wearing high-heeled ſhoes; becauſe they contract thoſe parts commonly called hamſtrings, ſhorten the limb, and deprive the muſcles from the hip downwards of all their power of action.

PLATE XIV.

From this we are led to diſcover the ill effects produced by crutches, which ſhould never be had recourſe to, except in caſes of fracture of the lower extremities, becauſe the more the body weighs on them, ſooner will the thighs and legs loſe their power and waſte away; beſides, a variety of injuries may occur from the compreſſion of thoſe muſcles made manifeſt by this figure.

PLATE XV.

From this we are made acquainted with the cartilages or caps of thoſe bones where they form the joints of the knees and ankles, which on diſſection have often been found eroded, reſembling in appearance the roughneſs of an old iron hinge. Now this effect frequently ariſes from want of action ſufficient to promote the ſecretion of a proper proportion of that lubricating fluid called ſynovia; for it is an allowed axiom, that all glands the more they are agitated, the greater will be the quantity of their peculiar fluid ſecreted.

Perhaps from the general idea I have given of the modes to be uſed in reſtoring the power, ſtrength, and action of the limbs, people totally ignorant of the formation of the human body, with the connections of one part with another, and their dependencies, may be induced to try experiments upon themſelves. This would be dangerous—For certainly there is a much greater probability of injury than benefit from ſuch raſh attempts.—Much is neceſſary to be known previous to any application, before ſucceſs can be expected—Muſcular anatomy ſhould be perfectly underſtood—the nature alſo of muſcular action—and the uſes to which particular muſcles are appropriated.—Beſides, a thorough knowledge is neceſſary of the means to which, under peculiar circumſtances, recourſe is to be had—both with reſpect to the direction of the parts, the duration of the operation—as well as the quickneſs or ſlowneſs of motion to be given, in order to accompliſh the deſired purpoſes—

Becauſe, if a perſon be ignorant of the principles above recited, how can he judge of the proper direction into which the muſcles are to be thrown—or the nature of the motion to be given?—And if defective in theſe points, which form the very baſis of practice, he will, nine times out of ten, rather increaſe than alleviate or cure the complaint he undertakes to ſubdue.—However, to bring this home to every man's conception, I ſhall beg leave to ſtate a few Queries—Let the judgement be exerciſed upon theſe—the reſult, I doubt not, will prove the truth of what I have aſſerted—

QUERY I.

With reſpect to the following circumſtances, under which the conſtitution is frequently placed, what modes of treatment will be neceſſary for their alleviation or cure?

A. When the muſcles of the neck, termed ſplenius capitis, ſplenius coli, maſtoideus— (ſee PLATE I. Fig. 3, 4, 5, 6.) become rigid by gout, rheumatiſm, colds, cramps, &c.?

B. When the articulation of the ſhoulder bones and the inſertion of the pectoral muſcles bcome contracted, or the deltoid muſcle waſted? (See PL. I. Fig. 8. 9. 11. 12.)

C. When the muſcles of the extremities are lengthened by paralytic cauſes, and the part in conſequence enfeebled, or when the extremities are ſhortened?

D. When either or both the lower extremities are relaxed after rheumatic fevers, or when the ankles, knees, elbows, and wriſts, are contracted by the gout or any other cauſe?

E. When the peroneus longus, (ſee PL. II. Fig. 52.) which ariſes from the external and ſuperior part of the fibula, or outward bone of the leg, is compreſſed by irons, ſtraps, &c. or when the limbs are contracted, or ſhortened by artificial high heels?

F. When the tendo Achillis, by accidents, (ſee PL. V. Fig. 19.) is too greatly diſtended, or the flexors of the foot (ſee PL. VIII. Fig. 11, 13.) become contracted?

QUERY II.

When the inward muſcles of the arm, biceps flexor cubiti ulnaris internus, ſublimis, palmaris longus— (ſee PL. IX. Fig. 5, 7, 8, 9.) become contracted, what treatment is requiſite to extend the flexors, and throw into action the extenſors, and thereby re-eſtabliſh their flexibility?

QUERY III.

When in a paralytic caſe, the tibialis anticus, or the moſt tendinous muſcle on the front of the leg turns the foot inward (ſee PL. V. Fig. 17.) and overpowers the extenſor proprius pollicis pedis, and the extenſor longus pollicis, (ſee PL. IV. Fig. 12, 13.) what method muſt be uſed to re-extend the tibialis anticus, and throw into action the extenſors?

QUERY IV.

When the lower extremities are ſo much enfeebled, from various chronic complaints, that they cannot bear the weight of the body without aſſiſtance, by what means, or by what action can ſufficient ſtrength be given to the muſcles of the parts affected ſo as both to enable the patient to bear his weight and to walk?

QUERY V.

When children are weak and ricketty, or have their joints contracted and protuberant, what peculiar treatment is neceſſary for their relief, in order to avoid the uſe of irons, ſtraps, high-heeled ſhoes—which, by the compreſſion they occaſion, are in all ſuch caſes ſo highly injurious?

QUERY VI.

Should the ankles be relaxed, or ſwelled by gout, rheumatiſm, or any other cauſe, or ſhould the inward bone called aſtragalus, (ſee PL. 15. Fig. 2.) or the external bones become protuberant, what method would be the moſt proper to be adopted to reduce the ſwelling, and reſtore the muſcles to their due tenſion?

To anſwer theſe and ſuch like inquiries experimentally has been the object of the author's labors; which he has had the happineſs to purſue with no inconſiderable ſucceſs.

Many other Queries might be ſtarted, but theſe will be ſufficient to every candid mind, as they furniſh the moſt irrefragable proofs of the neceſſity of that knowledge and experience of which we have before ſpoken ;—

Notwithſtanding we conſider previous knowledge of ſome particular points, indiſputably eſſential to a rational and ſucceſsful practice, without which every attempt is mere quackery—ſtill patients are ſometimes ſo unhappily ſituated, that they neither can aſſiſt themſelves, nor be aſſiſted, without the application to ſome mechanical apparatus ;—which contrivances will, in a very great variety of caſes, alſo contribute to the eaſe, and expedite the cure of thoſe leſs diſagreeably circumſtanced---For inſtance, when a patient becomes bent almoſt double, ſo that he has not power to elevate the ſuperior part of the body from the lumbago, (ſee Pl. XII. Fig. 14.) or ſciatica, (ſee Pl. VII. Fig. 19.) how can the parts affected be ſo alleviated as to aſſume their healthful action, except by the application of ſome well-adapted apparatus---The neceſſity is obvious.—And again, if the flexors or extenſors of the fingers become contracted ;—if the circulation of the blood be more languid in one extremity than another, or the limb ſhould be benumbed, ſome means muſt be uſed, by which not only proper motion may be given to the relaxed and inactive part, but alſo that ſhould be regularly and methodically continued : for random attempts at exertion, by the untaught patients themſelves, if continued for the neceſſary duration, would occaſion too great fatigue ; and conſequently that motion would be often injurious inſtead of contributing to relieve, and would tend to aggravate the affections of the parts which are relaxed or inactive, becauſe, though they may receive benefit from exerciſe in a given degree proportionate to their powers, ſtill ſhould that exerciſe be carried beyond the due limits, the parts would afterwards fall into a ſtate of greater debility.

Simple as are the plans we have propoſed, and ſalutary in their conſequences, we find ſome experience is requiſite in properly conducting them ; without which, the beſt formed ſchemes will prove abortive ; but with which, ſucceſs is attainable even in conſtitutions the moſt delicate, and in ſubjects whilſt in their infantile ſtate.---For children, as well as adults, in a great number of caſes, require various modes of treatment to

relieve them from complaints which too frequently ariſe from ignorance and inattention.

Nurſes will often ſuffer children, when firſt they are ſet upon their feet, to bear *indiſcriminately* the whole weight of the body upon the lower extremities, which is apt to occaſion protruſions—From want of cleanlineſs and activity, children too often become ricketty—Hence, from theſe as well as other accidental cauſes, the joints will become protuberant, the muſcles contracted, but more frequently relaxed---To remedy which, it hath been too much the cuſtom to have recourſe to contrivances made of iron, wood, and leather, to confine their tender limbs in improper ſituations, by which the circulation of the fluids is impeded, their activity and remaining powers deſtroyed, and lameneſs brought on and even perpetuated.

For children under theſe circumſtances, the author has made it his particular ſtudy to invent ſuch modes of treatment as will by degrees aſſiſt nature, and thus by gentle means reſtore ſtrength and vigour to the affected parts---which may be done by properly adapted action alone--- In ſupport of which I ſhall appeal to the experience of many years, and refer my readers to the caſes recited in this work, which are ratified by characters of ſuch reſpectability as will diſſipate every doubt and render any further proofs unneceſſary.

Before I conclude, I reſpectfully beg leave to add that I ſhould think myſelf guilty of the higheſt ingratitude if I was to omit paying my acknowledgements to a number of my friends for their good wiſhes during my inquiries, particularly for the unbounded generoſity of THOMAS NEWTE, Eſq. L. L. D. without whom my labors muſt ſtill have ſlept in oblivion ;— therefore, the merit, if any, of this performance, and the utility which may be derived from the peruſal of the documents it contains, muſt in a great meaſure be attributed to him, who ſo nobly ſtepped forward a PATRON to encourage and aid the proſecution of this work, now preſented to the public, becauſe it promiſed to alleviate the miſeries of his fellow creatures ; and to whom, I doubt not, many in conjunction with myſelf will offer the juſt tribute of a grateful heart.

AN

ESSAY

ON THE UTILITY AND SALUTARY EFFECTS OF

MUSCULAR ACTION.

INTRODUCTION.

On the different effects of inactivity and exercise on the human machine.

IN order to preserve or recover health from a ſtate of painful, and too often fatal diſeaſe, there have been a variety of plans handed down from HIPPOCRATES, (and even before his time) to the preſent day, for promoting theſe purpoſes. And notwithſtanding they have been founded on theories very different from, and often diametrically oppoſite to each other, ſtill they ſeem univerſally to have held one opinion, relative to the great utility of exerciſe, and the miſchief ariſing from inactivity. And, indeed, in a vaſt variety (particularly of

chronic maladies) the latter has been allowed, not only to be often the cauſe, but always the means of aggravating them; whilſt the former has been conſidered as preventing, always alleviating, and in moſt caſes the principle from whence permanent cures have been obtained — and ſometimes ſo neceſſary a coadjutor to the powers of medicine, that even the moſt efficacious have been of no avail without its aid.

It may therefore, perhaps, not be unacceptable to our Readers, before the preſent ſubject is entered upon more fully, to be informed of the truth of theſe aſſertions, by quotations from various authors eminent in their profeſſion, who have held different theoretic opinions, as well as thoſe who for their guide have depended more upon ſimple obſervations.

In order to give a clear and perfect idea of their ſentiments, we ſhall firſt ſhew what they have ſaid on INACTIVITY and EXERCISE, with the conſequences they have from thence in general deduced; and this will lead us, with reſpect to the latter, to ſome neceſſary ſpecifications—by which we ſhall underſtand, that though exerciſe may be employed, ſtill it ought to be adapted to the peculiar circumſtances of the ſeparate caſes requiring its aid:—for by its improper and irregular application it may be uſeleſs, nay even dangerous —and that the favourite mode, which is ſo agreeable, and ſo univerſally adopted, RIDING ON HORSEBACK, will, in ſeveral caſes, be inſufficient for anſwering the deſired purpoſes.— Beſides, we ſhall be ſupplied with an opportunity of proving that *the air of foreign climates*, which is often adviſed as a ſuccedaneum for muſcular motion, can by no means ſupply

the defect:—for agitating the machine, and the change of air, though they have, doubtleſs, many ſalutary tendencies, ſtill they can never ſupplant the uſe of limited muſcular action, applied to particular parts;—for there are many local diſorders which aſk merely for the aid of this topical application, by which their conſtitutional deficiencies can alone be remedied.

CHAP. I.

WE ſhall now proceed to point out, by a variety of quotations, the OPINIONS OF AUTHORS ON INACTIVITY AND EXERCISE, with the reſults from thence accruing.

On INACTIVITY.

"By being too intent in writing the Hiſtory of Chronical Diſeaſes, I occaſioned the *worſt* fit of the gout I ever had, for as often as I went to ſtudy, ſo often the gout returned."

"Hard ſtudy and too great an application to ſerious things, greatly diſſolve the frame of the ſpirits, and weaken the inſtruments of digeſtion, as melancholy always attends arthritics more than any other, for which reaſon the gout ſeizes very few *fools*."

" One of our reverend biſhops, famous for learning, having ſtudied too hard, and fell at length into a *hypocondriacal* diſeaſe, which afflicting him a long time, vitiated all the ferments of the body, and wholly ſubverted the concoctions."

" After repeated attacks of the gout, the limbs without exerciſe, during the intervals, become contracted and encumbered, ſo that though a patient may ſtand and perhaps go a little, yet he creeps along ſo very lamely and troubleſomely, that when he attempts to walk he ſeems to ſtand ſtill."

" The tendons of the hams and heels are contracted, when by reaſon of the tormenting pain, the afflicted allow themſelves to lie ſtill a long time; they at length are deprived of the motion of their legs and feet for the remainder of their lives." SYDENHAM.

" Where the aſſiſtance of proper exerciſe has been always wanting, or long diſcontinued, the due velocity of the circulating blood is diminiſhed, while the muſcular and nervous fibres, at firſt ſtretched and braced to a fit degree of tenſion, for want of the labour and activity of the limbs, loſe much of their ſpringy force of vibration; and becoming ſlack and flaccid, are unable to puſh on the blood in its canals, which for want of ſuch aſſiſtance cannot complete its rounds with a requiſite celerity: for this reaſon the groſſer coagulated parts of the blood cannot be exalted and divided minutely enough by ſtriking, beating, and rubbing upon one another with ſufficient force; for as the particles of the blood without mutual attrition and daſhing againſt each other, during the

ſwift circulation of the maſs, cannot receive a proper comminution or ſubtlety, conſequently the juſt mixture of the whole cannot be well preſerved if exerciſe be wanting. — Hence concretions, tough, and ſharp contents continuing coherent and undiſſolved, fill the glands and nervous fibres with depraved matter that obſtructs their paſſages, and by that means lay the foundation of the gout. The noxious or crude matter that ſhould have been refined by exerciſe, ſtill remains undigeſted, ſtopped, and entangled, and grows up by degrees to ripe chronic diſtempers. The want of exerciſe is a *preparatory cauſe* of the gout, and this is warranted by long experience; for inſtance, the ſedentary lawyer, and the unwearied ſtudent, who continually converſe with their books, and ſeldom employ themſelves in exerciſe, thereby often contract the gout. The ſauntering, ſupine, and oſcitant gentleman, by his birth and great poſſeſſions exempt from labour and exerciſe, therefore is *entitled* to diſeaſes. The cartilages, by long confinement and inactivity, are robbed and deprived of their native oily ſupplies that uſed to keep them moiſt, ſlippery, and inoffenſive to each other, during nature's great expence of her richeſt treaſure." BLACKMORE.

—" Inactive arthritics are afflicted with many other ſymptoms excluſive of the gout; ſuch as pains of the hemorrhoidal veins, with unſavory belchings, reſembling the taſte of the meat laſt eat, putrefying in the ſtomach by reaſon of a ſcarcity of ſpirits and want of action; at length the patient languiſhes, with the whole body, and the gouty one lives only to be wretched and miſerable, and not at all to taſte of the comforts of life."

—" The numbneſs and ſleepineſs of the limbs after *long ſitting* is no other than a temporary palſy; the preſſure upon the branches of the *cauda equina* hinders the circulation of the ſpirits that way for a while, and the continuance of ſuch a poſture would at laſt diſpoſe to a real palſy."

—" Students who write much, ſhould be cautious of their ſitting poſtures, for the famous Dr. COLE, from ſuch a continued poſture, got an abſceſs on the muſcles of the belly."
STROTHER.

—" An eaſy, indolent life tends to bring back the bodies of adults to their primitive relaxation."

—" Some gouty perſons have not been able to ſit without a fire the hotteſt day in ſummer, and they in general are very ſenſible of cold, proceeding from a languid circulation, and from the inactivity of the limbs."

—" Nothing ſo certainly lays a foundation for perpetual fits of the gout as exerciſe diſcontinued." CAVERHILL.

If much ſtudy be joined to the want of exerciſe, it becomes then *doubly* prejudicial, and will, if long purſued, ruin the ſtrongeſt conſtitutions.

Hard ſtudy never fails to deſtroy the appetite, and produce all the ſymptoms already enumerated, with *headachs*, *vertigoes*, *coſtiveneſs*, *wind*, *crudities*, *apoplexies*, *palſy*. 1

Diſeaſes produced by ſedentary life, muſt be cured by their contraries, namely, the action of the muſcular ſyſtem.

" All nervous diſorders ſeem to be but one continued diſorder, ariſing from a relaxation of the ſolids, in proportion to the reſiſtance of the fluids, in order to carry on the circulation, remove obſtruction, carry off the recrements, and make the ſecretions."

" In treating of nervous diſorders, the ſolids are chiefly to be regarded."

" The true acquired nervous diſorders are produced by intemperance and want of exerciſe ; the juices thereby have been made ſizy or corroſive, and the due tone and elaſticity of the nerves and ſolids relaxed and broken."

" If inactivity and want of exerciſe are joined with luxury, the ſolids become relaxed and weakened, and the acrimony of the ſalts and humours gradually increaſe, then chronical diſorders are produced, ſuch as gout, eryſipelas, rheumatiſm, with all the pains, miſeries, and torments, ariſing in this low-ſunk ſtate of the conſtitution." CHEYNE.

From what has been delivered, we are enabled to collect, that INACTIVITY renders the humours foul and viſcid—cauſes glandulous and nervous obſtructions—*robs the cartilages of their natural oily ſupplies*;—is a preparatory cauſe of the gout —and ſubjects the ſtudious and indolent to a variety of

chronic diſeaſes.—It deſtroys the appetite—occaſions indigeſtion—brings on the headach, vertigo, coſtiveneſs, wind, crudities, apoplexy, palſy, and other nervous diſorders—renders the blood ſizy, and the juices acrid—relaxes the ſolids—and occaſions gout, eryſipelas, rheumatiſm, and a variety of other painful diſorders.—It brings on the piles—and long-continued ſitting in one particular poſture creates numbneſs in the lower extremities, and palſy;—ſometimes occaſions abſceſs in the lower belly.—It renders the circulation languid—diſpoſes gouty people to be extremely cold, and lays the foundation for perpetual fits of that malady—It is the means of inducing general debility through the ſyſtem—melancholy and hypochondriaſis—It vitiates the whole juices of the body, *occaſions alſo contractions of the limbs in gouty ſubjects, and often impedes, through life, the motion of the legs and feet.*—And we may conclude, agreeable with the opinion of Dr. GREGORY, that indolence debilitates the body, renders it irritable, and occaſions a languid circulation of the fluids;—diminiſhes, commonly, all the ſecretions and excretions, and renders the machine fat and plethoric; and therefore paves the way for moſt diſeaſes—as hyſterics, indigeſtion, gout, hæmorrhages, apoplexy, palſy, obſtructions, and dropſies.—In contradiſtinction to this, let us now ſee what have been conſidered to be the effects of exerciſe.

CHAP. II.

On the neceſſity and importance of exerciſe.

"WE muſt ſometimes force the timorous from their beds, and rouſe the lazy and ſluggiſh."

—"Exerciſe gives ſtrength and firmneſs to the body, and vigour to the mind." HIPPOCRATES.

"If the lower extremities are kept warm by action, it produces a free circulation over the whole body." GALEN.

"A certain prieſt poſſeſſed of a rich living, and a martyr to the gout, happened to be taken by the pirates of Barbary, and was detained there a ſlave for the ſpace of two years, and kept *conſtantly* at work, which had the following good effect: when he was ranſomed from captivity, (having loſt all his troubleſome and monſtrous fatneſs) he never after had a fit of the gout, though he lived ſeveral years after the event." VAN SWIETEN.

"The ſooner the joints are relieved from contractions by muſcular motion, the leſs danger there is of obſtructions fixing in them, but inſtead of this the general practice is quite the reverſe." CADOGAN.

" The increaſing of one evacuation is the leſſening of another; and how much exerciſe increaſeth health, is evident from the 7th, 8th and 27th aphoriſms of SANCTORIUS compared with the 34th and 35th." PITCAIRN.

" If medicine helps the fluids, exerciſe helps both fluids and ſolids, and will diffuſe an equal degree of heat all over the body, and, beſide, make the acrimonious particles ſupply the place of warm internal medicines."

—" We muſt give an *equal* lift to all the parts of the human œconomy, and not apply to the fluids and *neglect the ſolids*, (or muſcles) for the ground of all miſtakes ought to be imputed to the want of this diſtinction."

" When I meet with a languid, hyſteric pulſe, I can eaſily riſe it, and give a full beat to the artery by anti-hyſteric medicines; but then the nerves are not helped by this, but ſometimes impaired: let exerciſe be uſed, the nerves and the blood partake of the benefit." CORNARO.

" Exerciſe helps to throw down wind from the bowels, and attenuates the contents of the ſtomach."

" There is an abſolute neceſſity for the fibres and fluids to be counterpoiſed by exerciſe; the ſolids during action rebound the fluids, and compreſs them with the ſame or equal force; it is by this mechaniſm life is kept on foot; this is the action

and re-action, ſo uſeful in perpetuating the circulation and all its appendages."

" Exerciſe prepares us for ſleep and ſends the digeſted materials into the blood, which fill the veſſels, and therefore ſleep enſues."

" Exerciſe is beneficial to hypochondriacs, becauſe the ſuccuſſions made by it are ſo many ſtreſſes upon the fibrous parts of our bodies, that the watery particles in which they are ſoaked and relaxed by this mild agitation, exhale, as we ſee water on the earth does by a gentle heat of the ſun."

" Exerciſe rarefies our juices, re-diſſolves coagulations, invigorates our ſpirits, by which the blood is rendered thin; the ſpirits are again rightly ſeparated, and all our functions re-commence in an exact manner, and health is thereby recalled, even without the help of medicine."

" Exerciſe is recommended in nervous rheumatiſm, and more eſpecially in ſcorbutic ones; in the ſcorbutic rheumatiſm the pains ſhift from place to place without any ſwelling, and they are increaſed by night; but in the nervous, however ſo wandering the pains, they are accompanied with convulſions in the tendons."

" Exerciſe opens the pores, ſoftens the fibres and unbends their contractions, and prevents that plenitude or rarefaction, from whence thoſe pains originally ſprung."

" Exerciſe alſo ſerves at once as an evacuant, and a diverſion, by which artifices the humours are put into the condition of flying off without the danger of bringing on ſpaſms."

" Exerciſe has a great ſhare in ſtaving off diſeaſes; by it our juices are preſſed into the minuteſt canals."

" We move by the aſſiſtance of our muſcles, which change their figures with the blood-veſſels ſtretching themſelves along them; when the muſcles are in action, the veſſels are ſqueezed and emptied, and as thoſe ſink theſe fill again; therefore exerciſe cauſes a *ſyſtole* and *diaſtole*, or action and re-action, in the veins, arteries, and lymphatics, and ſends the blood forward, and continues a full and regular circulation."

" The advantages we reap by exerciſe are NUMEROUS; life itſelf conſiſts in the circular and inteſtine motions of our fluids, and their uninterrupted paſſages through canals truly framed."

STROTHER.

" Nothing has ſo ſalutary an effect on the veſſels of the joints as proper exerciſe, and we have the concurrent teſtimony of all ages to ſupport this aſſertion."

" By proper action of the knees and ankles, the arthritic promotes the abſorption of the fluids, which produce the ſwellings, and by carrying them off will anticipate the diſtenſion of the fibres immerſed in them,"

" When the gout attacks the joints of the feet and knees, the perſon ſhould be daily attempting to move theſe parts: a gouty patient will much ſooner recover the activity of the limbs by the uſe of exerciſe, than by any other means, and prevent the contraction of the muſcles, an inconvenience which is apt to remain, when the gout has attacked the knees and ankles."

" Let it be ſuppoſed, that the firſt attempts to motion are attended with difficulty, and perhaps ſome degree of pain; yet, by gradual and daily repetition, it will become eaſy, and the muſcles more pliable."

" If the patient is obliged to interrupt his motion, it ſhould be renewed in a very few hours afterwards, or the following day; for by perſevering in daily exerciſe to recover the uſe of the part affected, the reſolute patient will certainly at laſt ſucceed."

" When the gouty ſymptoms begin in any joint, that joint ſhould be immediately moved, for by this means the fluids are driven back from the ſeparating arteries, which they were urging to deſtruction, and the tenſion is taken off the nerves; the pain therefore ſoon abates, and the part recovers its uſual powers."

" When the pain returns upon the diſcontinuation of exerciſe, the motion ſhould be renewed and perſevered in, and the part at laſt will be ſo ſtrengthened, as to be in no danger of a relapſe." CAVERHILL.

" Moderate exercise not only corroborates and preserves the muscles, promotes the circulation of the vital juices, enlivens the sensitive spirits, but likewise creates hunger, and assists the concoctive ferments of the stomach, which must be frequently interposed, that the unagitated and lazy mass of blood may not corrupt and putrefy like ponds, and the repositories of the bowels be obstructed, and filled with the aggregated principles of the gout."

" In short, the only effectual method to prevent the severity of the gout, is to avoid the causes that produce it, which are enumerated at large, and are offered to the free choice of all, according to the observation in the CYCLOPEDIA, " that the cure of the gout, at least alleviation, lays within every person's reach."

" Exercise preserves the *appetite* and the digestive faculty of the stomach, and wholesome, well-concocted nourishment is conveyed to the veins, and the blood is refined and purified from degenerate humours, that generally protected it from the outrage and cruelty of this formidable disease."

" It must, therefore, be of great and general benefit to mankind, and highly becoming the profession of a physician, to suggest any thing of MOMENT for the relief and cure of such a malady as the gout."

" Exercise, regular and in a moderate degree, such as neither exhausts the spirits, nor gives too great velocity

to the motion of the blood, is very profitable to the patient." BLACKMORE.

" The operation of digeſtion, by which chylification begins, is performed by the *ſuccus gaſtricus*, which flows continually from the *tunica villoſa*, and partly by the action and re-action of the muſcular coat of the ſtomach ; theſe motions in men are but very weak, and no ways ſufficient for digeſtion without the aſſiſtance of the alternate motions of the diaphragm and the muſcles of the abdomen." WINSLOW.

" It is well known, that the ſtomach is deſigned and fitted for the digeſtion of our food, by which it is divided into ſuch ſmall parcels, as will paſs through the *lacteals* into the maſs of blood for our ſtrength and nouriſhment."

" The ſtomach is made of membranous and muſcular fibres, filled with arteries, veins, nerves, and glands, by which a viſcid matter is ſeparated from the blood, and poured into its cavity for very good ends and purpoſes."

" The ſtomach by the help of its muſcular fibres, with the diaphragm and muſcles of the abdomen, is enabled, with the aſſiſtance of exerciſe, to toſs the food about, and if this motion be not the ſole, (according to the learned Dr. Pitcairn) it certainly is the principal cauſe of digeſtion ; for the force of the muſcles by action employed in this buſineſs, is almoſt incredible."

" Whatever increaſeth muſcular motion haſteneth digeſtion."

" Exerciſe mightily promotes digeſtion by ſtrengthening the fibres, whereby muſcular motion is increaſed, as well as by leſſening the quantity of viſcid matter ſeparated in the glands of the ſtomach." WAINWRIGHT.

" As to my own experience, I never ſaw any thing done to the purpoſe in nervous caſes with ſucceſs complete, or ſubſiſting, without exerciſe and diet; therefore it is not my buſineſs to collect authorities for a ſyſtem ſo UNIVERSALLY acknowledged and ſo little diſputed."

" Experience, which extremely confirms the benefit to be derived from exerciſe, is the only ſolid foundation to go upon in the cure of *chronical* diſorders, and the reaſon of it is ſo obvious, that every perſon muſt ſee it."

" As diet and proper medicine purify the juices, exerciſe alſo ſtrengthens the ſolids, by *continuing* their actions and motions."

" There ſeems, as it were, new particles to be forced by muſcular action into the interſtices and ruptures of the ſolids, to knit and ſolder, and recover their loſt union, coheſion, and ſpring; ſo that exerciſe ſeems the ONLY, at leaſt the ſovereign remedy in relaxed and weakened ſolids."

" Where the perſpiration is ſmall, and ſcarce any at all, eſpecially in chronic and nervous affections, there is an ABSOLUTE NECESSITY of *due* exerciſe, to ſupply the want of ſun and thin air to remedy theſe effects."

" The neglecting of exerciſe in our cold climates ought to be reckoned as abſurd, as over uſing it appears fantaſtical to orientals."

" The ſolids are the great, the proper, and the only inſtruments of *life* and animation."

" For the want of exerciſe to preſerve the tone and elaſticity of the ſolids, laxity and weakneſs enſue, which produce viſcid, ſharp, and ill-conditioned juices."

" Due exerciſe will *always* recover a decayed appetite, ſo long as there is any ſtrength and fund to go upon."

" There is not one thing more generally approved of and recommended by all phyſicians, for the relief of *chronic* complaints, than exerciſe."

" Weak limbs and all the bodily organs may be ſtrengthened and repaired by exerciſe." CHEYNE.

" I do not know any thing that will ſo certainly perfect the cure of the bilious colic as exerciſe, with an *anodyne*, morning and evening."

" By a proper kind of exercise the matter causing the disease is brought to the habit of the body, and the blood being broken into small parts by regular motion, adapted to the patient's strength, is separated again, and at length, by daily perseverance, the intestines are much strengthened and refreshed, by this way of stirring up the natural warmth of the blood; nor am I ashamed to confess, that by exercise I have more than once cured this disease, when I could not cure it by any other way: but exercise is not to be used before the sick is well purged, and then to continue the use of the exercise for many days."

" And truly I have known exercise used with *admirable success* in most other *chronical* complaints, if the patient continued it RESOLUTELY, for the organs of secretion are much strengthened thereby from the powerful excitation of the native heat, and restored by exercise."

" Without exercise (in conjunction with medicine) the perfect cure of the gout cannot be completed, and all physicians ought to desire this UNION, especially myself, after *thirty-four* years martyrdom; yet I do well understand the humours of *illiberal* men, that I shall not be much deceived at the unkind reception of my treatise on the gout; yet I understand and consider it MY DUTY, and therefore shall not be discouraged; and if the tormenting pains wherewith I have been afflicted can acquire ease for others, I shall receive, now I am passing into another world, some fruit of the misery of this kind I have felt in life."

" Though the unfitneſs for motion may ſeem to contra-indicate exerciſe, yet it muſt be undertaken; for no excellent and effectual remedy has been any where experienced, which had not received its chiefeſt virtues from the aid of muſcular action."

" The total impotence of the limbs for motion is conſiderably helped by conſtant exerciſe."

" The truth of what is ſaid concerning the cauſe of chronical diſorders, will manifeſt itſelf by the incredible relief derived from exerciſe."

" For want of exerciſe the body becomes withered, and the concoctions are no more rightly performed, but on the contrary, the *dregs* of the juices of the body are laid up in the veſſels as a ſtock for the gout, which by exerciſe in due time may be diſperſed and diſcharged."

" Exerciſe is not to be taken by the bye, but muſt be conſtantly and daily uſed, with the greateſt diligence."

" Exerciſe is neceſſary for thoſe who indulge themſelves in luxury, are worn out by ſloth, negligence, and hard ſtudy."

" Whatever aſſiſts nature in *daily* performing her offices, by aſſimilating the chyle brought into the ſtomach, is properly called digeſtive, whether it be a rule of diet or exerciſe; the latter ſtrengthens the blood and renders it briſk, and does

moſt good in *chronic* caſes, ſuch as the gout, which ought to be imputed to the indigeſtion of the humours."

" Our great miſery is, that we forſook long ago our ancient and ſkilful guides, HIPPOCRATES, SANCTORIUS, who ſo ſtrongly recommend daily exerciſe for the removal and prevention of *chronic* complaints." SYDENHAM.

Indeed, were we to collect whatever had been written on this ſubject by different authors, it would be merely almoſt a repetition of what we have already inſerted; we ſhall, therefore, only add, that from the writings of BOERHAAVE, HOFFMAN, and CULLEN, names ever to be remembered whilſt medical ſcience exiſts, it appears that exerciſe has been one of the principal means by which many of the chronic diſeaſes have been cured; and certainly it appears calculated to be of the utmoſt utility, for if it is not too violent, it gives ſtrength and vigour to the body, increaſes the circulation of the blood —aſſiſts digeſtion—thins and divides the fluids—promotes all the ſecretions and excretions, particularly perſpiration—invigorates the ſpirits, and increaſes nervous influence in every part of the machine—prevents any ſanguinary accumulations—and gives activity and ſtrength to all the muſcular fibres—and hence not only prevents but cures a number of diſeaſes;—and we may obſerve, that thoſe who are accuſtomed to exerciſe, are for the moſt part robuſt, and ſeldom ſubject to complaints, which harraſs and deſtroy the indolent and inactive.

But, however, great as are the advantages of ſuitable exerciſe, we find that it is not only uſeleſs, but dangerous, when

uſed irregularly or improperly, according to the ſentiments of the following authorities:

"Exerciſe is not to be taken by the bye, but ſhould be uſed daily and regularly with the greateſt diligence."

SYDENHAM.

"If a perſon takes violent exerciſe now and then, or only for few days in the courſe of a month, and imagines by that to counteract all the bad effects of a ſedentary life he may have led during the reſt of the month, he will be *much miſtaken*; for the relaxed ſtate to which his body is reduced by the inactive and ſtudious parts of his life, ſubjects his arteries to be more eaſily cloſed, ſo that a greater number of them will be rendered impervious by this ſudden change of life."

"When the cauſes of relaxation prevail, it demonſtrates the abſolute neceſſity of *perſevering* in proper exerciſe, as being the only method of reſtoring the limbs after an attack of the gout."

CAVERHILL.

"Violent exerciſe, although it often ſtrengthens, and renders the body firm and active, yet it renders it ſubject to ſome diſeaſes; partly, perhaps, from the greater denſity and acrimony of the humors; but more probably from the great power and ſtrength of the ſolids, and conſequently from the great force of the humors; from whence it happens, that ſome fevers and inflammations are more readily occaſioned, and run on to great degrees of violence.—But ſevere and perpetual labor,

for another reaſon, exhauſts the body, creates debility and dryneſs, and therefore brings on a premature old age — for that kind of labor, by which great part of mankind ſupport themſelves and families, although it may protect them from many diſeaſes, yet haſtens decay, and conſequently death.— Thoſe who walk in the ſuperior ſpheres of life, and the rich, though debilitated by luxury and indolence, and often broken down by many diſeaſes, ſtill grow more ſlowly old, and therefore live longer than the poor artificers and ruſtics, whom poverty confines to temperance at home and labor."

GREGORY.

" As nothing is more conducive to health than moderate exerciſe, ſo that which is violent diſſipates the ſpirits, weakens the body, deſtroys the elaſticity of the fibres, and exhauſts the fluid parts of the blood—Add to this, that by the violent attrition of the ſolids and fluids, together with the heat thence ariſing, all the humors will incline to a greater acrimony, and the ſalts and oils of the blood will become more acrid and volatile — hence, from ſevere exerciſe acute and mortal fevers often ariſe." BOERHAAVE.

Beſides, under peculiar circumſtances, the exerciſe ought to be adapted to the nature of the diſeaſes, or their effect, which we wiſh to prevent, or cure.

" Thoſe liable to fall into gravelly complaints, or ſubject to indigeſtion or viſceral obſtructions, *riding on horſeback* is moſt beneficial—thoſe ſubject to the gout, or liable to catch cold, *walking*—to have collection of phlegm upon the lungs,

reading aloud or *ſinging*—thoſe who have a ſtrong muſcular ſtamina with a ſluggiſh circulation and coldneſs, *playing at cricket* or *tennis*—ſubject to hyſteric diſeaſes, or melancholic affections—where the mind broods too much over imaginary calamities—driving a carriage, ſhooting, hunting, or ſome where that reflection may be drawn from unpleaſant objects, &c.—and *thoſe exerciſes which are more or leſs violent, ſhould be adviſed according to the ends we wiſh to promote*;—for the grand end of theſe are to increaſe the tone of the ſolids—make the different glands perform their functions—promote inſenſible perſpiration—and prevent the fluids from becoming detrimental to either, by their thinneſs, viſcidity, or acrimony."

"Exerciſe may be divided into three degrees—the STRONGEST of which are,

First, Playing at tennis, cricket, fencing, running, &c. where great muſcular exertion is neceſſary.

Second, Walking, reading aloud, riding on horſeback, or in a carriage.

Last, Sailing, chamber horſe, dumb bells, and frictions,—which laſt are appropriated to old age, where muſcular force begins to grow effete, and are neceſſary for the preſervation of health, by promoting the circulation of the blood, and motion of the fluids, through the minute veſſels. Wallis.

If we reflect on what has here been advanced, we ſhall be clearly convinced, how inſufficient the change of climate

will be to promote the purpoſes of muſcular motion.—For,

" The joint power of warm air and light food cannot ſupply the place of exerciſe in keeping the joints pliable and moveable, and preſerving them from growing ruſty and ſtiff: light food may in ſome meaſure prevent the thickening of the fluids, but cannot do it ſufficiently without the aid of exerciſe, nor can it at all keep the fibres in due tenſion, for to that purpoſe exerciſe is abſolutely neceſſary."

" Exerciſe is not only neceſſary in the colder climates, and where the food is groſs, but even in the warmeſt climates; for though the warmth of the air may keep the perſpiration free and open, yet at the ſame time, and by conſequence, it will thicken the fluids and relax the fibres, therefore, in order to prevent both, exerciſe is abſolutely neceſſary." CHEYNE.

Nor ſhall we be leſs at a loſs to diſcover how inadequate will riding on horſeback be, in many particular caſes, to anſwer the deſired intent, where the joints, ligaments, and muſcles of the lower extremities, are in a debilitated or contracted ſtate.—For,

" The feet and knees of diſabled arthritics have nearly as little exerciſe on horſeback, as when the body is in perfect reſt; they have only a kind of tremulous motion, which is ſo very inconſiderable, when compared with the great action of progreſſion, that it does not merit the ſmalleſt attention."

" The feet and the lower limbs will even be found to be *injured* by riding on horſeback; for the weight of the blood between the feet and the heart is continually preſſing upon the coheſion in the feet, as it always does when the body is carried perpendicularly."

" Riding ſtrengthens only one half of the body; the *lower limbs* thereby are much *injured*, and many fatal conſequences may follow, in arthritic caſes, from inattention to this inequality of reſiſtance." CAVERHILL.

" Some men are ſo overween in favor of riding on horſeback, that we hear all its encomiums; it is ſet in ſo advantageous a light, that they have not neglected to mention the leaſt benefit received by it, and they ſeem to attribute more than its *ſingle* ſhare, and aim at a panegyrick."

" Exerciſe, of whatever kind it be, ſhould be properly ſuited according to the caſe." STROTHER.

Riding on horſeback, with other common exertions, are well adapted for the healthy and active, who have the free uſe of their limbs, to recreate themſelves according as their fancy leads them; but very inefficacious for arthritics and invalids, who are deprived of the power of uſing their limbs.

To point out the inutility of riding for the relief of caſes where the joints are become contracted, and the circulation languid, require but a ſlight inveſtigation; for inſtance, thoſe in perfect health, who are long on horſeback,

loſe a portion of the vigour of the *lower extremities*, by the muſcles being compreſſed, and the full crural arteries ſomewhat impeded, and the circulation of the fluids rendered more languid.

Riding is only *one* exerciſe, and that of a jolting motion to the weak and almoſt uſeleſs joints, though continued for half a day; the knees, ankles, and feet, which chiefly require action, hang motionleſs throughout this *philoſophical* journey.

One and the *ſame* exerciſe for various local complaints, can no more be effectual than one medicine in various acute complaints.

Surely, four hundred and ſeventy-four muſcles, and two hundred and forty-ſeven bones, which the human body conſiſts of, require both partial and univerſal action, nor is it to be ſuppoſed that ſuch a group of muſcles and number of joints can remain in right order without being duly regulated.

Exerciſe which is to be procured by riding, or from walking, has no tendency to correct either ſtiffneſs of the joints, the effects of ſprains of long ſtanding, or to reduce callous and inelaſtic ſwellings round the knees and ankles, or to reſtore the muſcles, when contracted, to their proper tone and flexibility.—It is clear that muſcular action ſhould be appropriated to the parts affected, which, in a variety of caſes, cannot be acquired by any plan of general exerciſe, hitherto diſcovered.—For we ſhall ſee by all the quotations we have already given, as well as the ſucceeding, that

muſcular action has been recommended, and in ſome caſes, that alſo local—ſtill to the proper modes, the whole have appeared ſtrangers—After, therefore, ſupplying two or three quotations, we ſhall give our ideas of muſcular action, and ſhew the neceſſity of the diſtinction at which we now only hint; referving the further diſcuſſion for the concluſion of this work, which is intended to convince our readers, on the principles of reaſon, that however uſeful the exerciſe hitherto practiſed may be in general to the human machine, particular muſcular action cannot always be diſpenſed with.

" A perpetual afflux of blood is plainly neceſſary, in order to keep the tendons flexible, which muſcular action is capable of performing by promoting a regular circulation, and further its deſigns." STENO.

" The loſs of ſenſe and motion generally attends the relaxed palſy, from the thickening of the juices, as appears from the languid circulation; and in both the contracted and relaxed palſies it is evident, that muſcular action will be of additional ſervice after *bathing*, as obſerved by WYNTER."

" Every point and particle of the ſolids are elaſtic, and act for the relief of the whole." CHEYNE.

" Neither waters, medicine, nor regimen, will reſtore a gouty patient in half the time, as they will do when joined to exerciſe: a little attention to the theory of animal ſecretion will ſhew the inſufficiency of purges unaſſiſted by exerciſe; how is a medicine, which is calculated to ſcour and cleanſe the firſt paſſages, to renew muſcular ſtrength?" WARNER.

CHAP. III.

HAVING ſhewn, from a variety of authorities, what good effects ariſe in ſome caſes from exerciſe in general, and alſo that in others, exerciſe appropriated to particular parts is equally neceſſary, where the machine, or parts of the machine, are in ſo debilitated, or otherwiſe diſeaſed a ſtate, that patients are incapable of applying ſuch ſort as is beſt calculated to alleviate or cure the diſtreſs—We ſhall now go more fully into the nature of muſcular action; and in order to give a clear idea of what we propoſe for the benefit of mankind, who labour under theſe infirmities, we ſhall firſt point out *of what a muſcle is formed—its properties from whence ariſing, and explain the nature of thoſe powers by which it is actuated*—and afterwards give an account of various muſcles, with their uſes—ſuch as will readily meet the eye of any common obſerver—and be made manifeſt by a number of plates, with proper references, explaining the different ſtates in which they are placed, whether in ACTION, EXTENSION, or RELAXATION.

Amongſt the various parts which form the human machine, the nature of our preſent work confines us only to a few, and thoſe chiefly which are appropriated to motion, and parts moſt intimately connected with them for this purpoſe—Theſe are bones,—cartilages,—ligaments,—and muſcles, with their tendons—which we ſhall proceed to deſcribe, giving only of

them a conciſe view, ſufficient to make us underſtand the nature of muſcular action.

First. "The bones are the hardeſt and moſt ſolid parts of the human machine, calculated to ſupport thoſe which are ſoft and firm in all their motions and preſſures; they are covered with a membrane, or thin bladdery ſubſtance, called perioſteum, on account of its covering the bone, which is exquiſitely ſenſible, being plentifully ſupplied with nerves and blood veſſels. The outſides of bones are commonly more compact than the inner parts; and are formed of plates, joined together by tranſverſe fibres; their inſides are ſpongy and cellular, in which is contained marrow, within membranous bags, filling up the cells; this marrow, being more or leſs diſtributed all over the bones, and tranſuding through their plates and fibres, makes them tougher and leſs brittle; the bones are ſupplied, both within and without, with blood veſſels and nerves.

Second. "Cartilages, or griſtles, are ſolid, ſmooth, white, elaſtic ſubſtances, between the hardneſs of a bone and that of a ligament, covered with a membrane called perichondrium, becauſe it covers a cartilage, which is akin to the perioſteum of the bones; they ſerve to make the bones, whoſe extremities or ends they cover, move freely in the joints: they limit the growth of bones, as to their length, by hindering the bony fibres from ſprouting out; and, therefore, when the cartilages in the joints are eroded, an immobility is there formed, called anchyloſis, or ſtiff joint, by the elongation and coalition of the fibres of the bones that are

articulated together; ſometimes they ſerve as ligaments to join the bones together, and ſometimes they do the office of bones to greater advantage than theſe would do; as the cartilages of the ribs, which, by their elaſticity, chiefly contribute towards expiration; the cartilages that make out brims of cavities, &c.

THIRD. "Ligaments are made of white, tough, fibrous layers or ſtrata without cavity, the largeſt and ſtrongeſt of which run lengthwiſe; ſtretched with difficulty, and of little elaſticity, (excepting the ligaments ſurrounding the wriſts and inſteps, which are thin, flexible, and capable of expanſion and extenſion) thicker and firmer than membranes, and not ſo hard or ſolid as cartilages; they ſerve to connect and keep together, in a proper ſituation, the parts to which they are fixed to, as appears remarkably in the articulations.

FOURTH. "Muſcle, of which in the human machine, there are three different ſorts;—the LONG MUSCLES of the trunk of the body and limbs, which not only are put into action by the power of the will, but remain a long time in a contracted ſtate; although, if left to themſelves, may ſoon be relaxed; —the HOLLOW MUSCLES, that is, muſcular fibres which ſurround ſome of the hollow organs of the body, and cannot of themſelves ſhew any relaxing power, as in the heart, arteries, inteſtines, and bladder—although the functions of theſe parts being well underſtood, prove that relaxation ſucceeds their contractions;—and laſtly, the SPHINCTERS, or thoſe muſcles which cloſe the mouths of tubes or cavities before which they are placed, and never in a man in perfect health appear to be relaxed.—Now all theſe muſcles, according to

the opinion of moſt anatomiſts and phyſiologiſts, particularly the illuſtrious HALLER, are made up of ſmall bundles of red thread-like appearances, by which all perceptible motion is performed—when more fibres, and theſe more evidently red, are united together, then is the collection called a MUSCLE.

In every muſcle, long, ſlender, ſoft fibres are found poſſeſſed of ſome elaſticity, running univerſally parallel with each other, which, ſurrounded with a plentiful portion of cellular membrane, are collected into what are called LACERTULI, that is, in ſhape like the arm from the elbow to the wriſt—theſe bound together with a looſer, and for the moſt part fatty membrane, run into larger bundles, which are always divided by cellular ſtripes or partitions, then called LACERTI, which alſo running either parallel or inclined, ſurrounded with a thin cellular membrane continuous with the partitions, and ſeparated by a thicker cellular texture from the neighbouring fleſhy parts, are conſidered as one muſcle.—In every perceptible fibre there appears a ſeries of filaments, which being mixed and united with one another by oblique terminations, are joined in a larger fibre; ſo that we find one perfect muſcle conſiſts of a number of bundles, and theſe of a number of ſimple fibres.

In a great number of muſcles, particularly thoſe which are inſerted into the bones, and are preſſed by other ſtrong fleſhy parts lying above them, there are different kinds of fibres—for the fleſhy fibres collected in the middle of the muſcle create a degree of thickneſs there, which is named the BELLY, and theſe in their progreſs to each termination of

the muſcle grow gradually ſmaller and more firm, having loſt their redneſs aſſume a ſhining, ſilvery appearance, and approaching nearer to each other, collected in a thin cellular membrane, and ſhorter, are ſpread over with fewer veſſels, are more inactive, and not readily irritable—theſe then receive the name of TENDONS, if they are united into a ſmaller round bundle; but if they are ſpread out into a broad ſmooth ſurface, APONEUROSIS—The cellular coat which ſurrounds the whole of the tendon, like the common tunic of a muſcle, is called VAGINA.

That the tendons are formed from the fleſhy fibres, we ſhall be convinced by comparing the fœtus, which has very few tendons, with the grown boy, which has many more, and which in the adult and aged are greatly increaſed, particularly the latter. Muſcles having no inſertions into the bones, moſt commonly have not any tendons, as the heart, the ſphincters, the tongue, the muſcular membranes of the veſſels and viſcera.—But where they ſurround the joints and heads of the bones, called epiphyſes, the tendons there are very long, and in thoſe extremities which require more motion.—In the fœtus it is manifeſt, that the muſcles are inſerted only into the membranous covering of the bone, called *perioſteum*—but in adults, where the perioſteum is intimately united with the bone, the muſcular fibres confuſed with that covering penetrate into the foveoli of the bone itſelf.

In the cellular tunic ſurrounding the fibres, arteries, and veins, are divided, and form net-work at right angles, accompanying for the moſt part, and running contiguous with

each other; whence a vapor is poured out into the thin, and fat into the thicker cellular membrane, from whence they are both again reſorbed. The lymphatic veſſels, which run betwixt the muſcles of the tongue, neck, face, are with difficulty demonſtrated—But the nerves are diſtributed with the veſſels through the cellular membrane of the muſcles, more copiouſly than to any other parts of the body, except the eye—though having loſt their firmer involucrum, or covering, become ſofter, and diſappear before they can be traced to their ultimate termination—They enter the ſame muſcle at many places, but have not any peculiar for their entrance.—In the tendons they cannot be demonſtrated—neither are there any nervous fibres which ſurround and bind the lacerti, or larger bundles of muſcular ones—thoſe who have deſcribed them, having diſcovered nothing except cellular membranes.

Such, then, the particular ſtructure of the muſcles, we muſt now ſee from whence they derive their power.

CHAP. IV.

MUSCLES manifeſtly poſſeſs, like other ſolid parts of the human machine, a great degree of ELASTICITY, that is, the power of re-aſſuming their own form, when ſtretched beyond their natural limits by any diſtending force, on the ceſſation of the action of that force, which power continues even after death—whatever other motion it has more, that depends upon LIFE and the *connexion which is formed betwixt them and the brain and nerves.*

Beſides this they have alſo a tonic power, that is, ſtrength and activity united—which extenſion keeps ready for action, and this acts as a ſtimulus, to which every muſcle is ſubſervient—for almoſt all the muſcles of the living machine are extended, more or leſs, beyond their natural ſtate, that is, ſuch a ſtate as, if unconnected, they would ſpontaneouſly poſſeſs—This extenſion is occaſioned particularly by the bones themſelves increaſing with which they are connected, as well alſo as by the action of the oppoſite muſcles, and the weight of ſome parts which the muſcles are deſtined to ſupport; and finally, by the fullneſs of the organic cavities or viſcera, which they ſurround, or with which they are by ſome means or another connected.

Now, the greater the extenſion the more is the tone and the vigor of the action of a muſcle increaſed—the leſs, the

weaker will be its powers—this is proved by the circulation of the blood being quickened and augmented by the fullneſs of the veſſels—which effects are taken off in many diſeaſes by bleeding, than which we have not a more certain and immediate auxiliary in mitigating the impetus of the blood. But this tonic power, as far as it depends upon extenſion, is confined within certain limits; for, ſo far is a great and continued extenſion of muſcular fibres from rendering their contraction eaſier and ſtronger, that often it weakens and deſtroys it—and thus muſcles commonly loſe their power and are rendered incapable of either ſuddenly or with facility recovering their former ſtrength.

Moreover, a muſcle, not in a ſtate of extenſion beyond its proper limits, contracts itſelf by the application of any ſtimulus. To this power phyſicians have given the name *inſita*, inherent —Again, ſhould no ſtimulus be applied to the muſcle, but to the nerve which it receives, the ſame motions will be excited—or if the brain itſelf ſhould be irritated, a great number or all the muſcles will be convulſed—this ſtate or condition of the muſcles is termed the *vis nervoſa*, or nervous influence, and is ſaid only to differ in ſituation from the *inherent power*.—And laſtly, ſhould there be no irritating cauſe applied to the muſcles, brain, or nerves, by the will alone we can throw many muſcles into action; and this is properly called *animal*, as it belongs alone to the animal creation, and conſidered as *voluntary* motion.—Yet ſtill all muſcles are not ſubject to the will; for a great number, and thoſe of the utmoſt conſequence in the animal œconomy, are performed where the mind is unconſcious of ſuch motion,

nay act againſt the will, even when it contends to prevent ſuch effects; theſe are termed *involuntary*.

The *voluntary motion*, or thoſe under the command of the will, are thoſe of the muſcles of the head, face, eyes, trunk of the body, limbs, in an healthful man; although ſometimes without any diſeaſe, thoſe muſcles may be put into action, the mind unconſcious of, or contending againſt ſuch motion.

The *involuntary* are thoſe of the heart, arteries, ſecretory organs, of the whole inteſtines from the pharynx to the extremity of the loweſt inteſtine, the pupil of the eye, and other ſphincters; though indeed over many of theſe the will bears ſome degree of power, particularly of the urinary paſſages, bladder, uterus, and bronchia of the lungs.

The muſcles of reſpiration hold a middle place amongſt theſe, viz. the diaphragm, the muſcles of the abdomen, or belly, and thoſe which are ſituated between the ribs, and as many as are ſo united with them, that their contraction can either fix, elevate, or depreſs the ribs.

Thus much have we thought neceſſary to ſay with reſpect to the formation of muſcles, and the powers by which they are actuated, either adventitious or inherent in themſelves, agreeable to the opinions of the beſt authorities—that our readers may be prepared to receive information by what means the exerciſe, we intend hereafter to propoſe, produces its ſalutary effects, and enabled to judge of the rational prin-

ciples upon which it is founded—This part of the ſubject we ſhall therefore cloſe with obſerving,

That muſcles of voluntary motion, by ſtrong and proper exerciſe, admit it is not too violent, renders them firmer, more active, and ſtronger, and makes them more fleſhy or brawny—hence, from the appearance of the form itſelf, are we apt to judge of a man's ſtrength. This matter is perfectly underſtood by ſculptors, who know how to vary their manner, as far as reſpects the muſcles, when they would produce the figure of an HERCULES, an APOLLO, or a VENUS.

Strength and mobility of every muſcle are increaſed by uſe; and alſo, the conjunction of many muſcles, which contributes to perform the ſame motion, often repeated, becomes by cuſtom more eaſy, quicker, and more accurate.

CHAP. V.

HAVING ſpoken of the muſcles with regard to the nature of their formation, and the powers by which they are actuated—in order to give our readers a perfect idea of theſe inſtruments of motion, we ſhall now exhibit a table of the whole external muſcles, with the appropriate uſes, and then preſent them with different views in their ſtates of CONTRACTION, EXTENSION, and RELAXATION—by which they may clearly underſtand the ſituation of them in different actions, and better conceive by what means the morbid cauſes are likely to be removed.

THE GENERAL USES OF THE MUSCLES,

SPECIFIED IN THE FOLLOWING PLATES;

To which references may be occaſionally made.

Muſcles of the NECK.

PTERYGOIDEUS EXTERNUS	Pulls the lower jaw forwards, and the oppoſite ſide, and alſo the ligament from the joint, that it may not be pinched during theſe motions.
STERNO THYROIDEUS	Draws the larynx downwards.
—— CLEIDO MASTOIDEUS	Turns the head to one ſide, and bends it forwards.
SPLENIUS CAPITIS	Brings the head and upper vertebræ of the neck backwards laterally.
——— COLLI	Pulls the head directly backwards, when acting conjointly with the ſplenius capitis.
TRACHELO MASTOIDEUS	Aſſiſts the complexus, and pulls the head ſideways.

Muſcles of the TRUNK.

INFRA SPINATUS	Rolls the humerus outwards, and aſſiſts in raiſing and ſupporting it when raiſed, and pulls the ligaments from between the bones.
INTERCOSTALES	Raiſes the ribs equally upwards during reſpiration.
LATISSIMUS DORSI	Pulls the arm backwards and downwards, and rolls the os humeri.
LONGISSIMUS DORSI	Extends the vertebræ, and raiſes and keeps up the trunk of the body erect.
OBLIQUUS ABDOMINIS EXTERNUS	Aſſiſts the inferior part of the rectus abdominis.
——— INTERNUS	Aſſiſts the former, and bends the trunk in the reverſe direction.
PLATYSMA MYOIDES	Aſſiſts in drawing the ſkin of the cheek downwards.
PECTORALIS MAJOR	Moves the arm forwards and obliquely upwards towards the ſternum.
——— MINOR	Brings the ſcapula forwards and downwards, and raiſes the ribs upwards.
PYRAMIDALIS	Aſſiſts the inferior part of the rectus abdominis.
QUADRATUS LUMBORUM	Moves the loins to one ſide, and pulls down the laſt rib, and when both act, it bends the loins forwards.
RECTUS ABDOMINIS	Compreſſes the fore and lower part of the belly, bends the trunk forwards, and raiſes the pelvis.
SERRATUS MAGNUS	Moves the ſcapula forwards, and, when the ſcapula is raiſed, draws upwards the ribs.
——— SUPERIOR	Elevates the ribs, and dilates the thorax.
——— INFERIOR	Depreſſes the ribs into which it is inſerted.
TRAPAZEUS	Moves the ſcapula in three different directions.
TRANSVERSALIS	Supports and compreſſes the bowels, it being their chief conſtrictor.

——— *of the ARMS and HAND.*

ABDUCTOR POLLICIS MANUS	Draws the thumb from the fingers.
ADDUCTOR	Pulls the thumb towards the fingers.
ABDUCTOR INDICIS MANUS	Brings the fore-finger towards the thumb.
——— MINIMI DIGITI MANUS	Draws the little finger from the reſt.
ANCONEUS	Aſſiſts in extending the fore-arm.
BICEPS FLEXOR CUBITI	Turns the hand ſupine and bends the fore-arm.

BRACHIALIS EXTERNUS	Extends the fore-arm.
——— INTERNUS	Bends the fore-arm, and prevents the capſular ligament of the joint from being pinched.
CORACO BRACHIALIS	Raiſes the arm upwards and forwards.
DELTOIDES	Pulls the arm directly upwards and outwards, and a little forwards and backwards.
EXTENSOR DIGITORUM COMMUNIS	Extends all the joints of the fingers.
——— PRIMI INTERNODII	Extends the firſt bone of the thumb obliquely upwards.
INDICATOR	Extends the fore-finger.
INTEROSSEUS AURICULARIS	Pulls the little finger to the reſt.
PALMARIS BREVIS	Aſſiſts in contracting the palm of the hand.
——— LONGUS	Bends the hand, and ſtretches the membrane that is expanded on the hand.
PRONATOR RADII TERES	Rolls the radius together with the hand inwards.
PRIOR MEDII	Extends, and draws the middle finger inwards.
——— INDICIS	Extends the fore finger.
——— ANNULARIS	Extends the ring finger.
RADIALIS EXTERNUS	Extends, and brings the hand backwards.
——— INTERNUS	Bends the hand, and aſſiſts in its pronation.
SUBLIMIS	Bends the ſecond joint, or phalanx of the fingers.
SUPINATOR RADII LONGUS	Rolls the radius outwards, and the palm of the hand upwards.
TERES MAJOR	Rolls the humerus inwards, and draws it backwards and downwards.
——— MINOR	Rolls the humerus outwards, draws it backwards, and prevents the ligament from being pinched between the bones.
ULNARIS INTERNUS	Aſſiſts the radialis internus in bending the hand.
——— EXTERNUS	Aſſiſts in extending the hand.

Muſcles of the THIGHS.

ADDUCTOR TRICEPS FEMORIS	Brings the thigh inwards and upwards, according to the different directions of its fibres, and rolls the thigh inwards.
GRACILIS	Aſſiſts the ſartorius in bending the leg obliquely.
GLUTEUS MAXIMUS	Extends the thigh by pulling it directly backwards and a little outwards.
——— MEDIUS	Draws the thigh bone outwards, a little backwards, and rolls it outwards.
——— MINIMUS	Aſſiſts the gluteus medius in pulling the thigh outwards and backwards.

CRURALIS	Aſſiſts in the extenſion of the leg.
ILIACUS INTERNUS	Aſſiſts the pſoas in bending the thigh and in bringing it directly forwards, and alſo to raiſe the pelvis.
PECTINALIS	Brings the thigh upwards and inwards, and gives it a degree of rotation outwards.
PSOAS PARVUS	Aſſiſts the pſoas magnus; alſo to raiſe the pelvis.
—— MAGNUS	Bends the thigh forwards, and aſſiſts in bending the body.
POPLITEUS	Aſſiſts in bending the leg, and prevents the capſular ligament from being pinched, and when the leg is bent it rolls it inwards.
RECTUS FEMORIS	Extends the leg in a powerful manner by the intervention of the patella, like a pulley.
SARTORIUS	Bends the leg obliquely inwards, and brings one leg acroſs the other.
SEMITENDINOSUS	Bends the leg backwards and a little inwards.
SEMIMEMBRANOSUS	Bends the leg and brings it directly backwards.
VASTUS EXTERNUS —— INTERNUS	Extends the leg.

Muſcles of the LEGS *and* FEET.

ABDUCTOR INDICIS PEDIS	Pulls the great toe inwards to the ſmall toes.
—— POLLICIS PEDIS	Pulls the great toe from the reſt.
—— MINIMI DIGITI PEDIS	Draws the little toe outward from the reſt.
ADDUCTOR POLLICIS PEDIS	Brings the great toe nearer the reſt.
EXTENSOR LONGUS DIGITORUM PEDIS	Extends all the joints of the four ſmall toes.
—— PROPRIUS POLLICIS PEDIS	Extends the great toe.
GASTROCNEMIUS	Extends the foot by bringing it backwards and downwards.
PERONEUS LONGUS	Moves the foot outwards.
—— BREVIS	Aſſiſts in pulling and extending the foot outwards.
PLANTARIS	Aſſiſts the ſoleus to pull the capſular ligament of the knee from between the bones.
SOLEUS	Aſſiſts the gaſtrocnemius in extending the foot.
TIBIALIS ANTICUS	Bends the foot by drawing it upwards, and at the ſame time turns the toes inwards.
—— POSTICUS	Extends the foot, and turns the toes inwards.
TENDO ACHILLIS	Aſſiſts the ſoleus.

PLATE I.

Front View of the Muſcles of the NECK,

In the different States of Action, Extenſion, and Relaxation,

Specified in the margin by the Letters A. E. R.

1. Sterno thyroideus, - -	A.
2. Pterygoideus, - - -	—
3. Sterno cleido maſtoideus, -	—
4. Trachelo maſtoideus, - -	—
5. Splenius capitis, - -	R.
6. ——— colli, - - -	—
7. Trapezeus, - - -	E.
8. Pectoralis major, - -	R.
9. ——— minor, - -	—
10. Platyſma myoides, - -	E.
11. Coraco brachialis, - -	R.
12. Deltoides, - - -	—

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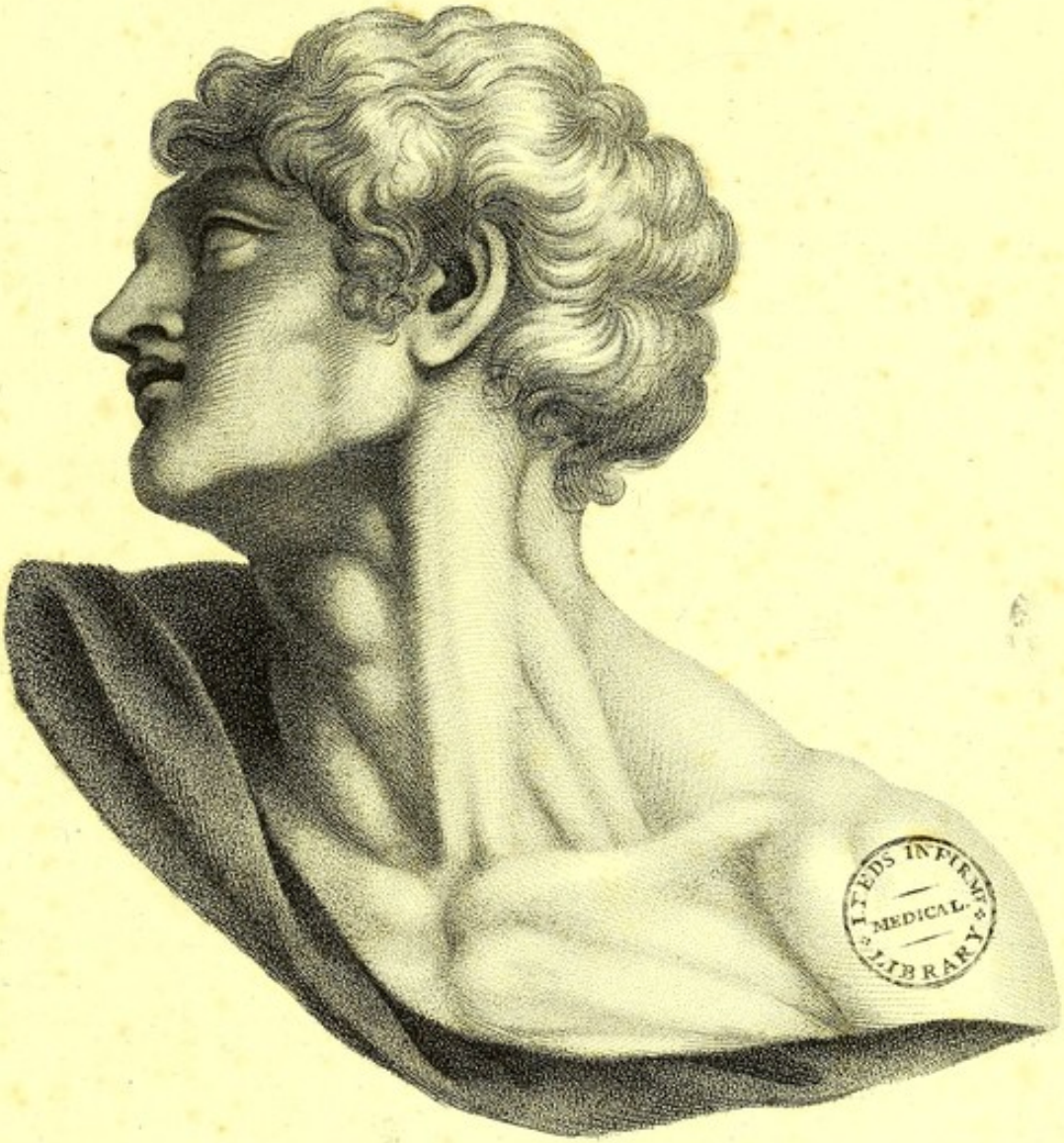

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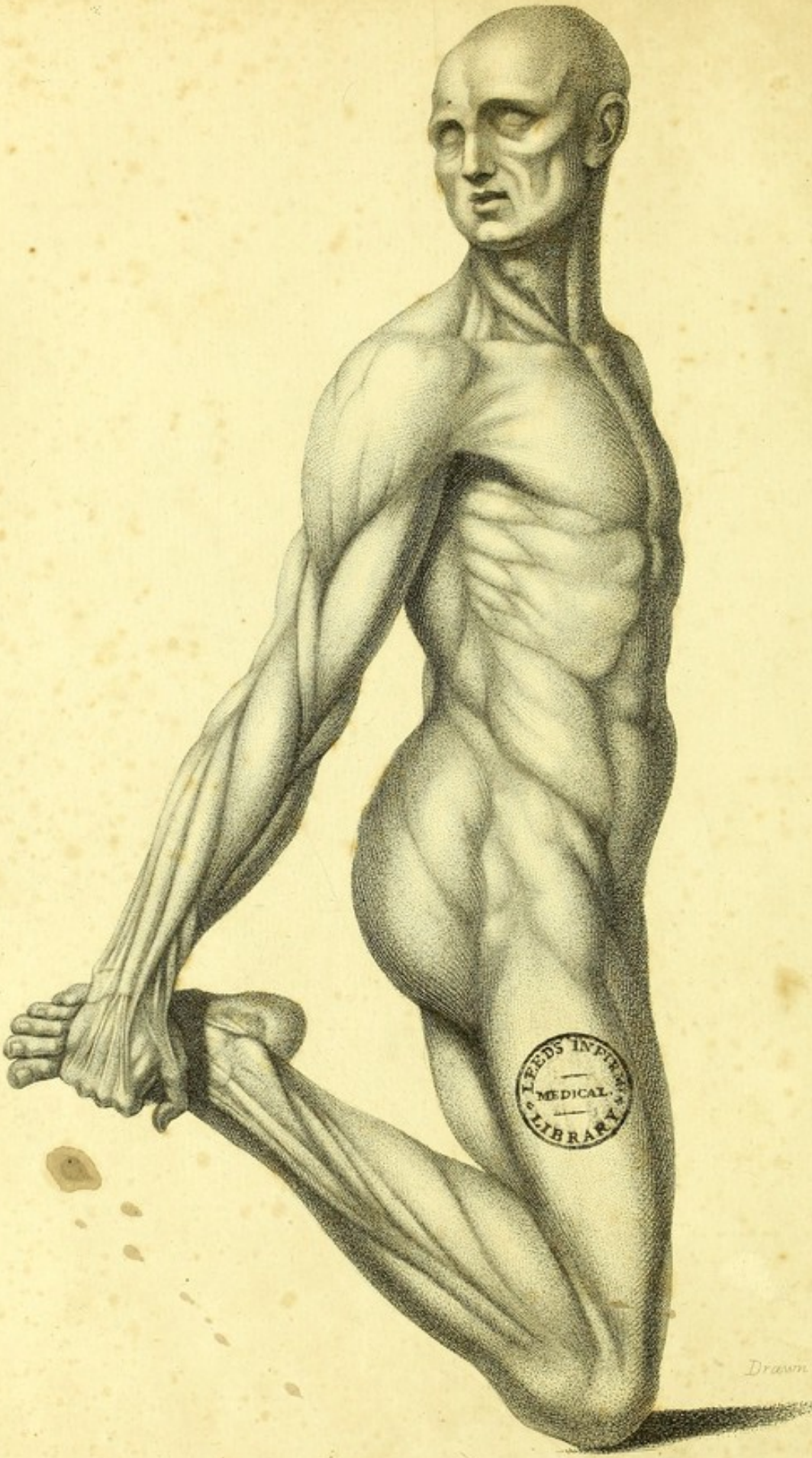

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Plate II.

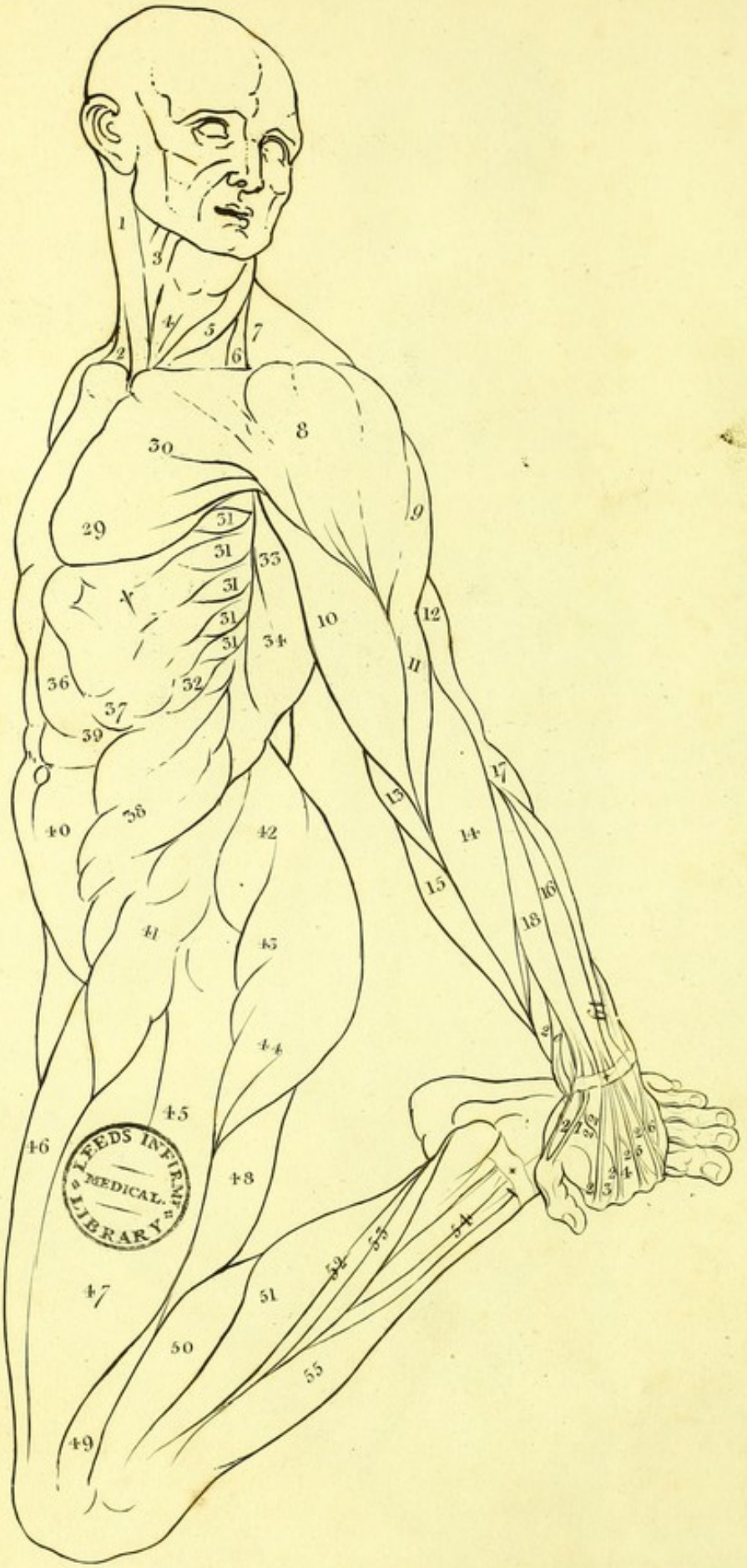

PLATE II.

Side View of a WHOLE FIGURE.

Muſcles of the Right Side of the NECK.

1. Sterno cleido maſtoideus, - A.
2. Trachelo maſtoideus, - - —
3. Sterno thyroideus, - - —
4. Pterygoideus externus, - R.

—— *of the Left Side of the* NECK.

5. Sterno cleido maſtoideus, - R.
6. Trachelo maſtoideus, - - —
7. Trapezeus, - - - E.

—— *of the* ARM *and* HAND.

8. Deltoides, - - - E.
9. Coraco brachialis, - - —
10. Biceps flexor cubiti, - - R.
11. Brachialis internus, - - E.
12. Triceps extenſor cubiti, - R.
13. Pronator radii teres, - - E.
14. Supinator longus, - - A.
15. Palmaris longus, - - —
16. Extenſor digitorum communis, —
17. Anconeus, - - - —
18. Radialis externus, - - E.
19. Ulnaris externus, - - —
20. Abductor pollicis manus, - —
21. Extenſor primi internodii, - A.
22. Abductor indicis manus, - E.
23. Prior indicis, - - - —
24. —— medii, - - - —
25. —— annularis, - - - —
26. Interoſſeus auricularis, - —

* Ligamentum carpi annulare expanded, - - —

—— *of the* TRUNK.

28. Platyſma myoides - - E.
29. Pectoralis major, - - —
30. ——— minor, - - - —
31. Serratus poſterior poſticus, - A.
32. ——— inferior poſticus, - —
33. Teres major, - - - - —
34. Latiſſimus dorſi, - - - —
35. Trapezeus, - - - - —
36. Obliquus externus abdominis, E.
37. Tranſverſalis, - - - —
38. Quadratus lumborum, - —

† Intercoſtales,* - - A.

* *Between the Ribs on each ſide there are eleven double rows of muſcles.*

39. Obliquus internus abdominis, E.
40. Recti abdominis. - - - —

—— *of the* LOWER EXTREMITY

41. Tenſor vagina femoris, - A.
42. Gluteus maximus, - - - —
43. ——— medius, - - - —
44. ——— minimus, - - - —
45. Faſcialis, - - - - E.
46. Rectus femoris, - - A.
47. Vaſtus externus, - - - —
48. Triceps adductor femoris, - A.
49. Cruralis, - - - - —
50. Gaſtrocnemius, - - - R.
51. Soleus, - - - - —
52. Peroneus longus, - - E.
53. ——— brevis, - - - —
54. Extenſor longus digitorum pedis, A.
55. Tibialis anticus, - - E.

* Ligamentum tarſi annulare expanded.

PLATE III.

Front View of the Muſcles of the THIGH, LEG, *and* FOOT.

1. Rectus femoris, - - A.
2. Vaſtus externus, - - —
3. —— internus, - - —
4. Cruralis, - - - E.
5. Gaſtrocnemius, - - A.
6. Soleus, - - - - —
7. Tibialis anticus, - - E.
8. ——— poſticus, - - - —
9. Peroneus longus, - - —
10. ——— brevis, - - —
11. Extenſor longus digitorum pedis, —
12. ——— proprius pollicis pedis, —
13. Adductor pollicis pedis. - —
14. Abductor minimi digiti pedis, A.
15. ——— pollicis pedis, - - E.

* Capſular ligament, - - R.

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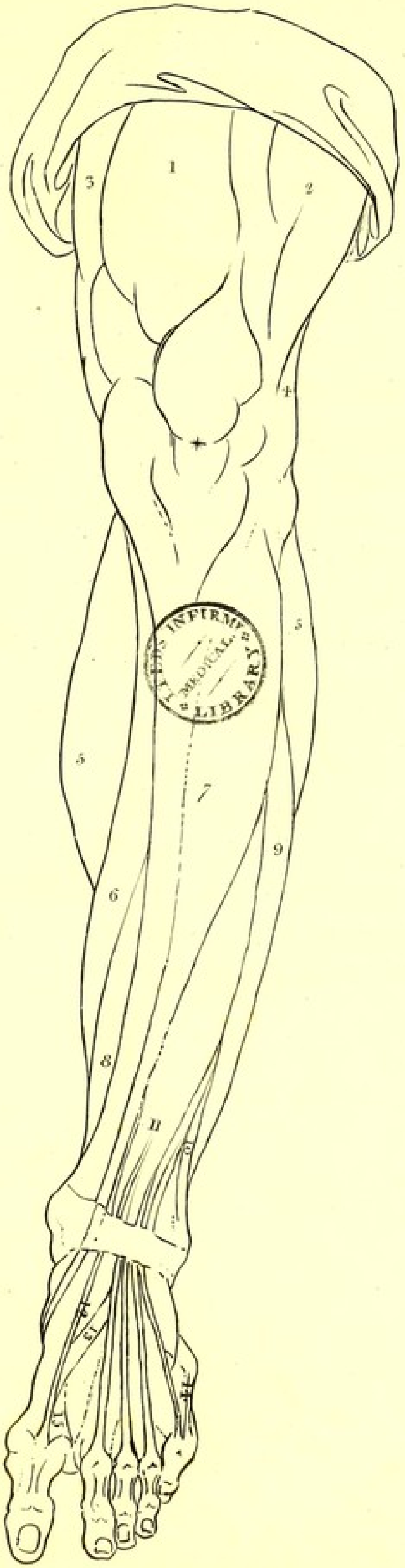

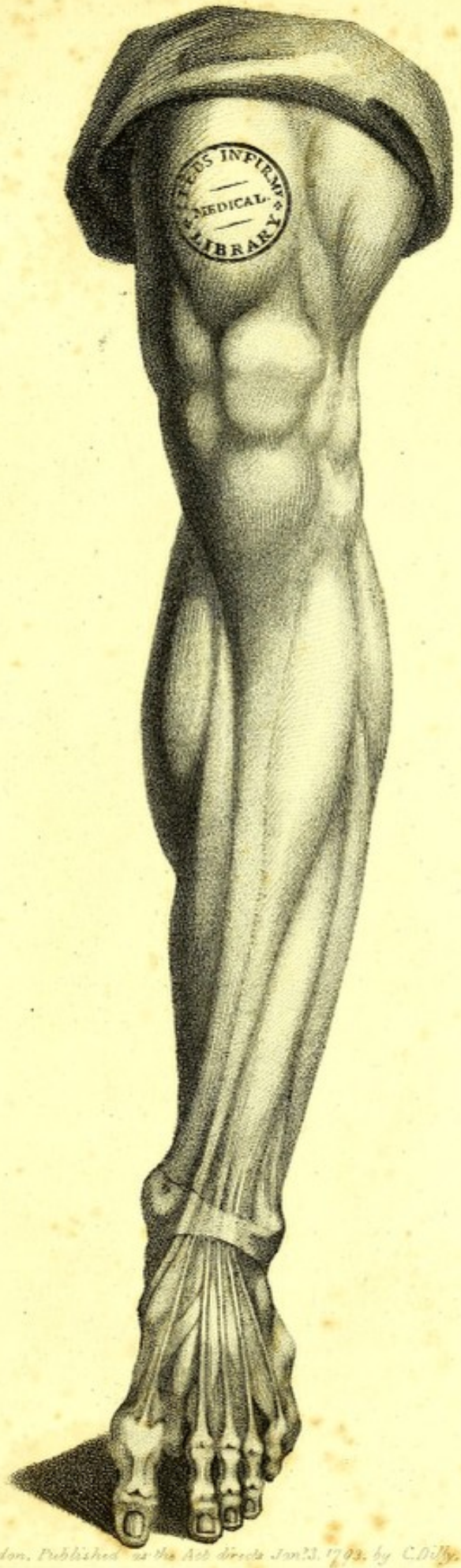

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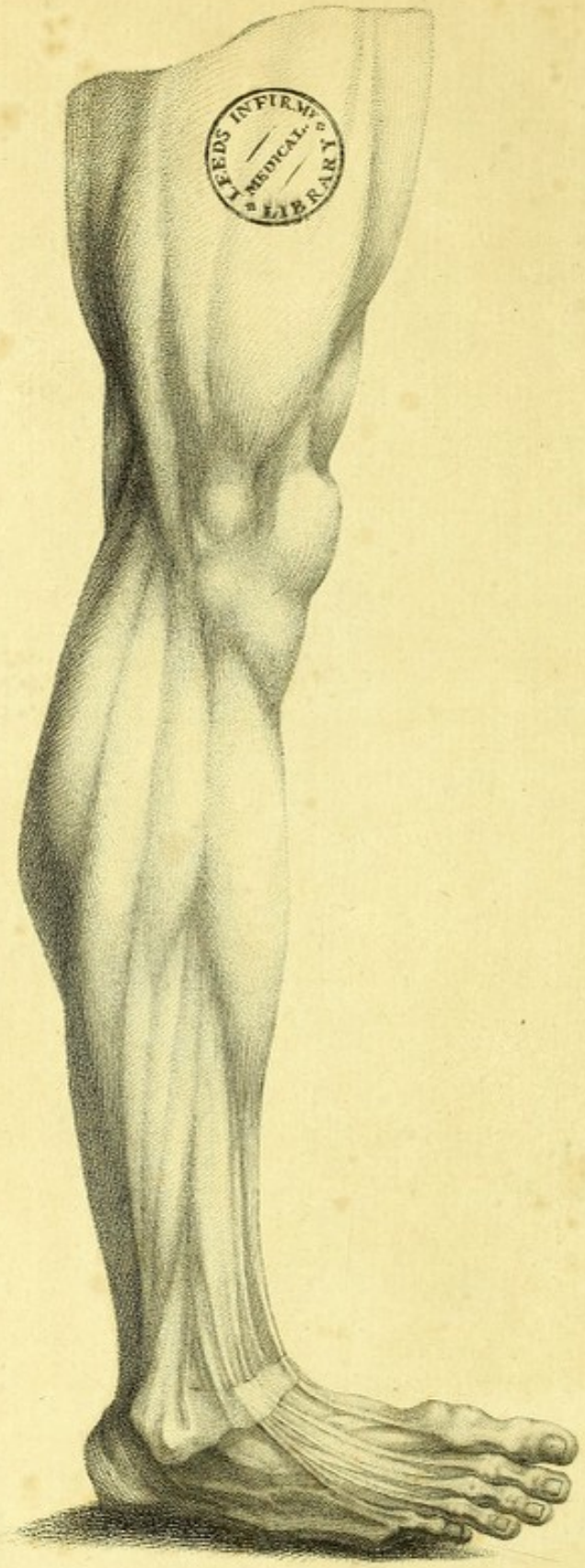

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Plate. IV.

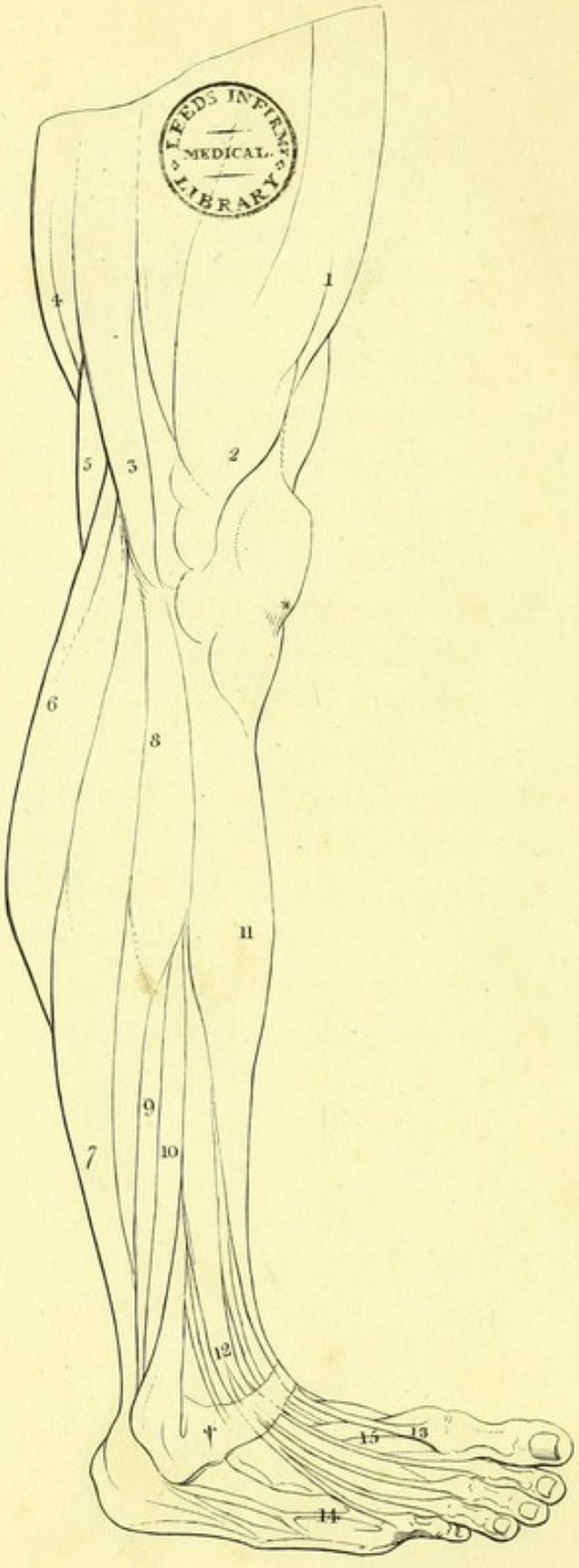
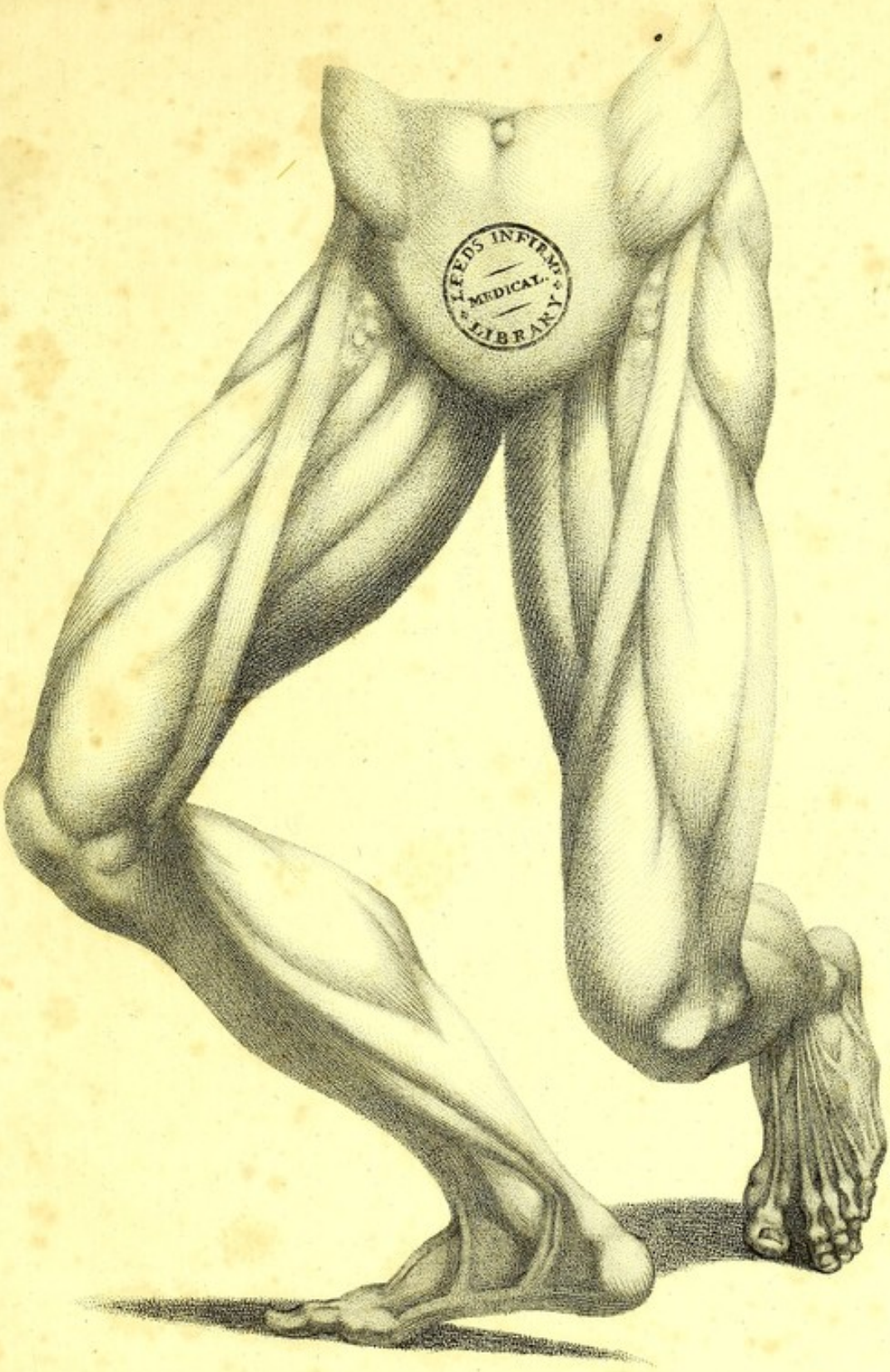


PLATE IV.

External View of the THIGH, LEG, *and* FOOT.

1.	Rectus femoris, - - -	R.
2.	Vaſtus externus, - -	—
3.	Cruralis, - - -	E.
4.	Semitendinoſus, - - -	—
5.	Popliteus, - - -	—
6.	Gaſtrocnemius externus, -	—
7.	Soleus, - - - -	—
8.	Peroneus longus, - -	—
9.	——— brevis, - -	A.
10.	Plantaris, - - -	—
11.	Tibialis anticus, - -	—
12.	Extenſor longus digitorum pedis,	—
13.	——— proprius pollicis pedis,	—
14.	Abductor minimi digiti pedis,	E.
15.	——— indicis pedis, - -	—
*	Capſular ligament, - -	R.
†	Annular ligament, - -	—



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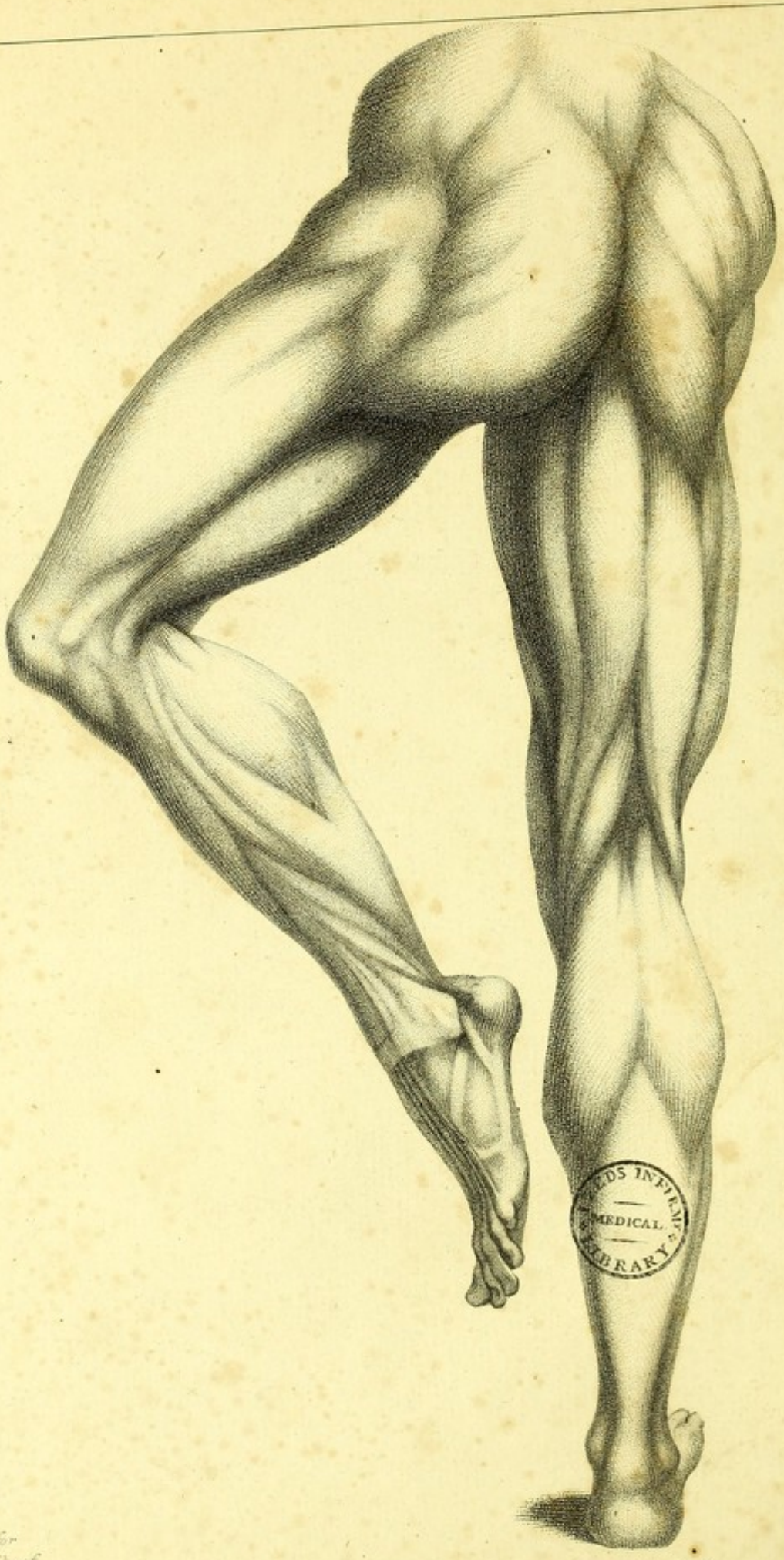

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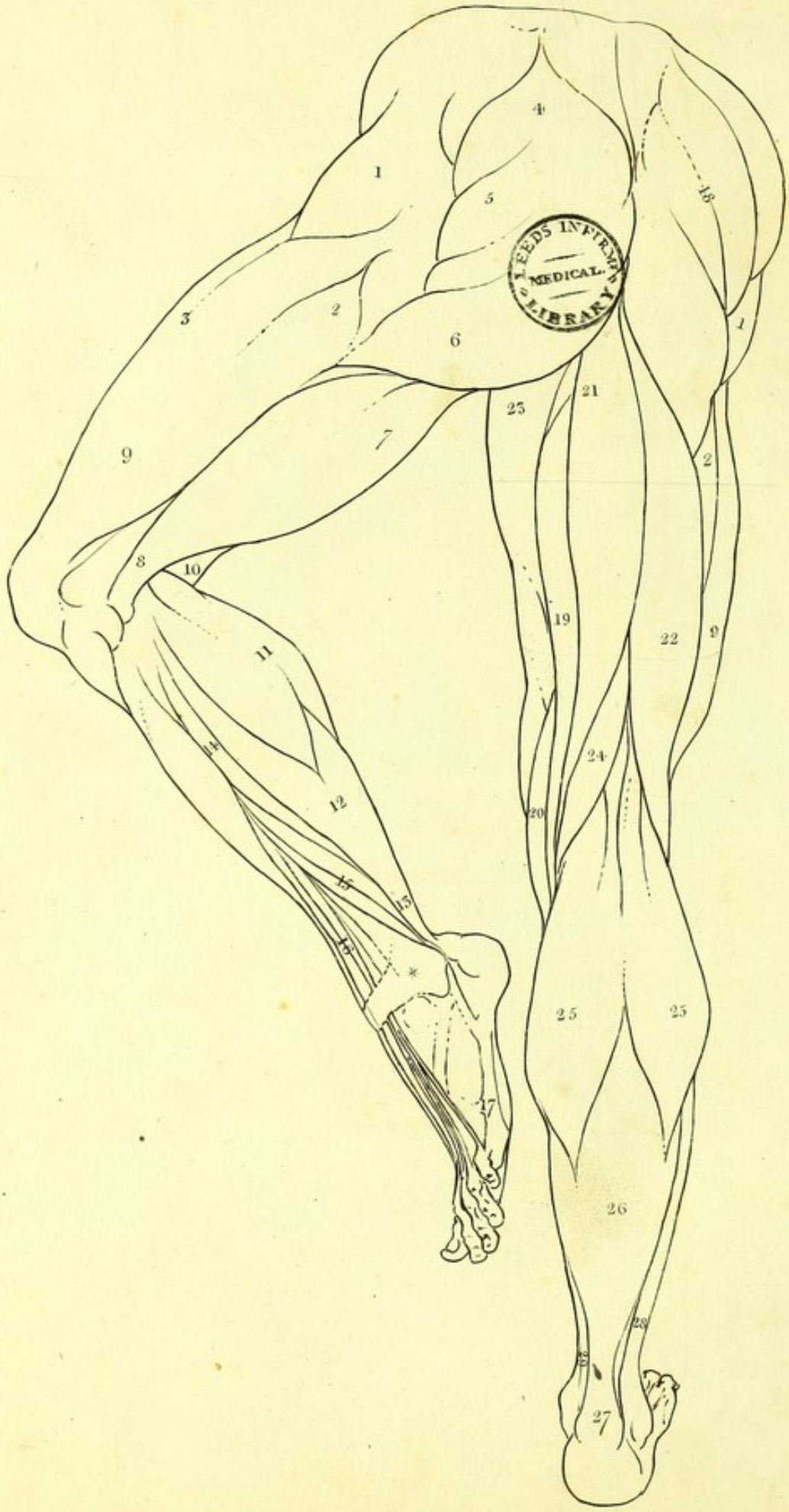
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PLATE VI.

Hind View of the LOWER EXTREMITIES.

Muſcles of the LEFT LIMB.

1. Tenſor vagina femoris, - - - A.
2. Faſcialis, - - - - —
3. Rectus femoris, - - - - —
4. Gluteus maximus, - - - —
5. ——— medius, - - - —
6. ——— minimus, - - - —
7. Triceps adductor femoris, - - —
8. Cruralis, - - - - A.
9. Vaſtus externus, - - - —
10. Semitendinoſus, - - - - —
11. Gaſtrocnemius, - - - - —
12. Soleus, - - - - —
13. Tendo Achillis, - - - —
14. Peroneus longus, - - - E.
15. ——— brevis, - - - —
16. Extenſor longus digitorum pedis, - - —
17. Abductor minimi digiti pedis, - - A.
* Annular ligament expanded, - - —

——— *of the* RIGHT LIMB.

18. Gluteii, - - - - R.
19. Semitendinoſus, - - - - E.
20. Semimembranoſus, - - - - —
21. Triceps adductor femoris, - - - —
22. Cruralis, - - - - —
23. Gracilis, - - - - A.
24. Popliteus, - - - - —
25. Gaſtrocnemius, - - - - E.
26. Soleus, - - - - —
27. Tendo Achillis, - - - - —
28. Peroneus brevis, - - - A.
29. Tibialis poſticus, - - - - —

PLATE VII.

Front View of the TRUNK *of the Body, with Part of the* ARMS *and* THIGHS.

Muſcles of the NECK *and* TRUNK.

1. Sterno thyroideus, - - - E.
2. —— cleido maſtoideus, - - - —
3. Pectoralis major, - - - R.
4. ——— minor, - - - —
5. Teres major, - - - E.
6. —— minor, - - - —

‡ Platyſma myoideus.

8. Serratus magnus, - - - - A.
9. ——— poſticus inferior, - - - —
10. Obliquus externus abdominis, - - E.
11. Tranſverſalis, - - - - —
12. Latiſſimus dorſi, - - - —
13. Quadratus lumborum, - - - —
14. Rectus abdominis, - - - —
15. Intercoſtales, - - - - A.

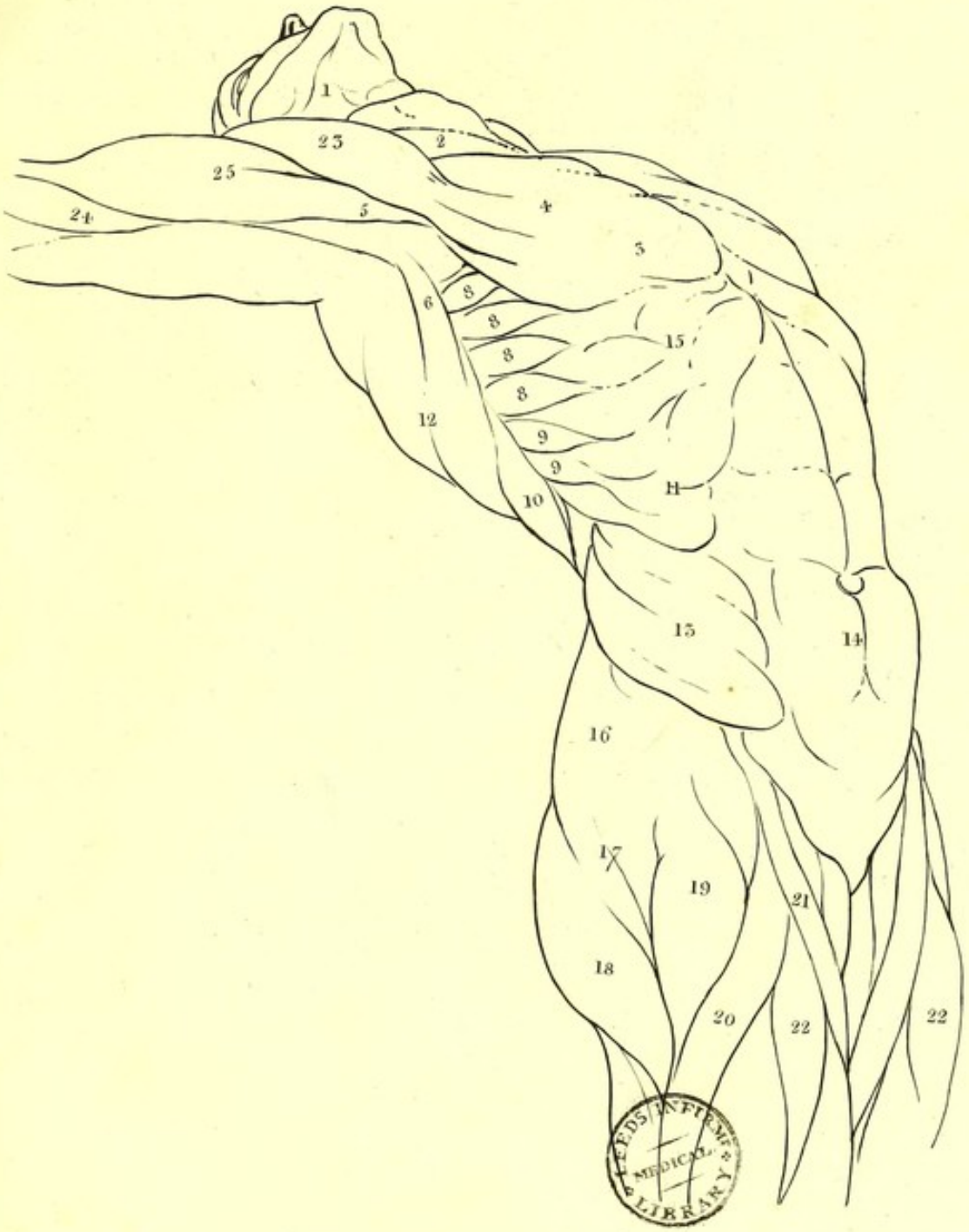
——— *of the* THIGH.

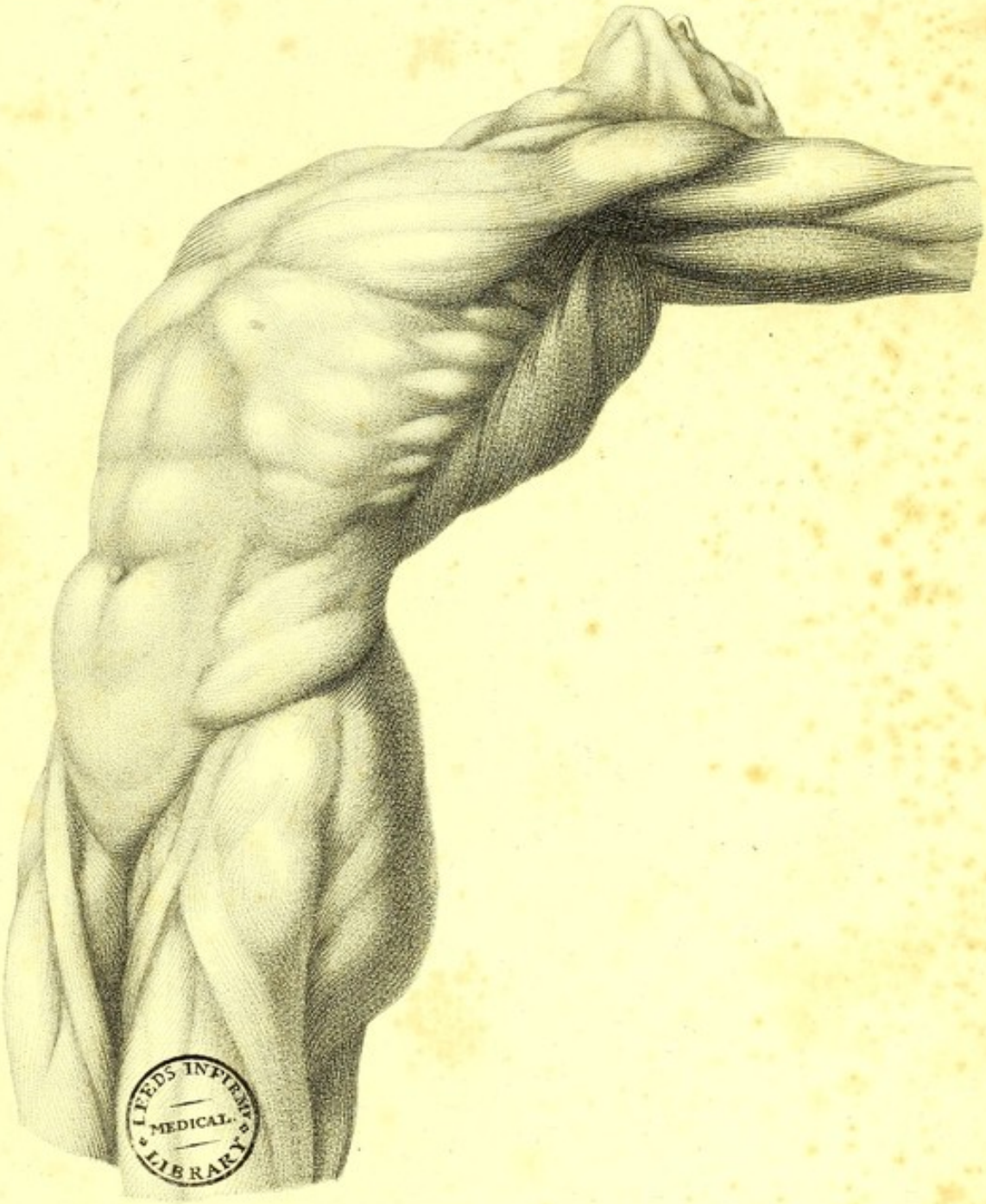
16. Gluteus maximus, - - - A.
17. ——— medius, - - - - —
18. ——— minimus, - - - —
19. Tenſor vagina femoris, - - - E.
20. Faſcialis, - - - - - —
21. Sartorius, - - - - —
22. Rectus femoris, - - - - —

——— *of the* ARMS *and* SIDE.

23. Deltoides, - - - - - A.
24. Brachialis externus, - - - - —
25. Biceps flexor cubiti, - - - - R.

‡ The Platyſma myoides (Plate I. No. 10, and Plate II. No. 28.) is diſſected off along with the ſkin, in order to ſhew the more important muſcles.





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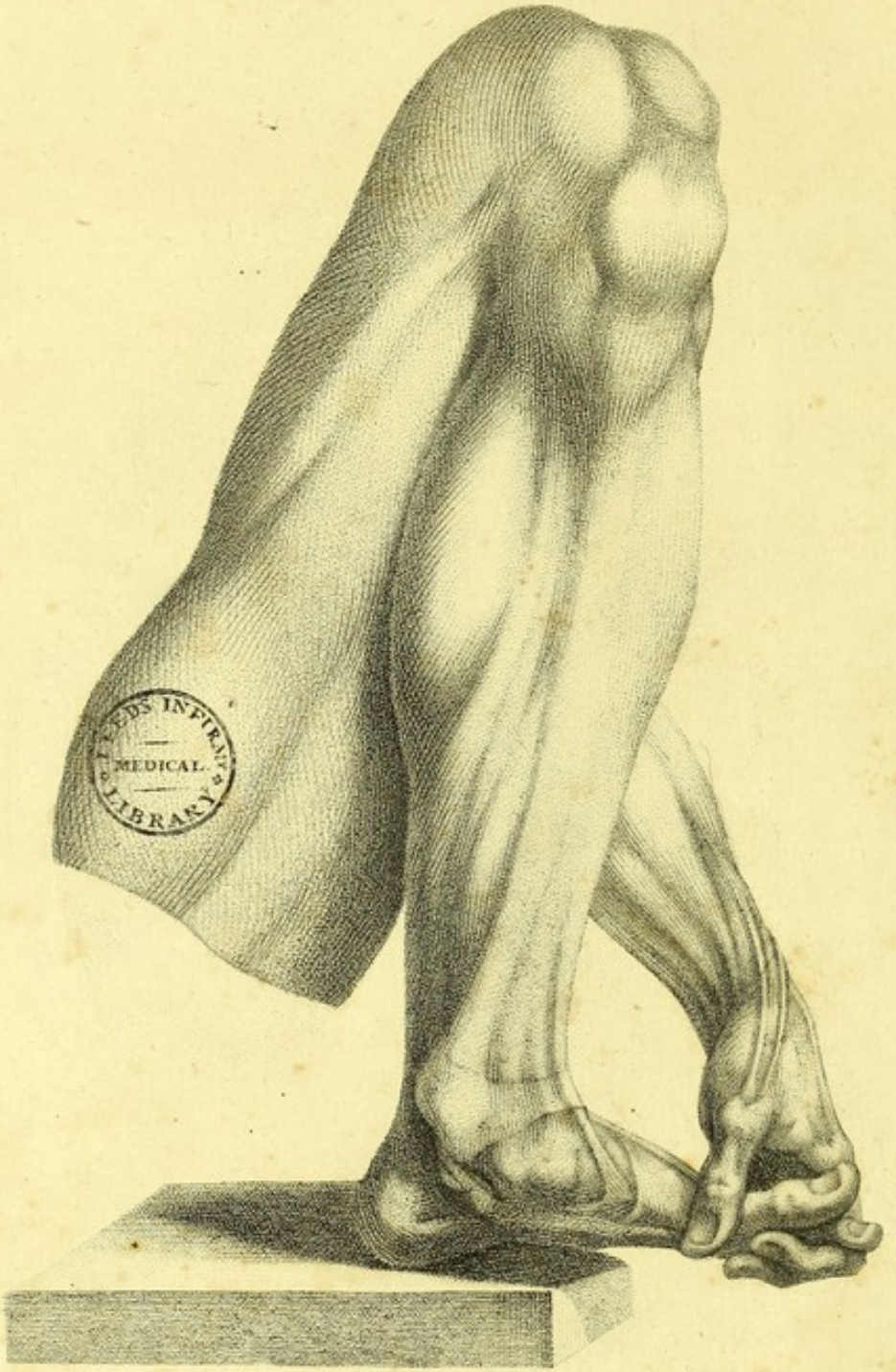

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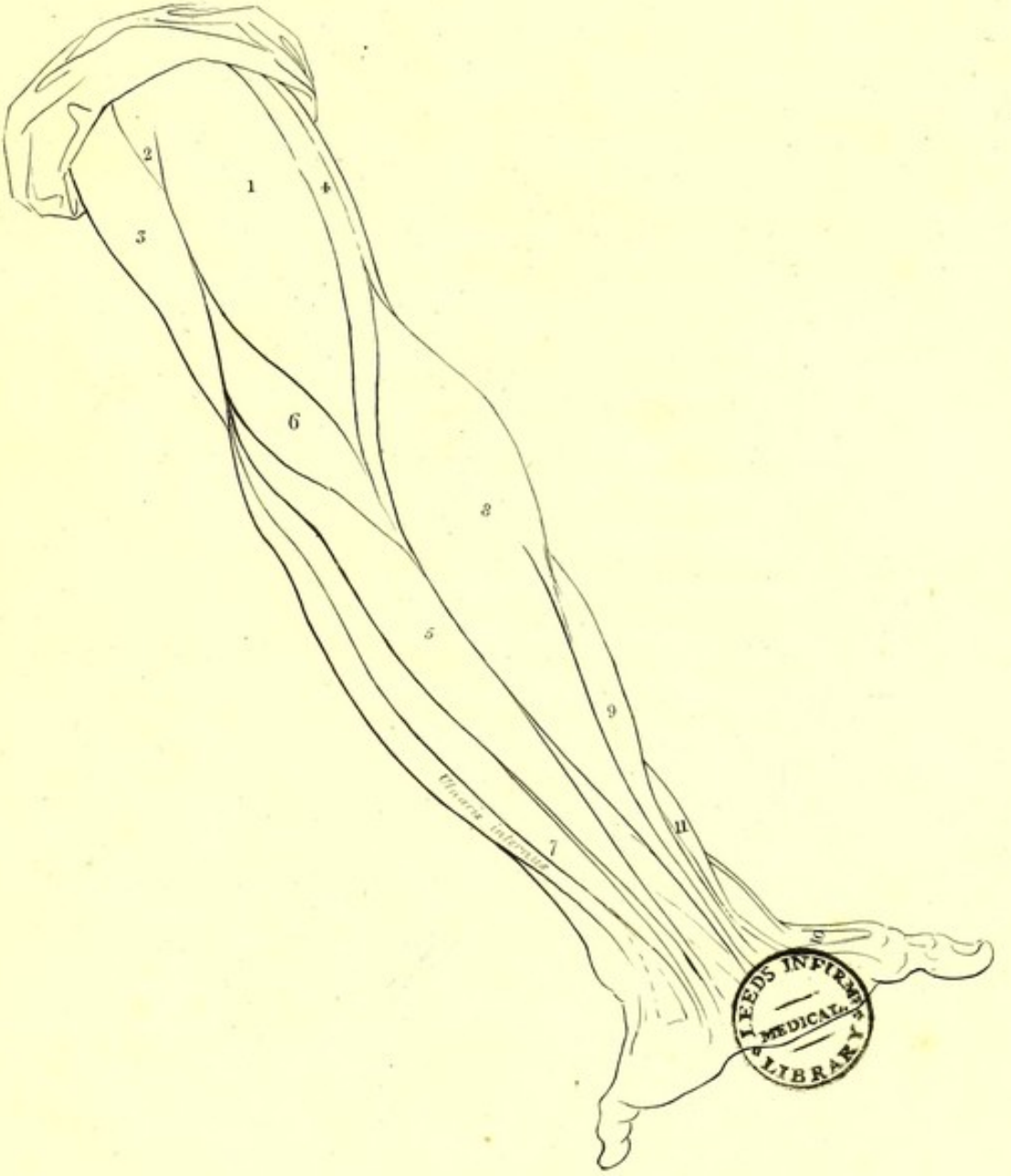
PLATE IX.

Internal View of the Muſcles of the FORE ARM.

1. Biceps flexor cubiti,	- -	R.
2. Brachialis internus,	- -	—
3. Anconeus,	- - -	—
4. Pronator radii teres,	- -	E.
5. Palmaris longus,	- -	—
6. ——— brevis,	- -	—
7. Sublimis,	- - -	—
8. Supinator radii longus,	-	A.
9. Radialis internus,	- -	E.
10. Extenſor primi internodii,	-	A.
11. Abductor pollicis manus,	-	—

Plate IX



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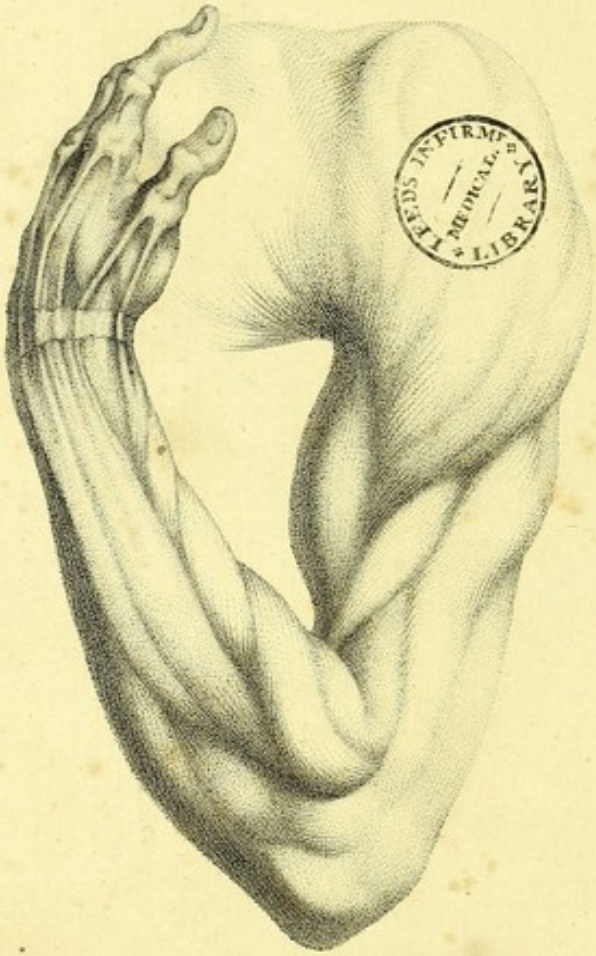

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Plate. X.

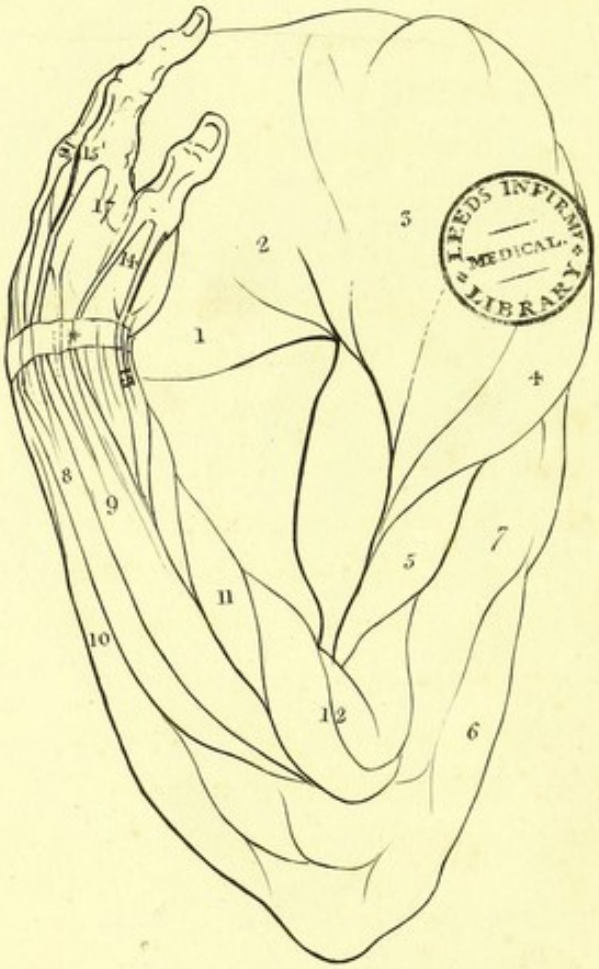


PLATE X.

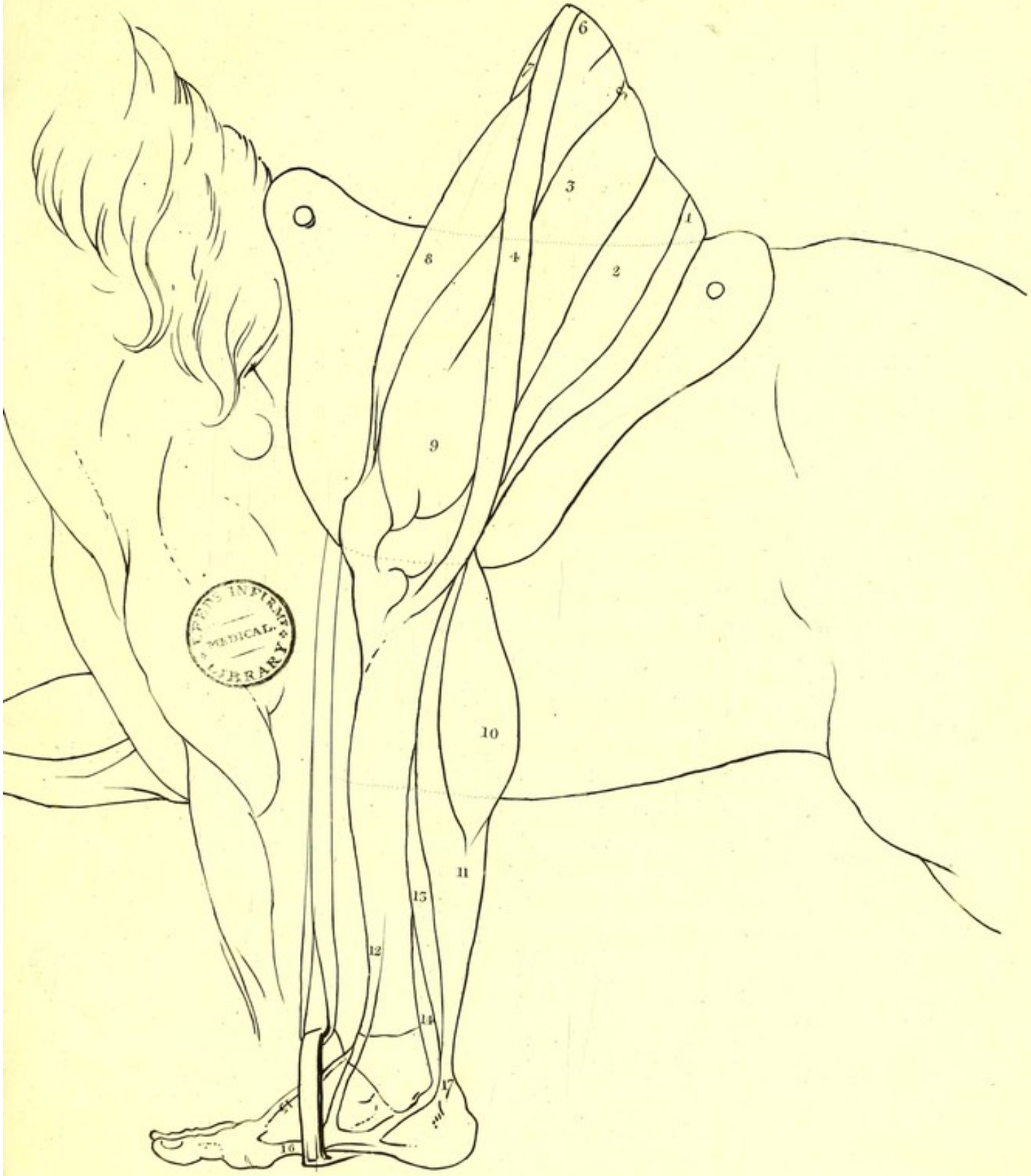
External View of the Muſcles of the LEFT ARM *bent.*

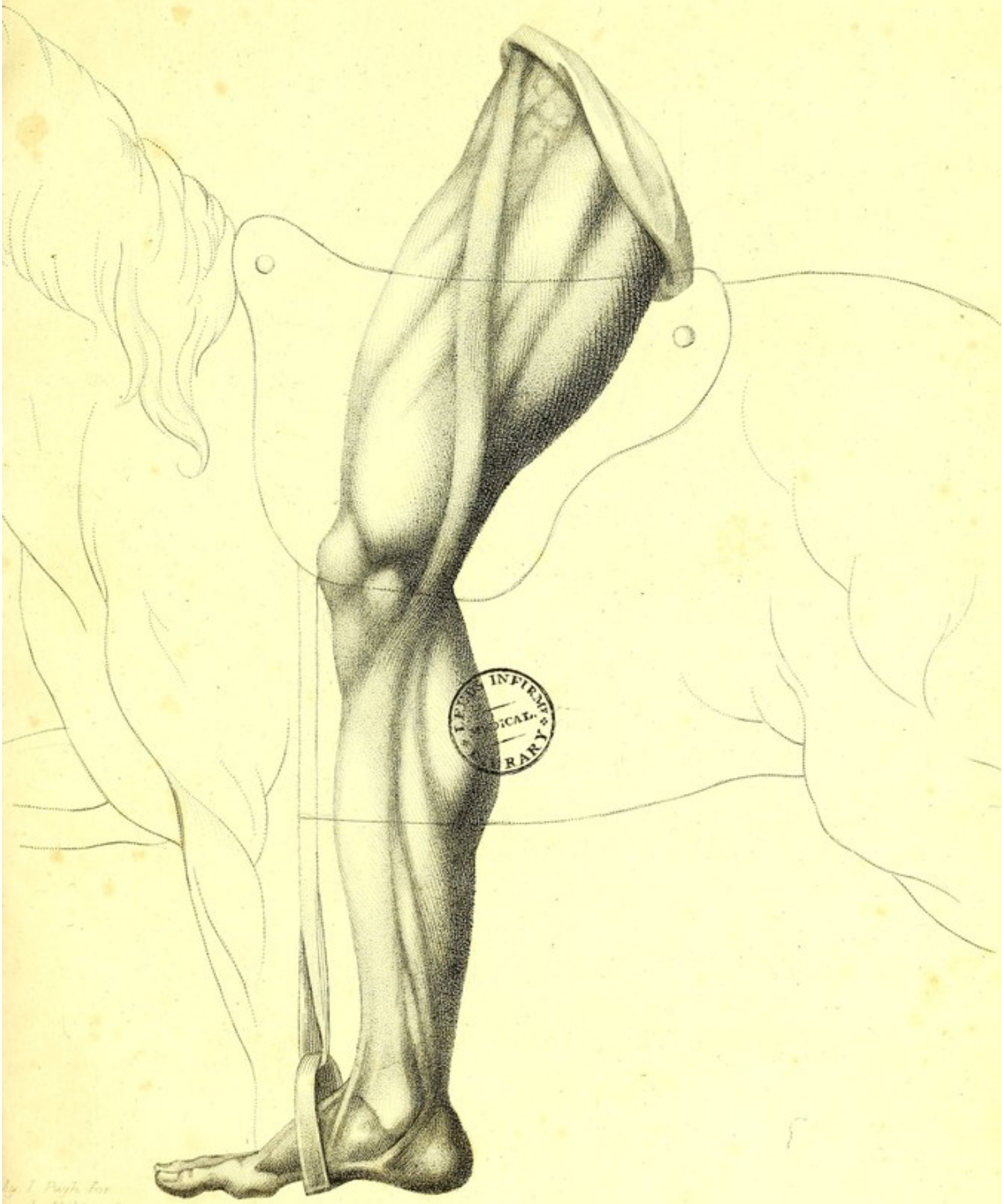
1.	Pectoralis major, - -	R.
2.	——— minor, - -	—
3.	Deltoides, - - -	—
4.	Coraco brachialis, - -	E.
5.	Brachialis internus, - -	A.
6.	Anconeus, - - -	—
7.	Triceps extenſor cubiti, -	E.
8.	Extenſor digitorum communis,	—
9.	Radialis externus, - -	—
10.	Ulnaris externus, - -	—
11.	Radialis internus, - -	A.
12.	Supinator longus, - -	—
13.	Abductor pollicis manus, -	—
14.	Extenſor primi internodii, -	E.
15.	Prior indicis, - -	—
16.	—— medii, - -	—
17.	Abductor indicis manus, -	A.
*	Annular ligament, - -	E.

PLATE XI.

Internal View of the Muſcles of the RIGHT THIGH *and* LEG,
As they appear compreſſed againſt the Right Side of the Saddle.

1. Gracilis, - - - R.
2. Triceps adductor femoris, - —
3. Pectinalis, - - - —
4. Sartorius, - - - —
5. Pſoas magnus, - - —
6. Iliacus internus, - - —
7. Tenſor vagina femoris, - —
8. Rectus femoris, - - A.
9. Vaſtus internus, - - R.
10. Gaſtrocnemius, - - —
11. Soleus, - - - - E.
12. Tibialis anticus, - - A.
13. ——— poſticus, - - - E.
14. Plantaris, - - - —
15. Extenſor proprius pollicis pedis, A.
16. Flexor longus digitorum pedis, E.
17. Tendo Achillis, - - —
* Capſular ligament, - - R.





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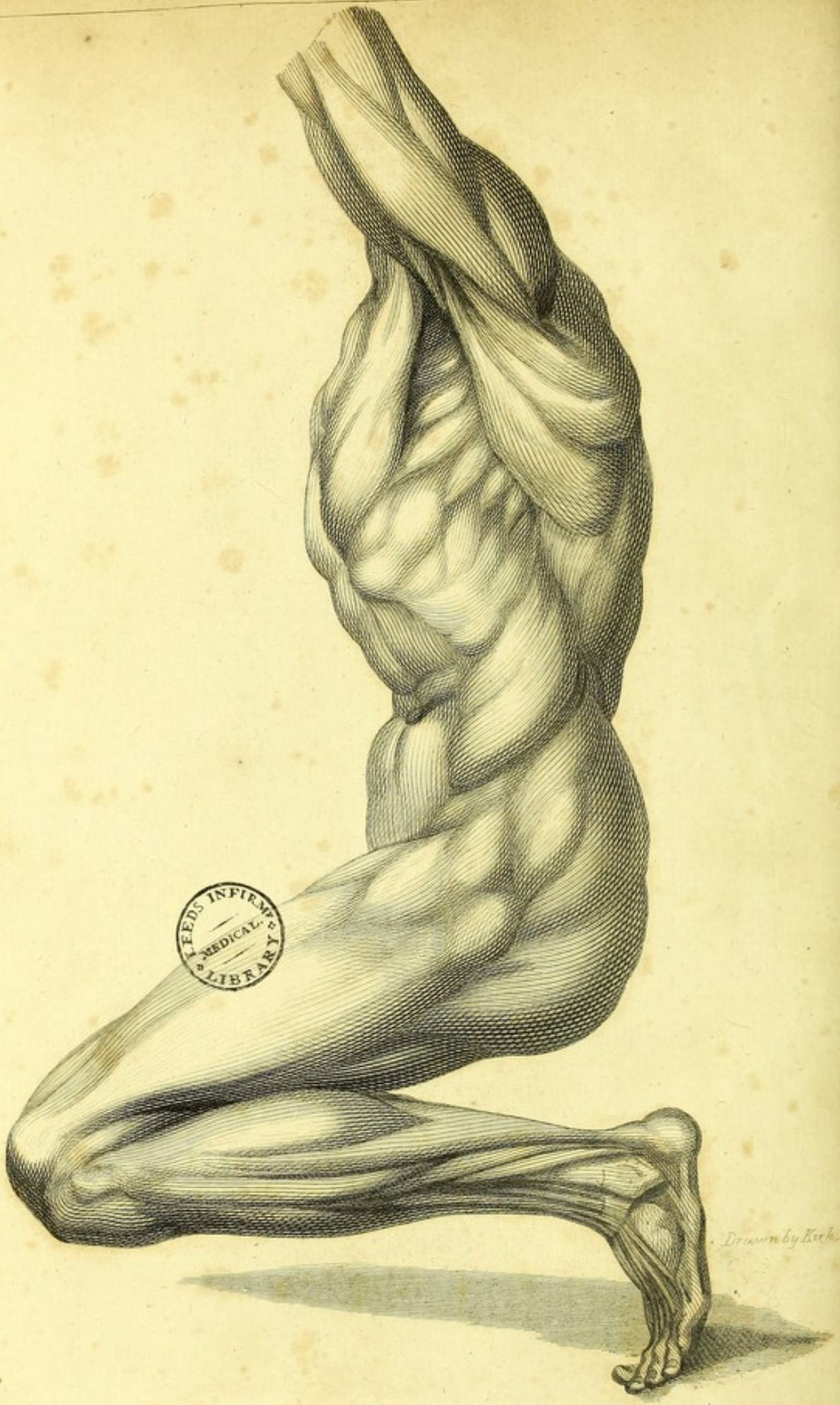

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Plate. XII.

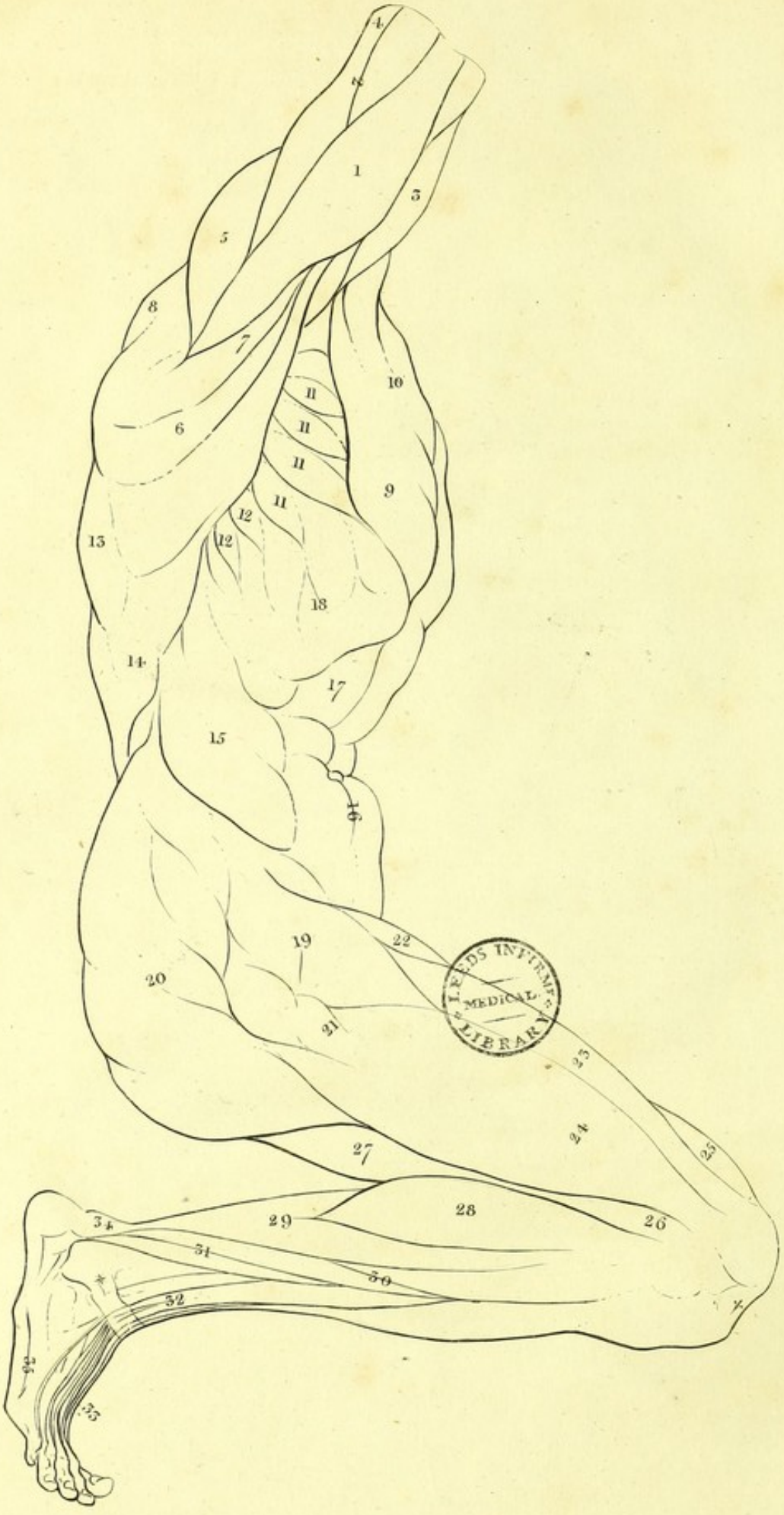
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PLATE XII.

External View of the LOWER EXTREMITY, TRUNK, *with Part of the* ARM.

1. Brachialis externus, - - - - E.
2. Anconeus, - - - - —
3. Biceps flexor cubiti, - - - - R.
4. Coraco brachialis, - - - - A.
5. Deltoides, - - - - - —
6. Teres major, - - - R.
7. —— minor, - - - —
8. Supra ſpinatus, - - - - A.
9. Pectoralis major, - - - R.
10. ———— minor, - - - —
11. Serratus magnus, - - - - A.
12. ——— poſticus inferior, - - - —
13. Latiſſimus dorſi, - - - - —
14. Obliquus externus abdominis, - - E.
15. Quadratus lumborum, - - - —
16. Rectus abdominis, - - - —
17. Obliquus internus, - - - - E.
18. Intercoſtales, - - - - A.
19. Tenſor vagina femoris, - - - —
20. Gluteii, - - - - —
21. Faſcialis, - - - - - —
22. Sartorius, - - - - —
23. Rectus femoris, - - - - E.
24. Vaſtus externus, - - - - —
25. ——- internus, - - - - —
26. Biceps cruris, - - - - A.
27. Triceps adductor femoris, - - R.
28. Gaſtrocnemius, - - - - —
29. Soleus, - - - - —
30. Peroneus longus, - - - A.
31. ——— brevis, - - - E.
32. Extenſor longus digitorum pedis, - - A.
33. ——— proprius pollicis pedis, - - —
34. Tendo Achillis, - - - - R.
35. Abductor minimi digitis pedis,

* Annular ligament,

† Capſular ligament.

PLATE XIII.

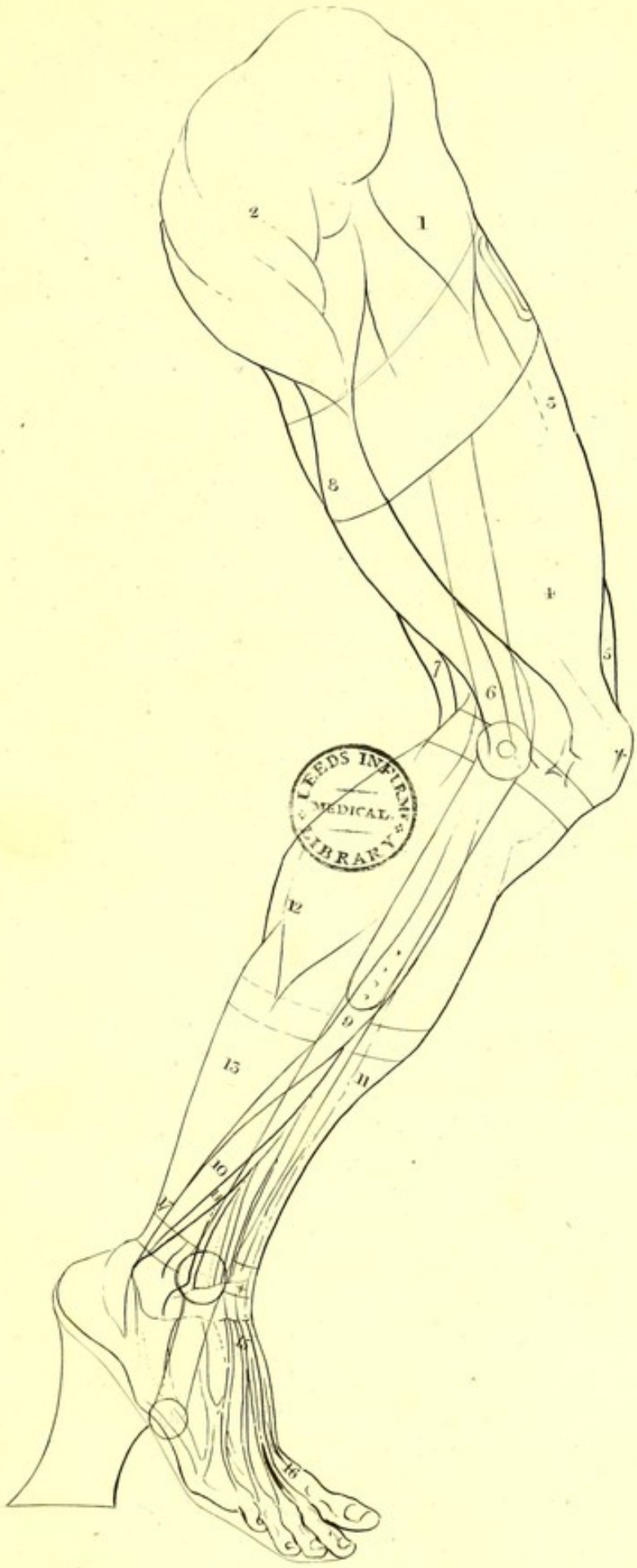
View of the MUSCLES, *in the ſtate in which they remain from the dangerous Habit of wearing* HIGH-HEELED SHOES; *and alſo when compreſſed with* IRONS.

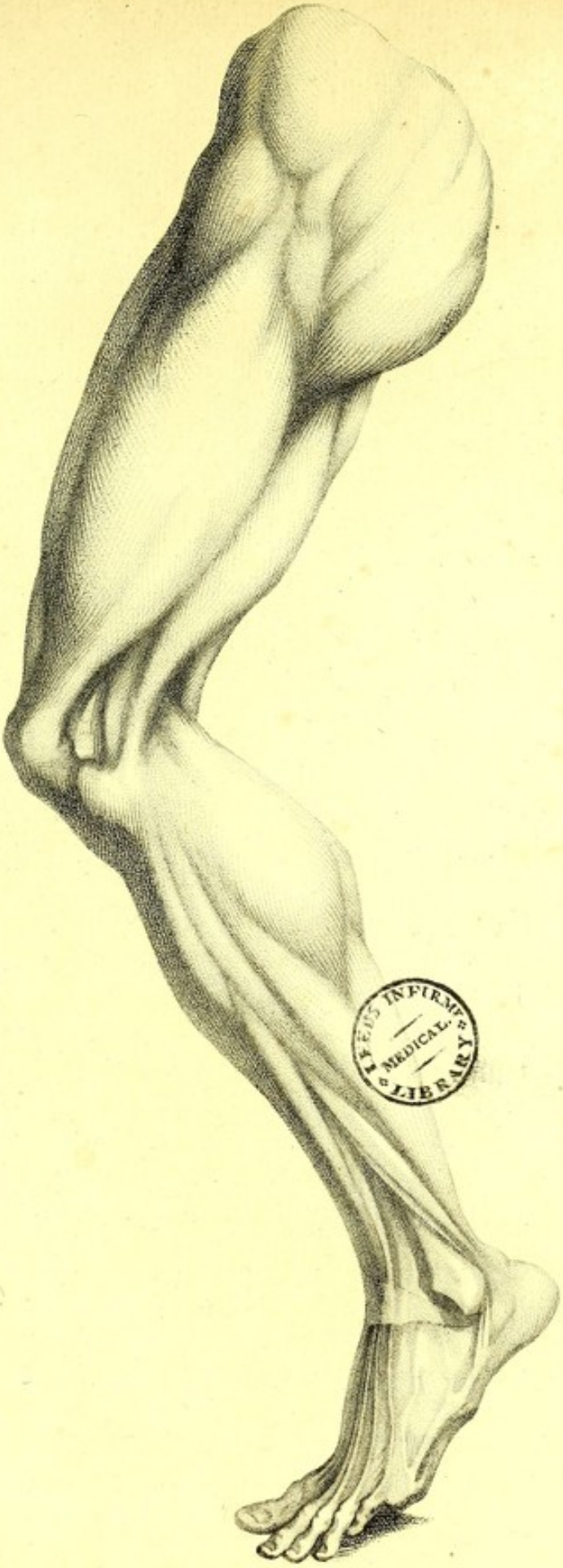
1. Tenſor vagina femoris, - - A.
2. Gluteii, - - - —
3. Rectus femoris, - - —
4. Vaſtus externus, - - —
5. —— internus, - - —
6. Cruralis, - - - —
7. Semitendinoſus, - - - —
8. Triceps adductor femoris, - R.
9. Peroneus longus, - - A.
10. ——— brevis, - - E.
11. Tibialis anticus, - - —
12. Gaſtrocnemius, - - A.
13. Soleus, - - - —
14. Plantaris, - - - —
15. Extenſor longus digitorum pedis, —
16. ——— proprius pollicis pedis, —
17. Tendo Achillis, - - —

† Capſular ligament,

* Annular ligament.

late XIII





by I. Pugh for
the Utility of
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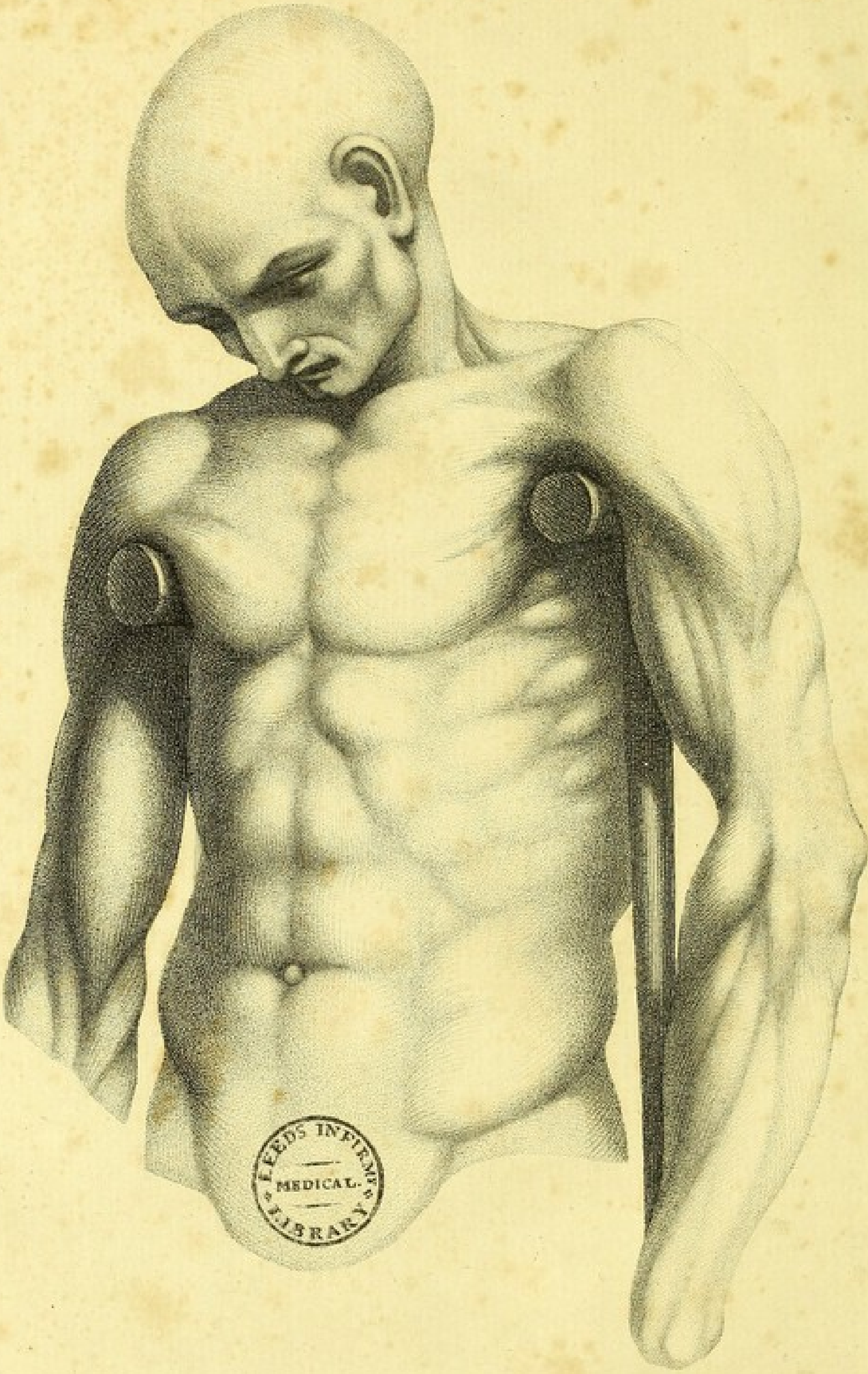

Invented by J Pugh for Illustrating the Utility of Muscular Action

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Plate XIV

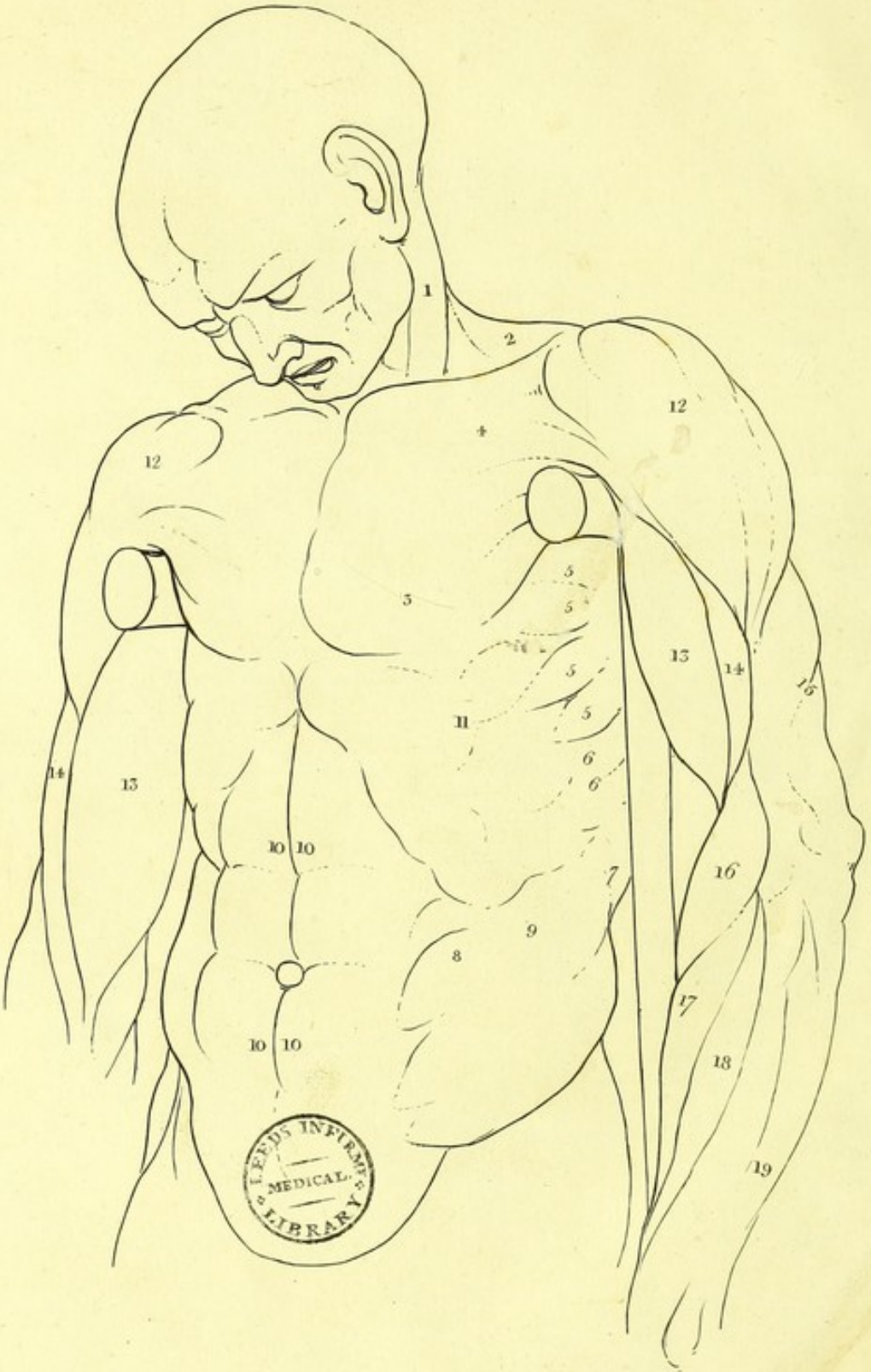


PLATE XIV.

View of the MUSCLES *of the Body in a paſſive ſtate, proving the dangerous Effects of leaning on* CRUTCHES.

1. Maſtoideus,
2. Trapezeus,
3. Pectoralis major,
4. ——— minor,
5. Serratus magnus,
6. ——— poſticus inferior,
7. Latiſſimus dorſi,
8. Obliquus internus,
9. ——— externus,
10. Rectus abdominis,
11. Intercoſtales,
12. Deltoides,
13. Biceps flexor cubiti,
14. Brachialis internus,
15. Triceps extenſor cubiti,
16. Supinator longus,
17. Palmaris longus,
18. Radialis externus,
19. Ulnaris externus,

N. B. The muſcles compreſſed by the uſe of Crutches; ſee the Arm-pit, Plate XII. No. 1, 2, 3, 4, 5, 6, 7, 8, and 10.

CHAP. VI.

MADE acquainted, as we have been in the foregoing part of this work, with the nature of a muſcle, its properties, and uſes, reſpecting its power of motion, and by what means theſe were created, it will now be neceſſary to ſay ſomething on the other moving powers of the machine which are connected with the muſcles, as thoſe powers are influenced very often, in a great degree, by muſcular action; and it is frequently from this action upon them that great benefit is derived to the machine in general, and many chronic affections alleviated and cured.

The BLOOD, that univerſal vivifying and nutritious fluid, which circulates to every minute part of the machine, is conducted to the heart by the large artery of the body called AORTA, and its ramifications; which ramifications, after they are arrived at their ſmalleſt ſeries, anaſtomoſe, or are united with the very minute branches of the veins; which uniting with larger and larger branches in their progreſs at laſt terminate in the heart, forming the large vein of the body named VENA CAVA—ſo that by this connection of the arteries and veins there ariſes a kind of circle, as it were, for the efflux of the blood from, and its reflux to, the heart, which gives us the idea of the circulation.—Thus, then, we conſider the aorta dividing itſelf into ſmaller and ſmaller ramifications

forming the origin of the arteries—and the minute branches of the veins uniting into larger and larger branches, forming the origin of the veins.

Now theſe ramifications are diſperſed every where over the human machine, and run in various directions along the interſtitial parts of the muſcles, and as they move along, ſend branches into the portions of the muſcles themſelves, as we ſee obviouſly by the red colour of the muſcular fibres.

Theſe arteries and veins are accompanied for the moſt part with branches of nerves, which are continuations from different parts of the brain, medulla oblongata, and ſpinal marrow, and are conſidered as the fountain and inſtrument of all perception and ſenſation, as well as parts by the continuance of whoſe action all motion is maintained.—Beſides, there are another ſeries of veſſels which are aſſociates with theſe, termed abſorbents, or lymphatics, which originate from ſurfaces, and cavities, and abſorbing fluids, which may be placed on theſe ſurfaces or cavities, and carry them alſo into the maſs of blood—And we know, for the well-being of the animal the fluids ſhould be carried through the courſe of circulation with proper force, quickneſs, and equability.

Being now in poſſeſſion of theſe principles, it is incumbent on us to inquire how they conjunctively act, to produce proper effect one upon the other, as by thoſe means, being informed of what conſtitutes the healthful ſtamina, we ſhall be better abl to judge what remedies ought to be applied in caſes of

morbid affections, and then ſee how far muſcular exerciſe quadrates with theſe particulars.

Now we know that a muſcle, to be in an healthful ſtate, muſt be poſſeſſed of proper degrees of contractility, elaſticity, and diſtenſion—capable of feeling the impreſſive power of nervous influence—and of exerciſing the inherent power peculiar to itſelf, (pag. 34, 35, &c.); ſo long, therefore, as it poſſeſſes theſe properties in due proportions, ſo long is it capable of performing all its actions in an healthful manner, and of continuing them, if the nervous influence is exerted with regularity and equability—But if theſe powers become too much augmented—decreaſed—or totally loſt—any one or all of them—or if the nervous influence ſhould be too ſtrong—defective—irregular, or altogether deſtroyed—then ſhall we have morbid muſcular action, or a total deprivation as the unavoidable conſequences—as may be inſtanced in ſome convulſions, cramps, pains, contractions, relaxations, debilities, palſies, &c. &c.—Beſides, theſe effects will be made more ſevere and more permanent by the increaſe or decreaſe of the circulatory powers, whence the fluids will be puſhed forwards too rapidly, or too tardily, perhaps ſtagnate, and have their particular properties altered from an healthful to a morbid ſtate—whereby a variety of diſeaſes may not only be locally, but more univerſally generated through the habit—as an example we will take the Gout.

This we conſider to ariſe from a humor, ſaid to be by phyſicians, *ſui generis*, that is, peculiar, and differing in its

nature from any other with which we are acquainted, as is that of the ſmall-pox, meaſles, &c. producing ſpecific diſeaſes, which originate not from any other ſource. This humor, either inherent, or generated in the habit, when it begins to exert itſelf, has the elective power of fixing itſelf upon parts contiguous to the ſmall joints of the body—moſt commonly thoſe of the feet, whence its name PODAGRA, from the Greek words *pous*, pes, the foot, and *agra*, captura, a ſeizure or affection—this humor fixing there, or in the ankle or knee, creates by its pungency great pain, by which the fluids are ſolicited into thoſe and the contiguous parts with great freedom; whence the veſſels, even the minuteſt, become filled and diſtended, and the cellular membrane alſo, as well as thoſe of the ſkin, occaſioning ſwelling and inflammation of the parts, which will be large in proportion to the violence and continuance of the offending ſtimulus.—Hence, when the ſtimulus of the gouty matter ceaſes, there remains other cauſes of pain, occaſioned by the fullneſs and diſtenſion of the veſſels, and of ſome muſcular parts alſo being left in a ſtate of too great irritability and weakneſs, by which great pain is felt on ſlight motion, and very often from different poſitions of the parts firſt affected, or thoſe which are contiguous. This being the caſe, patients are afraid of motion, and ſolicitouſly keep the limb in an inactive ſtate, and ſo placed as to render it eaſy to themſelves, which is generally in a bent poſture. This, therefore, produces too great and too long extenſion of the muſcles and tendons on one part, whence the elaſtic as well as contractile power is debilitated, the veſſels on the parts rendered ſtraighter, and the fluids

prohibited from circulating with proper force through their cavities—whilſt the muſcles and tendons, on the oppoſite ſide, have their elaſticity and contractility increaſed—the veſſels diſtended from too great fullneſs, and the fluids, from the weakneſs of the vaſcular coats induced, ſlowly moving through, or ſtagnating in their cavities; hence will come on infarction or obſtruction, thickening of the coats of the fibres, lacerti and lacertuli of the muſcles and tendons, whence congeſtions of the fluids, contractions, rigidity, inability to motion, and lameneſs—and theſe made perpetual by inactivity—hence alſo thoſe indurated ſubſtances called chalk ſtones; on which ſubject we ſhall give the opinion of Sydenham:

" Chalky concretions are conſiderably increaſed in the " joints, and eſpecially in the fingers, by long inaction, ſo " that at length theſe parts quite loſe their motion: for, " however poſitively ſome may aſſert, that the matter of " theſe concretions is only the tartar of the blood tranſ- " lated to the joints, it will nevertheleſs eaſily appear, upon " conſidering the thing with a little more attention, that " when a large quantity of indigeſted gouty matter falls " upon ſome of the joints, and occaſions a laſting ſwelling of " the neighbouring parts, it happens at length, partly from " their aſſimilating property being deſtroyed, and partly from " the obſtruction cauſed therein by this ſluggiſh humor, that " this matter is generated, which is changed into this kind " of ſubſtance by the heat and pain of the joint, and in- " creaſes every day, converting the ſkin and fleſh of the

" joint into its own nature, and may be picked out with a " needle, and reſembles chalk, crab's eyes, or ſome ſuch " ſimilar ſubſtance.

" But I have experienced in my own particular caſe, that " not only the generation of theſe concretions may be pre- " vented by daily and long-continued exerciſe, which duly " diſtributes the gouty humor through the whole body, that " otherwiſe readily attacks a particular part, but it alſo diſ- " ſolves old and indurated concretions, provided they be not " come to ſuch a degree, as to change the external ſkin into " their ſubſtance." WALLIS's SYDENHAM, vol. ii. p. 238.

Though every dependence is to be had on the facts recited by SYDENHAM reſpecting their truth, yet he appears ſometimes not ſo clear in his ſpeculative ideas; and in this caſe, with regard to the nature of what he calls chalk-ſtones, we cannot avoid thinking him guilty of an error—He conſiders theſe gouty concretions as matter forming the gout, and depoſited in theſe places;—but ſome experiments prove them only to be the earthy ſubſtance which forms the baſis of the bones, which will be found recited by VAN SWIETEN, where it is proved, that the cretaceous ſubſtance found in and near the gouty joints, have the ſame properties of the earthy matter which forms the bone.

Speaking of the formation of bones,— "rtilage," ſays he, " differs from bone, becauſe it [illegible] that earthy ſub-

" ſtance—and if by macerating bone in an acid that earthy " matter will be removed, the cartilage re-appears :—if that " earthy matter ſhould be coloured, as it will be by feeding " the animal on madder root, the bone being macerated in " acid, the coloured part will be deſtroyed, and the cartilage " remain untinctured." HERISSART hath obſerved, " that " gouty concretions diſſolve entirely in nitrous acid, leaving " behind neither cartilage nor membrane.—The ſame was " obſerved in an old woman, who had in her toes ſimilar " gouty concretions, for after uſing madder root the concre- " tions were tinged of a ſaturated red colour, and diſſolved " entirely in a dilute acid—Hence it is concluſive, that the " oſſific matter may be tinged by taking the root of madder, " and ſeeing that gouty concretions conſiſt of this earthy " ſubſtance, they are ſtruck with a deeper colour than the " bones themſelves."—From which, joined with ſome other experiments tending to prove the ſame point, he concludes,

" If, therefore, from repeated attacks of the gout, the " veſſels ſhall be ſo changed, if the fabric of the bones " ſhould be ſo injured, that which had been deſtined for the " reparation of the bone cannot arrive at the proper place, " it ſeems probable, that the ſame matter depoſited in the " parts contiguous, conſtitutes the gouty concretions, or " chalk-ſtones :—for it has before been proved, that they " have the ſame properties which are found in the earthy " parts of the bone, and which, added to cartilage, form " bone."

" Therefore, where this matter deſtined for the neceſſary " reparation of bone is collected within the cavities of the " joints, it creates ſtiff joints, ſcarce ever recoverable—if it " ſeizes the ligaments, it deſtroys their flexility—and thus " takes away both the motion and uſe of the parts, and " occaſions there different ſpecies of deformities—ſometimes " diſtorting one or more fingers, making them like a bundle " of parſnip roots, and depriving them of motion gradually." VAN SWIETEN's Comment. in Boerhaavii Aphor. 4to. vol. iv. p. 326.

From what has been advanced by SYDENHAM, relative to the removal or prevention of gouty concretions by exerciſe, might have been ſufficient to anſwer our purpoſe; but as it has been thought by ſome, that morbid matter generating any ſpecific diſeaſe, acts like poiſons, and is not capable of being aſſimilated by the powers of the conſtitution into the nature of our healthful fluids; exerciſe, in diſperſing the gouty matter through the habit, might be attended with dangerous conſequences, inaſmuch as it might be the cauſe of occaſioning a depoſition on the more noble parts of the machine—but as no ſuch circumſtance ever does occur from this cauſe, and exerciſe perfectly prevents the congeſtion, or in ſlight caſes removes it; it is more than probable, that the matter itſelf is ſuch as is natural to the habit, and capable of circulating in our fluids like other of their healthful parts, with eaſe and ſecurity, and adapted to the particular purpoſes of nature's intent by the laws of the animal œconomy. —And this we conſidered it our duty to prove, from the

obſervations and experiments of medical characters of the firſt conſequence.

From the circumſtances above enumerated, it appears, that the cauſes which occaſion thoſe morbid affections with which too many unfortunate patients are oppreſſed, ariſe from inactivity; it then can ſcarce be doubted, but that exerciſe early begun, and properly purſued, may prevent or cure theſe complaints before they are too obſtinately fixed: for we muſt obſerve, that when the muſcular parts have been continued in a ſtate of contraction on one part for a long ſeries of time, and too great extenſion on the other, the veſſels, from obſtructions remaining in them ſo long, will be conſolidated with their fluids, forming inſtead of canals, ſolid ſubſtances—or the very texture of the parts may, by the accumulation of gouty concretions, be totally deſtroyed; therefore it will be impoſſible to give flexibility or proper motion in theſe caſes to the diſeaſed parts.—Indeed, ſo well aware of this was SYDENHAM, and other phyſicians, that they adviſe exerciſe at an early period—and indeed inſiſt upon it in all its various forms, with which they were acquainted, preferring that which gave the greateſt power to the circulating fluids, adequate to the ſtrength and convenience of their patients.—Becauſe, as in exerciſe the muſcles of the body are moved, the motion of the blood in the veins is accelerated, the heart contracts itſelf ſtronger and more frequently, as alſo the arteries—Reſpiration is equally increaſed, and thus all the powers aſſimilating chyle into ſound humors, in a given time act more freely than in indolent men: all the ſecretions and

excretions are promoted, and by theſe means all things conſpire to induce health.—For this reaſon, not only in the gout, but in all chronic diſeaſes, phyſicians recommend exerciſe as ſalubrious—nor does motion of the body contribute only to ſanguification, or forming of the blood—but alſo of chyle—ſince the pendulous viſcera of the abdomen are thus agitated, and alternately preſſed by the diaphragm and muſcles of the abdomen, the ſecretion of the juices of the ſtomach—pancreas — inteſtines — and liver are increaſed. Whence men, ſubject to ſevere and conſtant labour, live upon any kind of food, and very readily digeſt it; whilſt thoſe who lead indolent lives, are oppreſſed with the lighter kinds of viands, and are conſtantly troubled with flatulence—Nor is it ſufficient, that men ſhould take exerciſe now and then, but have daily recourſe to it, as neceſſity requires ſuch perſeverance.

But ſince the gout uſually torments thoſe advanced in life, they ought to contend againſt the ſluggiſhneſs of old age, if they expect any alleviation of their miſery; for unleſs they exert ſome reſolution, both by old age and diſeaſe their limbs will grow ſtiff, and be rendered incapable of motion. And SYDENHAM has informed old gouty people, " that nothing leſs " is to be hoped for, *than that diſeaſe ever ſhould be brought* " *to any perfect termination without exerciſe*; for as the diſ- " eaſe may by its violence conquer nature, they often die of " languor and ſickneſs, which the quantity of morbid matter " reſiſting the power of concoction occaſions; and from " theſe unconcocted materials, which can by no means be " aſſimilated, they are deſtroyed as by poiſon." But ſtill

this exercise, that it may be used every day, ought to be proportioned to the strength and age of the patients, lest they should be debilitated by fatigue.—Whence riding on horseback has in general been preferred, because it wearies those less who have been accustomed to it, and increases the action of the lungs upon the blood; but it is most beneficial if taken in a pure, clear air. But should riding on horseback be too severe, riding in a carriage may supply its place—though it will be less beneficial. Indeed, so essentially necessary has exercise always been considered, that there is no species which has not been advised; even the motion of particular parts has been recommended, that the rigidity of the joints, which is common in an inveterate gout, and very difficult to cure, might be avoided.

Cælius Aurelianus, an eminent physician of the city of Sicca in Numidia, supposed to be prior to Galen, advises gouty patients to take wax into their hands, and by motion to soften it, or to hold the gauntlets, or leaden weights which wrestlers, or athletic men, called *halteres*, as well made of wax or wood, with lead placed in them, similar to our dumb bells,—and make use of them, obviously for the purpose of exercising the joints—riding also, at first in proportion to the strength, then walking on straw strewed upon the ground—to which he adds, exercise of the voice, with anointing the body—From whence it was obvious, that he was afraid of a rigidity or stiffness of the joints from absolute rest—and at the same time, to walking he added the exertion of the voice, that the action of the lungs might be increased:—it was also

underſtood, that theſe efforts ſhould be begun whilſt the fit was not yet completely finiſhed, but ſome ſlight pain ſtill remained; for beginning at firſt with the gentleſt motion, walking was afterwards to be attempted, the ground covered with ſtraw, and the feet uncovered with ſhoes, that the motion might be attended with leſs pain.

Paulus of Ægina, a celebrated ſurgeon of that iſland, who lived in the ſeventh century, confirms this doctrine: he adviſes exerciſe and frictions, particularly of the joints, in the remiſſions, that is, when the pain is ſlight, the fit not altogether gone off; which is further ratified by the obſervations of Sydenham, who recommends gouty patients to uſe motion, though the joints are ſtill in pain.

Friction itſelf, that gentleſt ſpecies of exerciſe, if applied to the parts which during the gouty fit were uſually afflicted with pain, has been of ſingular utility.

"Certain I am," ſays Van Swieten, "from a variety of "experiments, that if gouty patients would conſtantly, "morning and evening, uſe friction, particularly to the feet, "which the gout moſt frequently attacks, they would find "great relief—nor ſhould the remedy be deſpiſed for its "ſimplicity: I have ordered flannel impregnated with ſome "aromatic fumes, at the ſame time exhibiting ſome ſoft "ointment; ſtill I will confeſs, from friction I have ſeen the "ſame effect, if it had been adminiſtered for the ſpace of "fifteen minutes morning and evening—for the parts were

" invigorated and ſtrengthened ſo much, that if any morbid " matter had begun to be collected and fixed, it was diſſi- " pated."

ÆTIUS, a famous phyſician, born at AMIDA in Meſopotamia, who lived at the end of the fifth or beginning of the ſixth century, ſtrongly recommends frictions, as the moſt certain preventive of the gout; he orders it to be adminiſtered, " Not, indeed, during the inflammatory or painful " ſtate, but in the remiſſion;"—then enumerates theſe ſalutary effects, " In all who uſe frictions in this manner, the " natural heat is increaſed, and what is præternatural is " diſcuſſed—the recrementitious matter is diſperſed, and the " affected limbs become ſtronger, and are made leſs ſuſcep- " tible of the diſeaſe, particularly if they aſſiduouſly every " day, night and morning, during life, make uſe of this " remedy when the pains have remitted."—" But Ætius at " the ſame time anointed the parts with oil intimately mixed " with ſalt—though the moſt powerful effect ought to be " attributed to friction.—I adviſed this preventive remedy to " a gouty patient, who afterwards uſed to rub his feet very " well, night and morning with his ſtockings, as he pulled " them off and put them on, and was ſo familiarized to the " operation in a little time, that he continued the frictions " without any trouble, ſcarce thinking of it, ſo long as he " lived.—But although he did not pay ſtrict attention to the " courſe of diet preſcribed, ſometimes indulging himſelf, ſtill " his gouty fits were ſlighter, and had longer intervals, and " he preſerved the flexibility and agility of his limbs, and

" thus was enabled to uſe exerciſe."—PHILAGRIUS had ſuch an opinion of friction, that he with great confidence declared, " That frictions alone were ſufficient for thoſe who were " guilty of very great dereliction with reſpect to diet."

From the opinions of the moſt experienced men, as well as from reaſoning, it appears obvious, that the greateſt benefit is to be derived from keeping the muſcles in proper condition to perform their actions completely and regularly, thus conſtantly promoting a due circulation of the blood and humors, and maintaining a juſt equilibrium between the ſolids and fluids of the human machine.—From hence, then, we may fairly conclude, that whatever renders theſe muſcular powers inactive, impedes the circulation, and deſtroys that equality which ought to be preſerved through the whole, and every part of the habit, will not only injure the parts themſelves, but be a means of debilitating the conſtitution in general, and laying the foundation for variety of other complaints.

Now if we examine the effect which muſt neceſſarily ariſe from the uſe of crutches, and wearing high-heeled ſhoes, with ſprings of different kinds, with intent to alleviate ſome diſtreſſing affections, we ſhall be convinced that they become cauſes of many painful diſeaſes.

But, in order ſtill to give a ſtronger idea of this matter, among the plates there are inſerted three ; one to ſhew the the poſition of the machine on crutches—another, the ſitua-

tion of the thigh, leg, and foot with high-heeled ſhoes, ſprings, &c.—and another of the bones of the leg and foot, the better to explain what miſchiefs are apt to ariſe in theſe parts, and how well calculated they are to be injured (ſee plates, No. 13, 14, 15.) by theſe contrivances.—Theſe, therefore, we ſhall examine ſeparately.

If we for a moment conſider the variety of muſcles of which the arm conſiſts; that theſe are formed of fibres, which uniting into ſmall bundles, called lacertuli, and theſe into larger called lacerti, and theſe again into muſcles—the ultimate fibre being ſupplied with blood veſſels, nerves, &c. and enveloped in a membranous ſubſtance, ſubject to adheſions, inflammation, rigidity, &c. from ſtimulus and obſtructions,—that alſo, for want of a due circulation in the veſſels, the inherent power of the muſcle is debilitated, perhaps deſtroyed, as well as the nervous influence, inducing relaxation and torpor of the parts, we cannot heſitate to conclude, that conſiderable miſchief may be occaſioned by the preſſure of the heads of the crutches on the muſcles and veſſels of the axilla; for by this preſſure, which muſt be conſiderable from the weight of the whole body being applied to theſe parts, the blood is prevented from returning to the heart ſo quickly as it ought, not only from the repagulum placed in the veins of the axilla, and parts contiguous, but from the preſſure hebetating the energy of the nerves, and rendering the veſſels, in a great part dependent upon that power for vigorous motion, too ſluggiſh in their motion.—From hence we find a preternatural congeſtion of fluids—pain brought on from vaſcular diſtenſion—a ſolicitation of fluids to

the parts more than natural—and frequently in gouty habits a depoſition of acrimony on the metacarpal or ſmall bones of the hand, the wriſt and elbows, which, without the application to crutches, might have remained free from the attacks of the diſeaſe. Beſides it too often occaſions the gout to vary its ſituation at the end of regular fits, and ſubject the patient to an arthritic paroxyſm in the hands.—Nor are theſe the greateſt evils to be complained of. It is for the ſake of preſent eaſe that patients have recourſe to crutches, in order to crawl about without the pain of muſcular motion, and hence lay the foundation for themſelves becoming cripples the remainder of their lives; for to the limbs, as they will ever be kept in the eaſieſt ſtate, the ſame inconveniencies will occur, as has been repreſented pag. 59. and the patient at laſt fall a ſacrifice to the gout itſelf, aſſuming the aſpect of ſome other complaint, or ſo debilitating the active powers of the conſtitution, that ſome other malady puts an end to the ſcene of miſery occaſioned by inactivity, which has been fully enumerated in the former part of this work.

The ſame diſadvantages are likely, and do often occur, from wearing high-heeled ſhoes, ſtraps, and ſprings, at too early a period of ſome complaints, which might be rendered unneceſſary by proper care in attempting to prevent contractions from being brought on, too often occaſioned by inattention and ignorance.

In almoſt all theſe caſes, debility has been the principal cauſe, as in ſcrophulous and ricketty habits; hence, when

pain has affected the legs, the ſame indulgence has been permitted as has been repreſented in gouty people, and of courſe the ſame conſequences have occurred. To remedy which, inſtead of uſing that proper muſcular exerciſe which has been before ſpoken of, recourſe has been had to IRON JOINTS, STRAPS, and HIGH-HEELED SHOES; the FIRST of which can be of no uſe, for in the iron or artificial joints there is no power of motion, nor any aſſiſtance given to weak motion, if the natural joint is either void or poſſeſſed of too ſmall degree of action.—The SECOND is detrimental by waſting the muſcles, and depriving them of action from preternatural preſſure producing the ſame effects, as ſpecified in the application of crutches.—And the THIRD, occaſion the tendons of the hams and heels to contract, by keeping the knees continually bent forwards—hence creating ſimilar miſchiefs to what have been above ſpecified, pag. 59.

To all which we may add, that not only the muſcles, tendons, and ligaments ſuffer, but alſo the joints, particularly thoſe of the lower extremity: in order to elucidate which matter, a plate is given of the bones of one of the lower extremities, the peculiarities belonging to which may be applied to the arm and hand under ſimilar circumſtances.

From this plate it appears, that the foot conſiſts of a variety of ſmall bones, called tarſus, metatarſus, and bones of the toes named *phalanges*, which are thus conciſely deſcribed. The tarſus is compoſed of ſeven bones, the firſt of which is called *aſtragalus*, ſupports the tibia, or large bone of the leg;

and is ſupported by the *os calcis*, or heel bone, which being projected backwards, makes a longer lever for the muſcles that extend the ankle, to act with, and raiſe the body upon the toes—Theſe two bones have a conſiderable motion between themſelves, and the aſtragalus alſo, with the *os naviculare*; and all the reſt an obſcure motion one with the other—and with the bones of the metatarſus, the greateſt part of theſe motions being towards the great toe, where is the greateſt ſtreſs of action; *theſe bones thus giving way, are leſs liable to be broken, and as a ſpring under the leg makes the motions of the body in walking more eaſy and graceful, and the bones which are ſupported by them, leſs liable to be fractured in violent actions.*—To theſe join five others, called the metatarſal bones, that which ſupports the great toe is much the largeſt, there being the greateſt ſtreſs in walking; under the end of this lie the two ſeſamoid bones, (called ſo from their reſemblance to the ſeſamum ſeed) which are of the ſame uſe as the patella, commonly called the cap of the knee—The great toe has two bones, the leſſer three each, and the two laſt of the leaſt toes frequently grow together.

The bones of the tarſus are united to each other by very ſtrong ligaments, and their articulation with the foot is ſecured by a capſular and two lateral ligaments; each of the latter is covered by an annular ligament of conſiderable breadth and thickneſs, which ſerves to bring down the tendon of the foot, and at the ſame time to ſtrengthen the articulation.

With regard to the toes, although they are more confined in their motion than the fingers, yet they appear to be perfectly fitted for the purpoſes for which they are deſtined.

In walking the toes bring the center of gravity perpendicular to the advanced foot; and as the ſoles of the feet are naturally concave, we can at pleaſure increaſe that concavity, and form a kind of vault, which adjuſts itſelf to the different inequalities that occur to us in walking, and which, without this mode of arrangement, would incommode us exceedingly, eſpecially when bare-footed.

From the number of theſe bones, the nature of their junction, their ſituation and uſes, obſtructions are more likely to be formed in the ligamentous ſubſtances by which they are united, than other parts of the machine, particularly by the feet being kept too long inactive, and more eſpecially if the blood is impeded in its motion towards the heart by any obſtruction placed in a ſuperior ſituation.—Hence will be brought upon theſe parts ſevere inflammations, conſequent obſtructions, adheſions, ſtiffneſs and rigidity at their ſeparate junctures, inability to motion, and that halting, hobbling, infirm mode of walking gouty valetudinarians ſo often exhibit, if they eſcape the more ſevere degrees of decrepitude ariſing from what are called chalk-ſtones — nay, indeed, ſometimes it happens that the tendons and ligaments, and even the bones themſelves, have been deſtroyed by the conſtant depoſition and detention of arthritic and other acrimonious matter in theſe parts, which probably might have

been prevented by proper exercise, that is, by exercise adapted to the parts; which peculiarity must be attended to, it is evident from the situation and nature of the parts themselves, as no *general* plan can sufficiently affect them to produce the intended salutary purposes.

It is no small satisfaction to me, that I have been enabled to lay before my readers, not only the utility of general, but also the necessity of *partial exercise*, from the authority of the most respectable characters in medicine, both ancient and modern. But they seem not to have carried the latter far enough; for though we will allow great benefit may be derived in many cases by the strict observance of the rules which may be deduced from what has already been advanced in mild and recent cases, still will they all be insufficient in cases more inveterate, though curable by proper applications. —We find many arthritic subjects who, either from extreme debility, pain, or some other cause, cannot of themselves give power and force enough to the muscles, either to counteract the great contractility of some, to give proper elasticity to others—or promote a due circulation sufficient to alleviate or cure the local affections.—For many can only submit to frictions, which are applied too *superficially* to produce proper action on the more interior parts: for we find, that neither the muscular fibres, tendons, nerves, blood vessels, nor lymphatics, which are deeper seated, can sufficiently experience the effects which ought to be occasioned by motion;—a great number of convalescents, who have used frictions assiduously, can be brought in proof of this assertion, and such as have

by more powerful motion applied to the limbs received every deſired benefit.—Some contrivance, then, has been long wanting, whereby all the muſcles, left in a morbid ſtate of debility, might be thrown into action, and that action continued, or their too powerful contractility counteracted, and that with as much eaſe as the nature of the caſe would admit, or the neceſſity demand.—It has been my ſtudy for a number of years to contrive ſuch an apparatus; how far I have ſucceeded, will be moſt ſatisfactorily proved by the following caſes; a careful compariſon of which with the principles that have been laid down in the foregoing ſheets, will ſhew inconteſtably, I flatter myſelf, that the plan is founded on reaſon, and not on the vain boaſtful pretences of quackery and impoſition.

CASE I.

In a Letter to Mr. PUGH, *from* JOHN ANDERSON, *M. D. F. A. S. C. M. S. &c. &c. communicated to the* MEDICAL SOCIETY, LONDON.

SIR,

HAVING met with a remarkable inſtance of the efficacy of your machines very lately, in a moſt deplorable caſe, I was induced to communicate it to the London Medical Society, of which I have the honour to be a member; the words verbatim are as follow, which you are at liberty to ſhow to ſuch of the faculty, and others, as you ſhall think proper, as I flatter myſelf every liberal, obſerving, and candid mind will be diſpoſed to liſten to impartial facts that ſo nearly concern the general good of ſociety.

I am, SIR,

Your's reſpectfully,

JOHN ANDERSON.

London, 23 April 1791.

Copy of Dr. ANDERSON's *Letter read to the* LONDON MEDICAL SOCIETY, *March* 1791.

MR. PRESIDENT,

I BEG leave to notice to the Society a recent fact of the efficacious power of chamber muſcular action in ſuppling rigid joints.

THOMAS NEWTE, Eſq. of Gower-ſtreet, Bedford-ſquare, a native of Devonſhire, where the *gout* is hereditary almoſt in every family, had, from many heavy irregular attacks of the gout, the joints of his arms and legs grown ſo ſtiff as to be almoſt inflexible.

After medical treatment had proved ineffectual, nay detrimental, he applied to a *Mr. Pugh*, who exerciſed his joints daily for ſome time, and he regained the full uſe of his extremities. He ſupplied him, at the ſame time, with machines that he exerciſed himſelf with at home in his own chamber; by which not only his rigid joints were ſlackened, and his cumberſome corpulency reduced, but ſtrength and energy were given to his whole ſyſtem, ſo far as to enable him to walk, ride, and do other manly exerciſe better than he had been able to do for years.

Though exerciſe (partial or univerſal) alone is not equal to cure the gout, yet, in this inſtance, joined with temperance and regularity, by giving ſtrength and activity to the ſyſtem, aſſiſted greatly to ward off irregular, wild, and debilitating fits for eighteen months without interruption, and allowed Nature time to collect her ſtrength, to throw off noxious accumulations by a kind and regular fit, which he happened to have the latter end of laſt year at Margate.

He called me in early to conduct him through it, as he was afraid it might prove as lingering and debilitating as his former fits uſed to be, from the draſtic method he uſed to be treated, but which was not the caſe now; it was regular, I had only occaſion to order him a doſe or two of rhubarb and magneſia alba, conſiſting of a few grains of each, and a few leeches

to his knee and wriſt, which were ſwelled and inflamed, but which the leeches effectually relieved at once, that is, the inflammation and pain abated, and the ſwellings ſubſided; the tenſion being thus taken off the ſkin, and, by keeping in bed, a pleaſant diaphoreſis came on, which being ſupported by tepid diluent drinks for two days, they terminated kindly, and he mounted his horſe two days after, and rode ten miles with eaſe; and by continuing his horſe and chamber exerciſe, his life is rendered bearable, nay, comfortable to him; for his joints are not only ſuppled, but his general health is mended; and Nature not being drove, but led, his fits are brought to be more regular, the intervals more diſtinct, and the paroxyſm leſs tremendous.

Were there no more inſtances than this of the great benefit received by the uſe of theſe machines (but which I am told there are many) the ingenious contriver of them merits public attention, and countenance of the Faculty more in particular; for who deſerves more encouragement and ſupport, than he who ſhall by his induſtry and ingenuity contrive means to ſave life, and render it comfortable after medical art has proved ineffectual?

In no diſeaſe whatever is the beneficial power of exerciſe, temperance, and regularity more fully marked than in the gout, both hereditary and acquired.

Indolence and groſs high feeding are great promoters and increaſers of the gout.

Exerciſe, plain nutritive diet, regularity and moderation, are their great antagoniſt; they help and ſtrengthen the nerves; and the benefit our corporeal frame receives by the amicable conflict, is only equalled by the acquirement derived to the mental powers; the underſtanding and memory grow ſtronger by exerciſing them; they ſuffer by diſuſe and neglect. When the body is in health, the ſpirits dance, and the mind is in tune; the corporeal frame is ſubſervient to internal impreſſion, and the incorporeal or mental to external; it is for art to keep them in uniſon—go hand in hand. If noxious particles are prevented from gendering by exerciſe, and mild balſamic ones ſupplied in their place, gout will be ſuppreſſed, even that

which is hereditary kept within circumſcribed bounds; and the habit being clear of incendiary particles by critical diſcharges, the paroxyſm will be kind and regular.

It is as neceſſary to have a perfect criſis of gout as of fever, or the thief will harraſs and be perpetually haunting the habit to its deſtruction.

(Signed) JOHN ANDERSON.

CASE II.

From JAMES WATSON, *Eſq. M. P. Serjeant at Law.*

SIR,

AS you are about to publiſh a treatiſe on the principles and utility of the method employed by you for muſcular exerciſe, I think it my duty, in compliance with your requeſt, to authorize you to make any uſe you pleaſe of ſuch teſtimony as I can give in confirmation of its efficacy to prevent chronic diſeaſes, and relieve perſons afflicted with them; to reſtore the tone of relaxed muſcles, reduce thoſe which are contracted, and aſſiſt the joints when impaired by inaction; to promote recovery from nervous injuries, even when attended with alarming ſymptoms of the paralytic kind; and to ward off and remove the various complaints and diſeaſes with which the health of ſedentary perſons is moſt commonly liable to be attacked.

I have perſonally derived great benefit from it in all the particulars above enumerated, and ſeveral other gentlemen, within my knowledge, have obtained relief from your apparatus, and aſſiſtance in ſeveral caſes of a ſimilar deſcription. I will ſuccinctly mention what immediately relates to the benefit I have myſelf received. The complaint which occaſioned my firſt application to you was of a ſingular nature, and muſt, I think, as far as relates to its cure, be ranked under the head of paralytic affections: for, after having ſtruggled eighteen or twenty hours with an extraordinary kind and degree of pain, proceeding from the right ſide of the ſmall of my back, I was ſeized by violent ſpaſms, ſhooting, as it were, from a point in the

very center of that pain, and accompanied with a tingling, or ſort of pricking ſenſation, like what is felt in the ſole of the foot, when, according to the common phraſe, it is ſaid to be aſleep. This ſenſation ſpread down the loins, round the lower part of the abdomen, and over the whole ſurface of the thighs, legs, and feet: theſe parts were, in a few ſeconds, reduced to a ſtate of total inſenſibility, and quite deprived of all power of motion; but the injury did not extend upwards.

This misfortune happened to me in the forenoon of the 11th of October 1788, and it was not till the 30th of January following that I diſcovered the cauſe of it to have been a very fine needle lodged in my body at the ſpot from whence I traced all my ſufferings, to which the ſource of them was fixed, till within a few days of my making the diſcovery, and which, during the whole time, ſeemed ſo ſmall, that I could cover it with the end of my little finger, though the miſchief ſpread ſo wide.

A diſcuſſion of the various grounds of conjecture, as to the time and manner of this needle's having entered the frame; a minute enumeration of the various complicated ſymptoms of the diſorder produced by it; and a narrative of the different effects of the reſpective medicines and topical applications adminiſtered; accompanied with remarks upon ſome of the moſt particular attendant circumſtances; may, perhaps, hereafter meet the public eye: but it is evident, that whilſt the inſtrument of my miſery remained in its ſeat, a perfect cure was hardly attainable.

To my valuable friend, Dr. Reynolds, I owe much gratitude for a great degree of palliation: he devoted no ſmall ſhare of his time and conſideration to ſearch for the cauſe of an attack ſo uncommon; and, from a careful obſervation of the ſymptoms, he was enabled to ſupply, in the moſt efficacious degree, every aſſiſtance and alleviation that medical ſcience and ſkill could deviſe.

I alſo derived conſiderable benefit from muſcular exerciſe by your aſſiſtance and the uſe of your machinery, whilſt I yet remained in a very helpleſs condition. When I firſt applied to you, I had recovered ſcarcely any ſenſe of feeling beyond that of numbneſs and of dead cold, and but a very ſlight

power of motion in my lower extremities. I could, indeed, barely reſt upon them with my body inclined forward; but ſuch was their remaining weakneſs, that I could not ſtand upon them without ſupport, nor could I ſtand upright at all. Theſe limbs were, however, ſpeedily reſtored to ſome animating degree of warmth in conſequence of the circulation being quickened in them by exerciſe; as the blood came to be thereby puſhed into the capillary veſſels and excited to the ſurface the white and periſhed ſkin threw itſelf off from the bottoms and ſides of the feet, and the whole ſurface of the ſkin gradually preſented itſelf to the touch in a more healthy ſtate, and began to aſſume its natural appearance; the joints, particularly of the knees, daily gained ſtrength, and the muſcles progreſſively, though by ſlow degrees, and as the fruit of regular and long perſeverance, ultimately acquired again the tone which they had ſo entirely and ſuddenly loſt.

From the very firſt I perceived, that by your aid and ſkill in adapting the mode and proportion of exerciſe to my enfeebled ſtate, I could take as much as was requiſite with very little exertion of my own, and conſequently without fatigue. The moſt immediate advantage which I ſenſibly perceived to reſult from the uſe of it, was the warmth above-mentioned, and next to that I found the operation of the medicines preſcribed for me to become more efficacious; the conſequence was, that my nervous irritation gradually ſubſided; the various diſtreſſing ſymptoms occaſioned by my pain were diminiſhed, and my general health was promoted long before the cauſe of my miſery was removed: for all this while the ſeat of the diſeaſe remained permanently fixed as ever. You will recollect what daily pains you took, for many weeks ſucceſſively, to vary the application of different machines to the muſcles of my back and loins, and in how many changeable poſitions you placed me to employ them moſt advantageouſly, without my gaining any apparent ground, either by thoſe means, or from your manual aſſiſtance, towards the eradication of the evil itſelf, although its conſequences were ſo much ſoftened; and, from an apprehenſion that its root might poſſibly be in the ſpine, I was at one time nearly perſuaded to attempt to reach it by ſubmitting to the application of cauſtic, under the ſurgical care of the late Mr. Pott. In all probability the needle would have been diſcharged at the wound, but I providentially eſcaped

the additional ſuffering that muſt have been occaſioned by ſo ſevere a remedy.

I will ſhortly relate their circumſtances and manner of my deliverance.

On the 26th of January 1789, above a quarter of a year after the firſt attack, whilſt I was in the uſe of your machinery and made very warm by the exerciſe, I was ſuddenly ſtruck with an extremely violent renewal or rather increaſe of anguiſh at the very ſeat of the habitual pain. You may recollect that a degree of ſpaſm, and of temporary aggravation of the pain immediately in that part, generally came on during the time that particular muſcles were in a ſtate of extenſion; but this was ſo much more inſtantaneous and ſevere than uſual, that for a few minutes I apprehended it to be a relapſe: happily it did not ſo terminate. The ſpaſms did not ſpread, nor continue after the parts were relaxed; the nervous inſenſibility and attendant incapacity, which I know not how to deſcribe but by calling it a paralytic affection, did not return upon me; on the contrary, all my ſenſations ſoon became more tolerable, though the violence of the pain did not ſo immediately abate in the ſpot where the needle had lain, as the effects did in other parts; but I could move with rather leſs inconvenience than before in the courſe of that evening, and I was diſtinctly ſenſible next morning of a new ſort of feel, very different from that which I had been accuſtomed at the ſtationary point, and rather higher up my back. This I perceived to ſhift, and I traced its courſe nearly in a regular progreſs for that and the two ſucceeding days. About this change, ignorant as we then were of its cauſe, a variety of conjectures were entertained by my medical friends. It did not occur to us then to examine the back, otherwiſe the probability is that the needle would have been felt lying under the ſkin, as I could have pointed to its place at any inſtant between the evening of the 26th and morning of the 30th of January, when I made the diſcovery; for at that time it was ſo cloſe under the ſkin, juſt at the lower part of the deltoid muſcle of the right ſhoulder, as to be readily extracted; putting my hand upon the part affected I felt ſomething extraneous; upon my gently preſſing round it with my fingers, the point preſented itſelf; the ſmart was trifling, and as I drew the needle out, the feel was as if I had been drawing a hair through the ſkin.

The appearance immediately afterwards was like an exceeding ſmall pimple with a puncture in the middle; but there was no obſervable diſcharge of moiſture from it. The needle itſelf was caſed, or rather bronzed over, and diſcoloured almoſt to blackneſs; but with a ſmooth poliſh and not ruſted. This diſcolouration ſoon began to wear off from the point and eye, by handling; but I have taken care to preſerve the middle part untouched. It ſhould ſeem that when I was ſtruck while at exerciſe, in the manner above deſcribed, on the fourth day before the diſcharge of the needle, it ſtarted from the bed where it had ſo long lain buried, and got into the cellular membrane above the external muſcles; for it could not have paſſed through the ſubſtance of the fleſh ſo expeditiouſly, nor betwixt the muſcles without much greater pain. The ſenſation of uneaſineſs which accompanied its journey was by no means acute, except during the night of the 29th, when the whole region of the right ſhoulder was in excruciating torture; perhaps from the irritation of ſome ſmall nerve in that part of the paſſage.

It will not ſeem extraordinary to any perſon who has obſerved how ſpeedily an ear of corn, or even a pointed ſlip of ſtiff paper, inſerted at the wriſtband of his ſhirt ſleeve will travel over the whole ſurface of his body, that this needle ſhould have made ſo quick a progreſs when put in motion between the ſurface of the external muſcles and the ſkin, having no reſiſtance to encounter, but from the fine laminæ of the cellular membrane, and thoſe ſo lubricated with an oily matter as rather to help forward than retard ſuch a ſlender and poliſhed body as this needle was; upon which therefore the effect of the muſcular action muſt have been ſimilar to that produced by it upon larger and coarſer ſubſtances inſerted between the ſkin and the cloths. I was at that time in the habit of full exerciſe upon your plan; and think it providentially fortunate for me, that the courſe by which this needle was expelled lay in a direction ſo much leſs hoſtile than that by which it had entered.

The progreſs of my recovery was from this time rapid to a certain point; but I never got rid of all the effects of the injury till the autumn of the preſent year, if in truth ſome few of them are not ſtill remaining; and whether any of the dorſal or lumbal nerves had received an actual wound, or whatever was the miſchief done, I was rendered liable to an extraordinary

and very uncomfortable ſort of irritation, which I am unable properly to deſcribe, for a great length of time. Almoſt every change of weather, and often the drinking of a ſingle cup of tea, would bring on catchings and twinges proceeding from the part where the principal injury had happened to the right hip, and down the whole lower extremity on that ſide. In like manner attacks both of gout and rheumatiſm, which I inherit, with which I have ſince been troubled, ſeem to have been made on that limb as the weak part. It is, however, ſingular, that during my firſt confinement, before I applied to you, the left leg was the moſt waſted, and, I think, the coldeſt of the two; but ſooneſt recovered ſtrength and its natural appearance.

Although the paralytic ſymptoms in my caſe were produced by a cauſe ſo uncommon, there are circumſtances in the preceding narrative which make me think it reaſonable to conjecture, that when ſimilar effects are produced by their more ordinary cauſes, perſeverance in a courſe of exerciſe, eſpecially under your care, will be found very beneficial in itſelf, and will contribute much in aid and furtherance of medicine. I know that prior to the cauſe of my complaint being removed, I received more ſenſible advantage both from electricity and the medicines preſcribed, particularly thoſe of the nervous claſs, when immediately preceded or followed by the exerciſe than at other times.

I likewiſe have reaſon to think your mode of treatment peculiarly well calculated to give additional efficacy to the uſe of the Bath waters. When I have taken the exerciſe there juſt before, but more eſpecially directly after bathing or being pumped upon, I have found it moſt peculiarly beneficial; and even in the bath I have often received advantage from ſtretching the muſcles and working the joints, as much as I could of myſelf without the aid of any other machinery than the rails, ring-handles, and ſteps.

As applied to caſes of gout, I have obſerved in myſelf and others that the exerciſe is undoubtedly uſeful after the fit to reſtore the ſtrength and tone of parts weakened by the inflammation, or which have become rigid by inaction and the accumulation of peccant humours; and one may venture to conclude, without any pretenſion to medical knowledge, that by ſo doing it

will operate as a preventive to chalky concretions at the joints. I likewiſe believe that the diſeaſe itſelf may, by the regular and daily uſe of this remedy, be overcome in moſt conſtitutions; in my own at leaſt, I have experienced it to be calculated to prevent the gouty matter from generating or determining itſelf to the joints ſo faſt as not to be eaſily thrown off. I have ſeveral times, upon becoming oppreſſed with thoſe ſymptoms which every perſon of a gouty habit feels at the approach of a fit, returned to the exerciſe when I had intermitted it, and increaſed the meaſure when I had been uſing it, and by ſo doing for a good length of time together, have chaced the enemy away. There may be, and I dare ſay are, ſome caſes too obſtinate for this; where the ſeeds of the diſorder are too thickly ſown for the conſtitution to be cleared from them by theſe or any means, or at leaſt without much greater difficulty, eſpecially when the whole frame is much enervated. I have a friend who, after the moſt regular perſeverance for years together in the exerciſe, has not conquered the malady; his fits will return in ſpite of all; but he is reſtored to activity, after having the muſcles of his loins and the tendons of his lower extremities ſo contracted as to endanger his being a cripple for life; and all his ſufferings are ſo much abated, that I do not deſpair of ſeeing him at laſt enjoy the fruit of his ſteady perſeverance in a perfect recovery.

Whatever portions of the diſeaſe are got rid of by this courſe, they are completely thrown out of the habit; for hereby the humours peculiar to the diſeaſe are, like the circulation, puſhed from the center of the body to the ſurface, and being once excited to the ſkin are driven through its pores; hence none of the injurious conſequences produced by medicines taken to check the progreſs of this diſeaſe can follow. At leaſt I ſpeak for myſelf, that ſo far from having ever ſuffered the ſlighteſt inconvenience, I have always gained an acquiſition of health by this method of relief.

I conſider a fit of the gout to be a dreadful evil, though not an evil of equal magnitude with that of having the conſtitution overloaded by gouty particles and yet too weak to throw them off. But I believe no perſon who has been ſubject to the gout, even in its mildeſt and moſt regular form, can

doubt of its being ſo far prejudicial to his health, that he would have been better not to have had occaſion for relief by this effort of nature, and that it is never made without giving ſome ſhock to the conſtitution. I believe that moſt of thoſe who ſuffer much by this, which is vainly boaſted of as a cure for other diſeaſes, at laſt die martyrs to it: and yet it is frequently accompanied with ſo ſtrong a diſpoſition to inertion, that many of its ſufferers would rather alternately lie down under its torments, and during their intervals of eaſe wait its periodical returns in indolent or luxurious indulgences, than put themſelves to the mortification and trouble of an habitual daily courſe of temperance and exerciſe. But a ſudden effort or a temporary application of this remedy will not counteract a malady which, when it does not come by inheritance, is generally the purchaſe of intemperance. It muſt be perſevered in to be ſucceſsful.

You need not, in your diſſertation on this ſubject, prohibit the uſe of your exerciſe during the inflammatory fit, which it would certainly aggravate; for no perſon can then employ it. And in two violent attacks of rheumatiſm, both ſuppoſed to be accompanied with atonic gout, from the laſt of which I am now recovering, I found the diſeaſe much aggravated at its commencement, and in the progreſs of the inflammation, by reſorting to the uſe of your machinery. Its rage was increaſed by the ſlighteſt degree of motion during its advancement; but being once at its height, notwithſtanding the parts affected had ſuffered conſiderable injury, I found, that by firſt beginning very gently, and progreſſively increaſing the artificial exerciſe, I ſoon acquired the capacity of uſing my joints and limbs as before.

Where perſons have health, ſtrength, and leiſure for taking as much exerciſe by riding, walking, or in their occupations, as their conſtitutions require, there is no need of applying to this admirable ſubſtitute of yours. But the generality of the ſtudious and of thoſe of ſedentary employments muſt, I am ſure, reap unſpeakable benefit from the daily uſe of it. Some require more muſcular exertion than others to preſerve their health: I require a great deal; and therefore when deprived of the opportunity of taking it in any other way, I have uniformly derived the moſt ſalutary benefits from purſuing your directions; and having a cheſt of your portable machines,

which I keep in my dreſſing-room, I find that I uſe them moſt advantageouſly night and morning with my cloaths all looſe; I can by this mode without labour, at all times, acquire as ſtrong and univerſal a glow in about a quarter of an hour, as by three hours hard riding or by walking for a longer time; a circumſtance of no ſlight conſideration to the ſtudious, the ſedentary artiſt, and a variety of perſons occupied in mechanical employments.

I am, with real gratitude, and every good wiſh for your ſucceſs—

SIR,

Your very humble ſervant,

Powis Place,
20th November 1792.

JAMES WATSON.

CASE III.

From Col. ORCHARD, *M. P.*

SIR,

I CANNOT defer thanking you for the benefit I have received from your excellent method of treating gouty perſons who have been deprived of the uſe of their limbs.

I do with gratitude acknowledge that your muſcular exerciſe has reſtored health, and the action of the muſcles to myſelf and to many of my acquaintance.

If any perſons are deſirous of a more particular account, I ſhall be happy to be of any ſervice to them and to you. I am, wiſhing you every ſucceſs,

Your obedient humble ſervant,

Cheſterfield-ſtreet,
April 29, 1790.

PAUL ORCHARD.

CASE IV.

From Mr. SHEPPERSON, *No.* 137, *Oxford Road.*

SIR,

THE relief I derived, in a paralytic caſe, from your mode of treatment, by the means of your apparatus, induces me thus to acknowledge it, with a view that it may prove equally ſalutary to others in ſimilar complaints.

The numbneſs which pervaded over my left ſide and extremities is now removed, and warmth, with general circulation, is reſtored with the ſtrength of my extremities.

I am wiſhing you ſucceſs, becauſe your ſyſtem is rational, ſafe, and efficacious, and willing to ſatisfy, perſonally, any inquiries, ſhould my written teſtimonial be doubted.

I am, SIR,

Your obedient humble ſervant,

May 12, 1791.

JOHN SHEPPERSON.

CASE V.

Darſham, Suffolk, May 23, 1793.

SIR,

I HESITATE not one moment in paying juſt tribute to your very rational method of treating the limbs that have been debilitated, and the joints ſtiffened and contracted, by frequent attacks of the gout, and am myſelf a ſtrong inſtance of the utility of your muſcular motion, by which I am enabled to walk much further and with greater ſatisfaction than I have done for ſeveral years. My ankle joints, which were exceedingly ſtiff, are now become pliable, and the ſwellings, which almoſt conſtantly attended them, much ſubſided.

I am happy (for the benefit of thoſe laboring under the ſame complaint) to have an opportunity thus publicly to declare, that I think your ſyſtem founded on ſound reaſon, and am very well ſatisfied with the progreſs I have made ſince I have practiſed your muſcular action by means of your well-adapted apparatus.

I am, SIR,

Your moſt obedient humble ſervant,

Darſham Hall, near Yoxford, Suffolk,
April 12, 1793.

C. PURVIS.

CASE VI.

From A. YUELL, *Eſq. to Mr.* PUGH.

SIR,

ABOUT five years ago, when I applied to you, I was entirely diſabled from walking, even the length of a ſtreet, owing to a ſevere and uncommon pain affecting my limb from the right hip to the outward ankle.

After my friends had rendered every attention in their power, they adviſed me to give up farther trials, and remain inactive; yet the relief a gentleman of my acquaintance had derived from the uſe of your apparatus, induced me alſo to try its efficacy, which indeed had the deſired effect by enabling me, in the courſe of a few weeks, to walk eight miles at a time and take my uſual recreations.

I was at that time alſo troubled with gouty ſymptoms, of which I am entirely relieved, as will appear from a perſonal confirmation.

I am, SIR,

Your humble ſervant,

No. 25, New North Street,
Red Lion Square.
June 4, 1793.

A. YUELL.

CASE VII.

From Mr. DAY *to Mr.* PUGH.

SIR,

HAVING had, from an unknown cauſe, loſt the uſe of my left lower extremity upwards of two years, and in attempting to ride on horſeback was obliged, from the ſevere pain, to be helped off, and never attempted the horſe ſince the year 1790.

A gentleman of the faculty adviſed me to uſe embrocation, which, in ſome degree, afforded relief; notwithſtanding, the ſeat of the complaint being ſo deep in the back muſcles of the thigh, (as you expreſſed it) that walking the length of a ſtreet produced great pain.

I was perſuaded, by the recommendation of a gentleman of diſtinction, who had derived benefit from your aſſiſtance, to undergo your mode of treatment, which certainly has enabled me to ride on horſeback with pleaſure about ten miles at a time; and, for the ſake of ſuch perſons who may labour under ſimilar complaints, I am ready to ſatisfy them perſonally of the truth of this aſſertion.

I am, reſpectfully,

Your humble ſervant,

No. 95, Gracechurch Street.

T. DAY.

CASE VIII.

From J. DAVIES, *Eſq. to Mr.* PUGH.

SIR,

THE eſſential ſervice you have afforded me, by the means of your apparatus, leads me to give an impartial account of it.

About five years ago, as I was walking on Weſtminſter Bridge, the ſtones being ſlippery, I unfortunately fell on my left hip, the effect of which diſabled me from walking ever ſince.

I immediately applied to the late Mr. Wright, Surgeon, who, after many trials, bliſtered my hip for a conſiderable time, and, ſtrange as it may appear, ſaid, that if ever I ſhould recover the uſe of my limb, it would be by the means of putting the limb in motion; but not having deſcribed what motion or method, my limb, from the hip down, became gradually more contracted and waſted, that, in ſhort, I could only go few ſteps about the room, bearing on one leg, with the aſſiſtance of two ſticks, at the time I was recommended to apply to you; though I had been at Bath during two ſeaſons, and at the hot ſalt baths in Margate; neither of which rendered me the leaſt relief.

The hip at length became ſo painful and tender, and the limb numbed and waſted, that I could not bear the leaſt weight upon it; added to this, the viciſſitudes of a Weſt India climate during thirty-two years (having left Devon my native country at an early period) had greatly debilitated me, prior to the fall, and your mode of treatment has not only reſtored warmth and comfort to my limb, but alſo aided greatly to the recovery of my general health and ſpirits, by promoting, without fatigue, a full circulation, and thereby leſſening the quantity of bile, which was alſo become troubleſome.

Since, at my time of life your ſyſtem proves to be efficacious, I would earneſtly recommend others in ſimilar complaints to loſe no time in applying for your aſſiſtance.

I am now enabled to walk near a mile at a time without aſſiſtance, and my knee, which was ſo much contracted, is as flexible and ſtraight as the other; for which uncommon relief I think you well deſerving public notice, and the grateful and juſt acknowledgement of,

SIR, your ſincere humble ſervant,

JOHN DAVIES.

Pentonville, Iſlington,
No. 2, York Place.

CASE IX.

From J. P. HARRIS, *Eſq. to Mr.* PUGH.

SIR,

HAVING been informed, that you intend ſhortly to make public your Syſtem, or mode of treating thoſe afflicted with that painful diſorder the Gout, I take this the firſt opportunity of declaring my approbation of the ſame, and to aſſure you, that though at the time I was under your care, (which is now two years ſince) I was unable to take much exerciſe, yet, from the little I then took, I flatter myſelf I ſtill feel the good effects of it, as my health is much amended, and the diſorder is leſs violent, nor are the attacks ſo frequent as they were wont to be; you are at liberty to make what uſe you pleaſe of theſe my ſentiments, and I truſt you will have the ſame permiſſion from gentlemen of the firſt reſpectability, who, (from my own knowledge) have received much benefit from your mode of treatment, I beg you will add my name to thoſe of your other ſubſcribers. Wiſhing you ſucceſs,

I am, SIR,

Your obedient ſervant,

Baghurſt, 18th July 1793,
Baſingſtoke, Hants.

JN° POTTER HARRIS.

CASE X.

A LADY who has permitted the author to refer to her, had, from a ſuppoſed nervous affection, entirely loſt the power of her fore arm and hand, which at length became ſo relaxed and waſted, that her friends doubted of her ever recovering the uſe of them.

In this unhappy ſituation, ſhe was adviſed to try the efficacy of the apparatus, with which accordingly ſhe daily exerciſed the arm during ſix weeks,

and in the courſe of that time it recovered its fleſhy appearance, ſize, and ſtrength, notwithſtanding every other application had proved uſeleſs.

Several other ladies have alſo derived benefit in decayed and contracted extremities; and children with protuberant and weak limbs have been likewiſe relieved. The parties and parents have authoriſed a reference to be made to themſelves in ſome of theſe caſes.

CASE XI.

Copy of a Letter to Mr. PUGH, *from a diſtinguiſhed perſonage recommended as a Patient by Mr. Woodmaſon of Leadenhall-ſtreet, to whom the Reader is referred for a more particular account.*

SIR,

AS expected, I was detained in the city too late to return, and I was obliged to leave London the next day, without having it in my power to call upon you to thank you for your advice, of which I already feel the good effects,* and for your inſtructions, which you may rely upon being implicitly attended to.

I ſhall not fail to mention, whenever I think it may contribute to your advantage, the opinion I entertain of the uſe of your apparatus, and alſo of that which may be derived from your mode of treatment.

I hope I ſhall be enabled on my return to town to give you, in perſon, an additional proof of the efficacy of the principles of the mode of muſcular motion which you have eſtabliſhed, and remain till then,

July, 1793. Your obedient humble ſervant.

* This Caſe was a Diſtention of the *Tendo Achillis*, with ſwelling and tenderneſs in the ſoles of the feet.

CASE XII.

From R. OLIVER, *Esq. to Mr.* PUGH.

SIR,

I WAS abſent from Layton when your letter arrived, otherwiſe ſhould have anſwered it ſooner.—It is impoſſible that I ſhould have the leaſt objection in your making mention of my name in recommendation of your ſyſtem of Muſcular Action, as I am confident, from experience, that in many caſes it will prove moſt beneficial.

I am your obedient,

RICHARD OLIVER.

Layton Stone, Eſſex,
26 July, 1793.

CASE XIII.

From R. CAPPER, *Esq. to Mr.* PUGH.

SIR,

AS I know you intend, for the benefit of ſociety in general, to publiſh your method of treatment of perſons who have the misfortune to be affected in the uſe of their limbs, either by gout or rheumatic diſorders, I think I ought, in juſtice to you, to declare, which I can with great truth, how much benefit I have received from your attendance and inſtructions to me under this diſorder.

I was, in December 1791, attacked by a paralytic diſorder, by which I loſt the uſe of my right ſide; when I recovered a little, I was adviſed to take a journey by way of exerciſe: I ſet out accordingly, and travelled by the ſea coaſt. I did not return till November 1792, and at that time, though I had received great benefit in my health, found very little alteration

in my limbs till I applied to you, when, I can with great pleaſure ſay, that by your attendance and inſtructions, I can now, with very little aſſiſtance, walk about the room, and uſe my arm perfectly well as to feeding myſelf, and even writing in ſome degree, though before my hand and arm were totally uſeleſs; and I have no doubt, by ſtill purſuing your method, I ſhall recover in time entirely from the effects of the paralytic diſorder.—I am, with many thanks and good wiſhes for your ſucceſs in the plan you have eſtabliſhed.

Your obliged and obedient humble ſervant,

Lincoln's Inn,
Sept. 25, 1793.

RICH$^{D.}$ CAPPER.

P. S. You are at liberty to publiſh this, if you think proper; and I ſhall be ready at all times to give any information, at your requeſt, to any body labouring under the ſame diſorder.

CASE XIII.

From E. BARNETT, *Eſq. to Mr.* PUGH.

SIR,

THE very uncommon relief you have already afforded a ſon of mine five years of age, induces me with pleaſure thus publicly to declare it, as being of eſſential importance to ſociety, particularly to thoſe parents whoſe children may, from contraction or relaxation, have loſt the uſe of their limbs.

A ſuccinct account of this very uncommon caſe is as follows: The outward bones of the child's right foot had been ſo much out ever ſince he was a year old, that the articulation of the ankle and foot ſeemed to have no connection with each other; for on lifting up the leg the foot dropped down, and turned inwards, as if from debility it had been withered——

his left hip alſo was very protuberant, and from the hip down to the toe much waſted.

The right foot above deſcribed is now perfectly ſtraight, the ankle joint re-placed, and the foot altogether ſtrengthened; upon the whole, the child is materially better ſince the three months you have had him under your care; and I have reaſon to hope, from your tender and judicious treatment, to ſee him, ere long, enjoy general ſtrength.

I am, SIR,

Your obedient ſervant,

No. 10, Henrietta Street, Covent Garden,
Nov. 1ſt, 1793.

E. BARNETT

P. S. Prior to my applying to you I had been recommended to cramp his legs with *irons* and *ſtraps*, which, from this compreſſure, proved not only uſeleſs, but highly *dangerous*, I was glad to find you made no uſe of ſuch confined remedies.

CASE XIV.

From Mr. GRIFFITHS, *Wine Merchant, to Mr.* PUGH.

SIR,

WITH gratitude I ſend you an account of the relief I derived (in a very uncommon caſe) by your mode of treating thoſe perſons who have loſt the power of their limbs; I cannot heſitate in aſſerting it, as it may be the means of informing other perſons who may labour under ſimilar pain.

About a year ago I felt a very unpleaſant ſenſation from my great toe up to the front of my thigh, which, I ſuppoſed, had ariſen from cold; the pain gradually increaſed, and in the courſe of ſix months I was actually

unable to walk even a quarter of a mile, for the more I attempted to move, the more I ſuffered. I had tried opodeldoc, and ſeveral other things, and ſtill ſuffered a perpetual gnawing pain, which did not abate till I fortunately applied to you.

I am now enabled to walk ſeveral miles, and my limb is perfectly free from the diſtreſſing pain which I laboured under.

I am, SIR, with due reſpect,

Your very humble ſervant,

October 9th, 1793,
No. 4, Fore Street, Canterbury Palace.

JAMES GRIFFITHS.

P. S. For the farther authenticity of this Caſe, Mr. BLAND, of the Bath Hotel, Piccadilly, has alſo given leave to be referred to.

CASE XV.

From Mr. BROOKS, *late of Great Queen Street, Lincoln's Inn Fields, Paper Stainer, to Mr.* PUGH.

SIR,

ABOUT ſix years ago, then advanced to the age of ſixty-nine, I laboured under a fit of rheumatiſm, which produced ſevere pain and ſtubborn contraction in my right knee, and at length obliged me to be carried by two of my ſervants from one room into another at the time I applied to you.

By the uſe of your apparatus and ſafe mode of treatment the ſeverity of the pain was much alleviated in a few days; and in the courſe of two months regular application, only one hour a day, my knee became ſo flexible and ſtrong, that I was enabled to walk from Hammerſmith to my houſe in London, and have ever ſince enjoyed the uſe of my limbs, and even at this time walk ſeveral miles daily.

I am, SIR, reſpectfully,

Your obliged and obedient ſervant,

Nov. 18, 1793,
Morden College, Blackheath.

JOHN BROOKS.

CASE XVI.

A GENTLEMAN who had laboured for ſeveral months under a lumbago, has permitted the author to refer to him perſons of reſpectability who wiſh to be informed of the eſſential benefit he derived from the uſe of the apparatus, notwithſtanding he had been obliged to apply a plaiſter acroſs the loins for a conſiderable time, but to no purpoſe, as it prevented the neceſſary action of the lumbar muſcles.

Prior to his commencing the exerciſe it was thought prudent to take away the plaiſter, in order to reſtore the flexibility and wonted action of thoſe muſcles affected.

The gentleman's own perſonal authority may perhaps be more ſatisfactory; therefore any doubtful perſon deſirous of this, will, on applying

to the author, have a card directed to the Gentleman in town, who, ſince the year 1790, has remained without a relapſe, merely by regularly attending to the eaſy rules pointed out to him.

CASE XVII.

From Lieut. Col. DAWSON, *Chelſea College, to Mr.* PUGH.

SIR,

HAVING derived more benefit from your mode of treatment than from any other, I with pleaſure permit you to inſert an account of it, as it may be uſeful to thoſe perſons, who like myſelf advanced in years, labour under the gout.

I candidly own, when I applied for your aſſiſtance I could not ſtand alone with ſafety, being obliged to have my ſervant on one ſide and a ſtick in the other hand, and was alſo carried from room to room, and into a carriage.

It is with pleaſure I announce that I am enabled to walk about the houſe and into the carriage, and go up ſtairs without any other aſſiſtance ſave a ſtick.

The ſafety and conveniency of your plan, is a ſufficient inducement to all debilitated and aged perſons to try its efficacy.

I am, SIR,

Your obedient ſervant,

THOMAS DAWSON.

Dec. 28, 1793.

CASE XVIII.

From Mrs. PALMER, *Pall Mall, to Mr.* PUGH.

SIR,

IT is with much pleaſure I can ſay, that I think my daughter has derived conſiderable benefit from your judicious mode of treatment.—The contraction is by no means ſo great as when I firſt applied to you, and ſhe has alſo acquired a great addition of ſtrength. I am ſo perſuaded of the efficacy of your ſyſtem, that I believe had I had the good fortune to meet with you at an earlier period of her complaint, and before time had ſo fixed the contraction as to preclude the expectation of its being overcome, ſhe might have been entirely recovered.

I am,

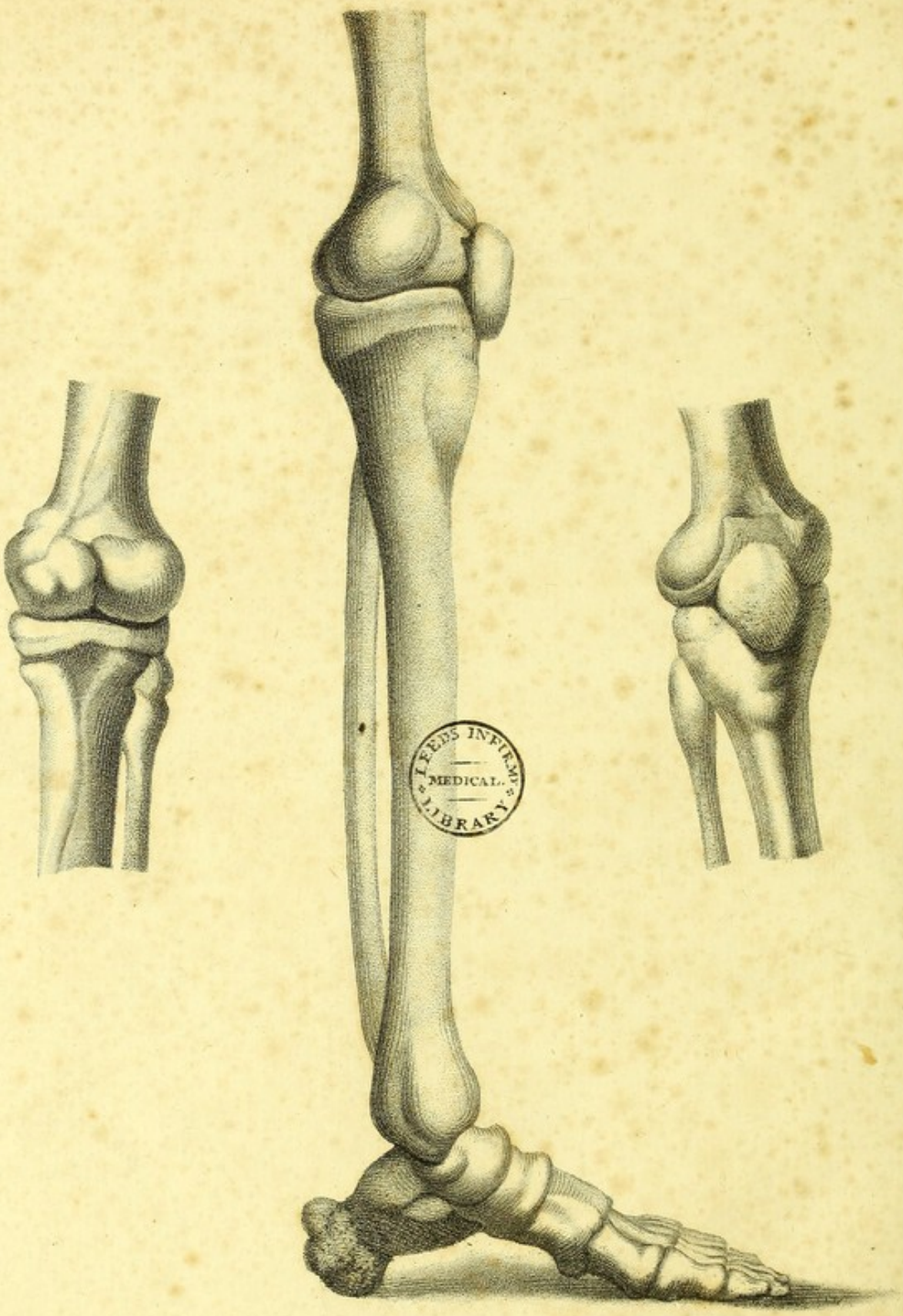
With much eſteem,

Your very humble ſervant,

M. PALMER.

Feb. 13, 1794.

CON-



Drawn & Engraved by Kirk

Plate. XV.

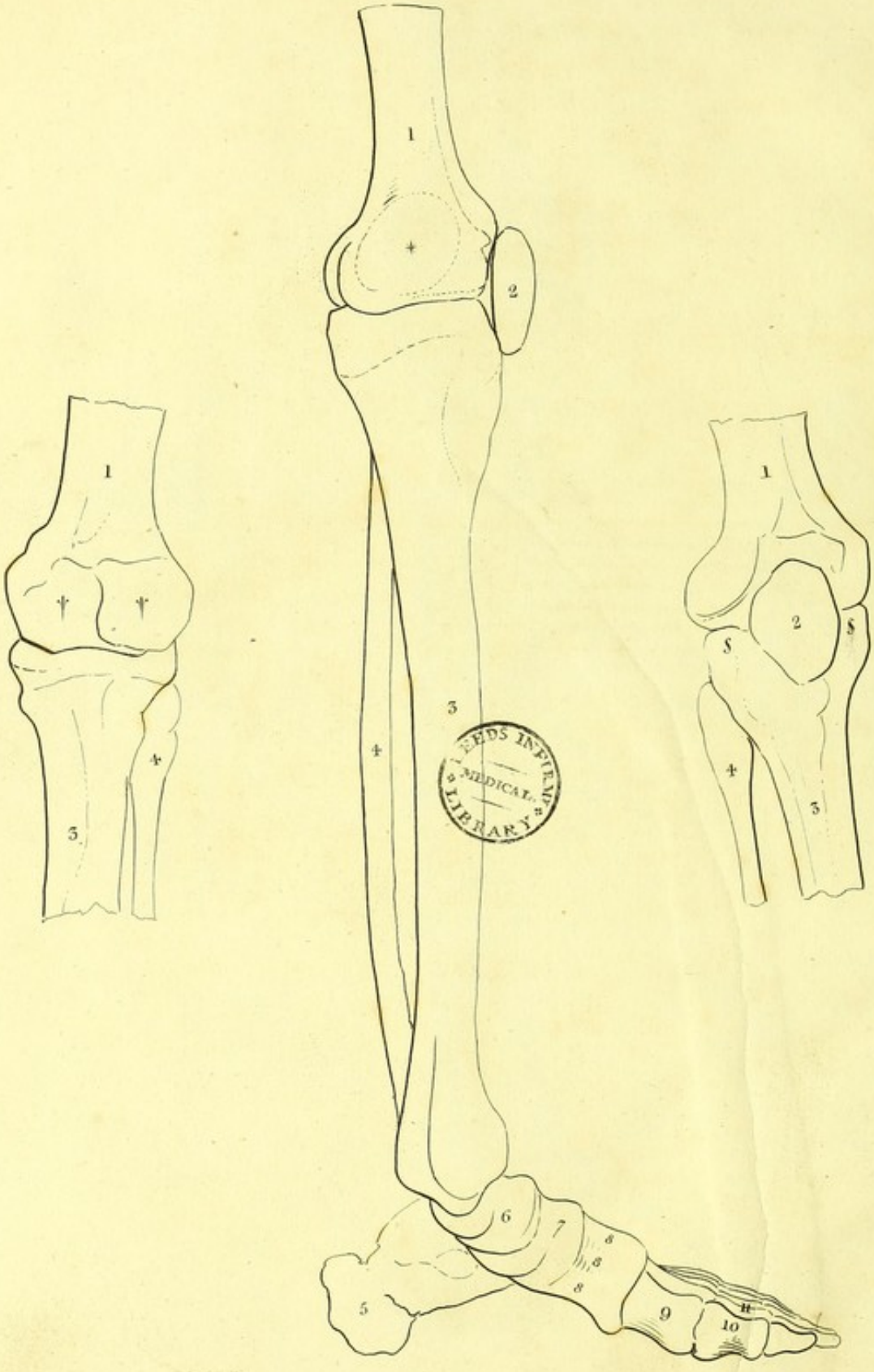


PLATE XV.

Hind View of the JOINT *of the Knee.*

1. Os femoris.
*. Condyles of the thigh-bone.
3. Tibia.

Inſide View of the JOINT *of the Knee, Patella, Bones of the Leg and Foot.*

1. Side view of the os femoris.
*. ——————— condyle.
2. ——————— patella.
3. ——————— tibia.
4. ——————— fibula.
5. ——————— os calcis.
6. Aſtragalus.
7. Os cuboides.
8. 8. 8. Oſſa cuniformæ.
9. Os naviculare.
10. The firſt metatarſal bone of the great toe.
11. Phalanges of the toes.

Front View of the JOINT *of the Knee and Patella.*

1. Os femoris.
2. — patella.
3. — tibia.
4. — fibula.
5. 5. — condyles of the tibia.

THE uſe of the bones in general reſpecting the body, are what a wooden frame is in reſpect to the whole building; give ſtrength and poſture to the body by means of their different conformations;—bones not only impart ſtrength and power but in ſome degree ſhape alſo and grace to the whole human frame: and by reaſon of their hardneſs and ſtability, and of the manner in which they are framed together, are the foundation and ſupport of the ſuperſtructure of all the other component parts of the body; they defend the ſofter parts, and ſuſtain the whole.

Some of the bones are hard and brittle, others more ſoft and ſpongeous: they are all compacted of thin plates, and of thread-like ſubſtances called fibres, faſtened one to another by very ſmall filaments.

The bones are covered immediately on the outſide with an exquiſitely ſenſible membrance, nervous and vaſcular, called the *perioſteum*, impregnated with by more or leſs moiſture, partly oily and partly bloody, called marrow, contained in certain very ſmall cavities denominated cells.

For a fuller and more curious deſcription of bones and their articulation—ſee WINSLOW. Vol. 1. p. 17 and 41.

CONCLUSION.

TO ſum up the whole; the author muſt conclude as he ſet out, by entreating the candor of his readers to interpret in the moſt favourable manner his endeavours to explain his ſyſtem of muſcular action. He cannot but lament his incapacity to embelliſh his obſervations by elegance of ſtile; his fear is that of having often offended by the want of it, and ſometimes even by defect of correctneſs: but his aim throughout has been ſo to expreſs his own ſenſe of the matter he was attempting to explain, that his readers might be enabled, impartially, to judge for themſelves how far the means ſuggeſted by him, for the preſervation or reſtoration of general health and for the alleviation or cure of local complaints, by the general or partial application and uſe of artificial muſcular action upon a ſyſtematic plan, are competent with perſeverance to effectuate the ends propoſed, or to invigorate the natural powers of the human animal œconomy.

" Muſcular Action has very much tortured the brains of many philoſophers, and *hitherto* no inſtance can be found,

either in natural effects, or in thoſe of art, by which we can regulate and determine, to a given degree, the ſpace, velocity, and duration, of any artificial motion.

" Till ſome ſuch LUCKY DISCOVERY is made, the utility of muſcular action will be but a mere *hypotheſis*.—To underſtand the uſes and contrivance of each muſcle in particular, we muſt conſider its ſituation, direction, lateral connexion, relation and compoſition of its parts: we ought likewiſe to examine, how the neighbouring muſcles are diſpoſed for producing ſimple motions, and how thoſe that are at a greater diſtance, can produce combined or compound motions."

WINSLOW, vol. i. p. 160.

To have made the beginning of reducing the hypotheſis to a ſyſtem, illuſtrated by the demonſtration reſulting from practical proofs, is the whole that he pretends to; and if he has had the good fortune in any effectual degree to unite theory and practice, in bringing forward to the public notice this " lucky diſcovery," he flatters himſelf that by having dignified it with the name of a ſcience, will not juſtly expoſe him to cenſure.—All he means by having adopted that term, that he has taken more pains, and laboured harder to bring it into a more regular, perfect and ſyſtematic form than any other during *two thouſand years*, or ſince Hippocrates; for no one hitherto has pointed out the various applications requiſite to relieve local complaints, however

often the repetition of the words " uſe exerciſe"—in anſwer to this it might be ſaid uſe medicine;—but medicine as well as exerciſe, uſed without judgment or indiſcriminately, is more likely to do harm than good.—Indeed we have no inſtance in the annals of the healing art, where the action of the human muſcles has been illuſtrated, though general recreative exerciſe (obviouſly inadequate to remove the effect of diſeaſes) has been ſo ſtrongly recommended: for it requires the power of the limbs even to perform the trivial amuſement of " a game at ſhuttle-cock," recommended by CHEYNE.—Upon the whole it clearly appears, that the principles of ſcientific muſcular action adapted to diſabled patients, have " hitherto" been found wanting.

If we are ſtruck with the productions of genius, in which the artiſt captivates us by an imitation of nature, and teaches the canvas or the marble to repreſent life, with what ſatisfaction ought we to behold the corporeal faculties actually regained or reſtored to their wonted powers, or the wheels of life, nearly motionleſs, again ſet into action.

However well engraved the tables of Albinus, taken from dead ſubjects or preparations, (the original plates of which have ſold for 30 guineas and upwards) they do not ſerve to explain the requiſite action of the joints and muſcles, in their diſtinct, united and relative motions, according to the plan and end propoſed in the ſyſtem now for the firſt time ſubmitted to the public, ſo effectually as the repreſentations

to be contained in the plates of this work, which, with great diligence have been drawn from dead and living ſubjects under the immediate and attentive inſpection of the author.

There is in fact, upon compariſon of them with thoſe above-mentioned and the drawings of other ſkilful anatomiſts, as much difference in the repreſentation of a dead and living muſcle, as between the appearance of a dead body and a man alive and active; and that appearance of life, action, extenſion and relaxation, is preſerved in theſe figures, highly worthy the attention of ſtudents in drawing, painting, ſculpture and anatomy.

The debilitated, arthritic, and ſedentary, will alſo have an opportunity to determine for themſelves reſpecting the rational principles whereupon relief is offered.

FINIS.