

Automatic mechanism : as applied in the construction of artificial limbs, in cases of amputation / by Frederick Gray. -- With upwards of one hundred illustrative cases and correspondence ; Dedicated to Sir Benjamin C. Brodie.

Contributors

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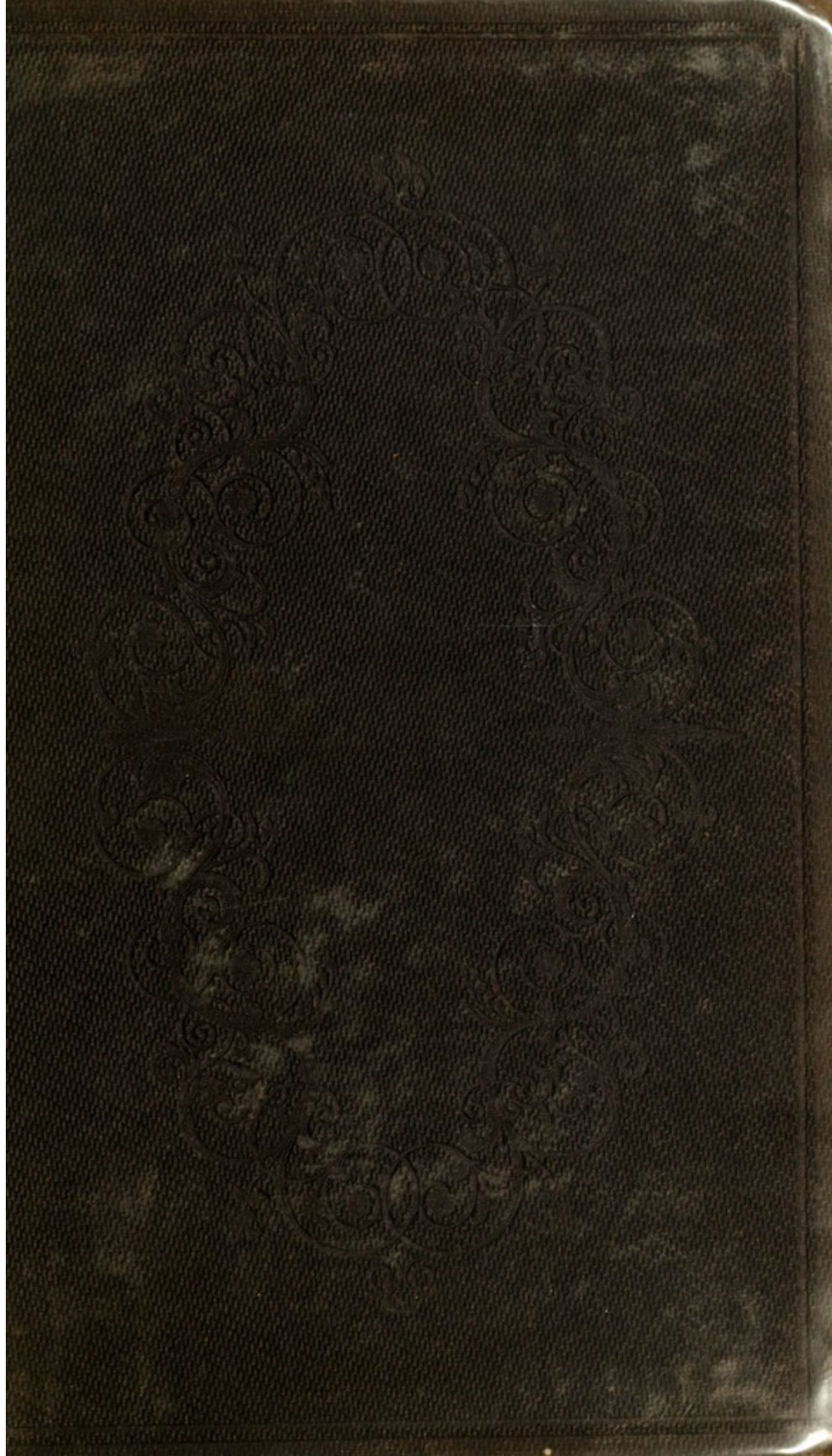
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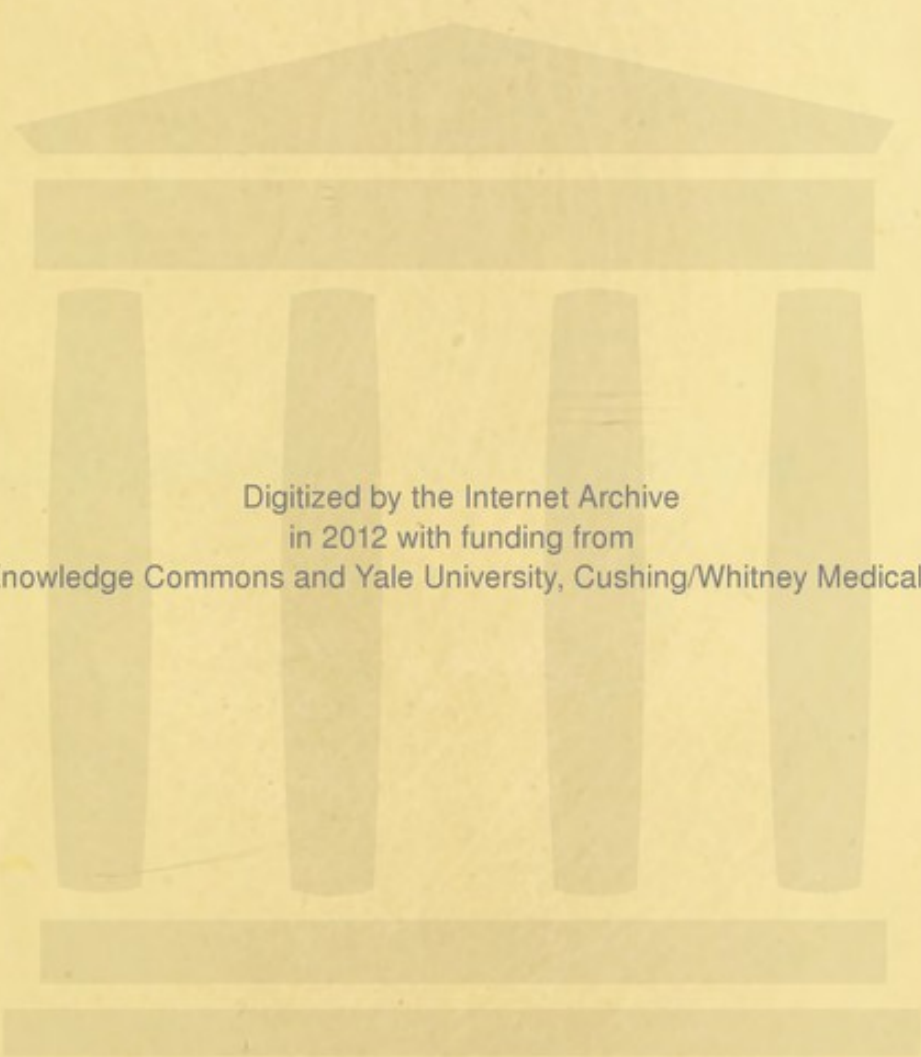


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AUTOMATIC MECHANISM,



AS APPLIED IN THE CONSTRUCTION OF

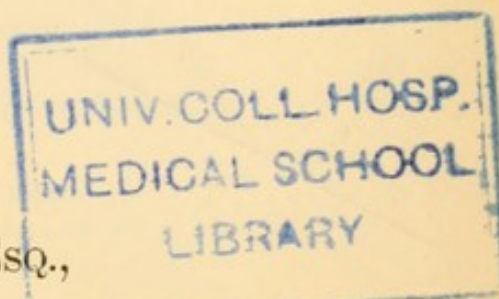
ARTIFICIAL LIMBS,

IN CASES OF AMPUTATION.

BY

FREDERICK GRAY, Esq.,

CONSTRUCTOR OF THE ANGLESEY ARTIFICIAL LIMB, AND OPERATOR
TO THE LATE MARQUIS.



WITH UPWARDS OF

One Hundred Illustrative Cases and Correspondence.

"Miseris succurrere disco."



DEDICATED TO

SIR BENJAMIN C. BRODIE, BART., F.R.S., &c. &c.

LONDON:

H. RENSHAW, 356, STRAND:

SIMPKIN, MARSHALL, AND CO., STATIONERS' HALL COURT:

HODGES AND SMITH, DUBLIN.

1855.



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NOTICE.

The Author of this work reserves to himself the privilege of translation, and an edition in French is in preparation.

TO

SIR BENJAMIN C. BRODIE, BART., F.R.S.,

SERJEANT-SURGEON TO THE QUEEN ;

SURGEON TO HIS ROYAL HIGHNESS PRINCE ALBERT ;

FELLOW OF THE ROYAL COLLEGE OF SURGEONS OF ENGLAND, ETC.

DEAR SIR,

I VERY gladly avail myself of the permission you have so readily accorded me, to inscribe the following pages to you.

To a name so illustrious, and a reputation so acknowledged, any tribute of admiration must be worthless, and may be indifferent ; but to myself it must always remain a proud distinction that I have been enabled to connect with the narration of my labours, so able a judge of their merits ; and that whatever I may have done in the service of suffering humanity, has been recognized by the Surgical

Profession in the person of its most eminent member.

In addition to thanking you for what I cannot but esteem a great favour, I take this opportunity of expressing my obligation for the confidence which has induced you to entrust so many cases to my care, and for numerous acts of courtesy and kindness which must always make me,

Dear Sir,

Your very much obliged

And faithful Servant,

FREDERICK GRAY.

7, CORK STREET, BURLINGTON GARDENS,

October 26, 1855.

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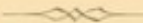
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Page 110.	Case 1, for "Hume," read "Home."
„ 123,	14, for "Heyes," read "Hey."
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PREFATORY NOTICE.



NOTWITHSTANDING so many curious pieces of mechanism have from time to time been contrived, and although some of the most curious of these date their invention many years back, yet it is something strange that hitherto, with the exception of the application of mechanism to the artificial limbs, which I take the merit of having brought to their present perfection, and with the exception of some very trifling application of mechanical power to things of the same class, nothing worthy of a mention has been done for the benefit of the public.

In numerous applications of the powers and principles of mechanism, hints have been given, which, had they been acted upon, might have removed a great amount of misery, and have afforded to human suffering such an

extent of alleviation as would scarcely be credited by those who are not conversant with the subject to which I am about to call the public attention.

We have seen the faculties of the most ingenious mechanics employed, I will not say uselessly, but at least unprofitably, in the construction of automats, and in providing automatic action by means of insensible agents, or in insensible substances, which have served little other purpose than to excite surprise and create amusement; but with the exception of the adaptation of such skill and ingenuity to clocks and watches, and some few other similar instruments, the utility of these efforts has been but problematic, and mankind have derived but little real benefit from such labours.

It is true that fanciful experiments have not unfrequently conduced to the most material benefits, and that many valuable discoveries, which by the aid of study have been so modified as to apply to the beneficial purposes of life, have originated rather in the pursuit of amusement than the researches of science. No more striking evidence of this assertion can be found

than in the mechanical recreations of the celebrated Vaucanson.

When in his childhood, he was shut into his room, and having gazed upon a pendulum with much attention, he conceived the mechanism by which its oscillation was produced. Thence, he constructed various small machines, in all of which were manifested the strongest proofs of ingenuity. He first produced the automaton flute-player, in the arrangement of which, by a method of inflation, simple, but eminently ingenious, the fingers of the figure modulated with precision, and executed ten perfectly harmonious airs.

In 1738, Vaucanson went to Paris, and gratified the public curiosity by publishing a memoir on the flute-player. This memoir was eulogised by the Academy of Sciences. Now, had this been the exposition of a theory, or the project of an automaton to be perfected, but not yet constructed, instead of what it really was, the exposition of a work of art already thoroughly complete, it would certainly have been received as a chimerical delusion.

I may with equal justice claim for my "memoir" that it treats, not of what I intend to

perform, but of what I have already accomplished; and, although I have not the vanity to compare my mechanical labours with those of the celebrated man just mentioned, I am entitled to say, that the service my invention has rendered to the world is not wholly undeserving of thanks.

Vaucanson's subsequent exercise of his ingenuity and skill in the construction of an automaton duck, and of a tambourine-player, is so well known that it is not needful to describe it here. He soon turned his thoughts from expending themselves on trifles, to objects of public good, which simplified and saved the labour of the manufacturers, and he devised an apparatus by means of which a single child could make the finest tissues of the day.

I regret that his inventions in this utilitarian branch of mechanical skill, were not adequately esteemed by those who were benefited by his talents; and I am happy to say that, in that respect, my labours have been more successful than his. My exertions have been duly appreciated, and it is my boast to affirm that hundreds of persons are at this moment by my means in a state of comparative com-

fort, and enjoying from my substitutes for amputated limbs an alleviation from pain and misery which, till within a very few years, would have been considered as extending beyond the range of hope, or even that of possibility.

In 1740, Vaucanson received an invitation from the enlightened King of Prussia to visit his dominions; and I may here perhaps add, that I have been honoured by a similar distinction from the same kingdom, of which I may avail myself when a fitting opportunity arrives.

When we see what great triumphs investigation governed by perseverance has achieved, to what fortunate results the simplest accidents of fanciful experiments have led, it is not presumptuous to hope that the felicity of future genius, guided by the rules of gradual progression and analysis, may yet discover causes and effects that have hitherto baffled the attempts of manifold research, and that the phenomena and anomalies now existing may be eventually reduced to lucid theorems, supported by the authority of facts.

I have already said that I have been so for-

tunate as to derive more satisfaction from the appreciation of my labours in the service of suffering humanity, than Vaucanson ever received from the application of his extraordinary talents and knowledge of mechanism to the demands of luxury in the fabrication of silks, &c. In this appreciation I must accord the first place to those best competent to judge, (the Medical Professors,) from whom I have received the most flattering testimonials of their estimate of what I have accomplished, in addition to the active support of nearly all our eminent Surgeons and Anatomists; and I very gladly avail myself of this opportunity to express my thanks and sense of obligation to them generally.

AUTOMATIC MECHANISM.

CHAPTER I.

IN submitting the contents of the following pages to the public, I may be allowed to say, that my principal inducement has been the alleviation, as far as the means which my experience can afford, of the sufferings to which so many of our fellow-creatures are subjected by loss of limbs; sufferings not ameliorated by the inadequate methods which in the great majority of cases are employed for their relief. I have attempted to place before the reader, in language as exempt from the technicalities of science as the nature of the subject will permit, the results of long practice and close application; I have drawn the attention of my readers to the manner in which my ideas have been carried out, with what beneficial effects they

have been attended ; and whilst I have scrupulously avoided passing any opinion upon the inventions or the modes of affording relief introduced or made use of by other people, I have, by the descriptions of various cases and by the inductions to be made from them, insisted on the efficacy of my own practice and the importance of my own inventions.

To assert that, in thus giving publicity to my labours and to the success of my practice, I have no view whatsoever to my own interests, would be merely a piece of impertinence, an affectation of disinterestedness which would neither be consistent with veracity nor with my professional claims. I have little doubt as to the just appreciation of my talents ; and, like other men who depend on the judgment of the public, I am quite content to be estimated according to my deserts.

The present is not a time for any man to remain silent in the declaration of what he has learnt, if he considers himself likely to be of service to his fellow-men by his practical experience ; the terrible but inevitable calamities attending war have rendered the aids which science can afford to the suffering, more necessary than

ever; and it has become the imperative duty of every one who has the power to furnish those aids, to come forward and state the scope and extent of his discoveries, and their results.

The subject for which I claim the attention of my readers is of much more importance than on a first view it may be supposed. The rude and almost inartificial means which have been adopted to supply the loss of natural limbs by the substitution of artificial ones, have failed to afford that relief which the sufferers have required, or at all events have stopped very far short of what a better system can afford. The construction of artificial limbs is an art which has made little progress; those principles, which can only be arrived at by investigation and practical acquaintance with anatomy, have not been consulted in the construction of the apparatus for relief; and, in many instances, instead of relief being afforded, an increase of pain and agony has been the result; disappointment and despair have ensued; and the sufferer has been reduced by mental and physical instability to the last stage of depression and misery.

It is to the amendment of a defective system as regards such sufferings, that I submit my opinions and the statements which corroborate their accuracy. The subject derives an additional importance from the fact of the (almost universal) mode of amputation at present practised by surgeons, and from the circumstance that surgeons, as well as patients, know but little of the peculiar requirements necessary to secure comfort in the formation of the substitute for the amputated limbs.

Let me not be misunderstood in my allusion to the ignorance of operators generally in these cases ; I mean no disrespect to those gentlemen, than whom no professional men are in their respective avocations more learned, more zealous, more attentive, or more entitled to respect and consideration. I have the good fortune to be acquainted with many of them, and I can testify to the assistance which in my professional pursuits they have always been forward to give me, and to the attention which they have invariably paid to the suggestions I have offered in connection with amputations, and with the adaptation of artificial limbs to the peculiarities of the case.

But it must be borne in mind that amputation having been performed, the work of the operator is over; that it is rarely considered within his province to attend to the construction of the artificial substitute, and that from this time the services of those of my profession must commence.

I shall have an opportunity by-and-by of saying more on this part of my subject; I will in this place, however, explain in part to what I allude.

Many of our best operators, from want of directing their thoughts to the subject, have a very limited knowledge of the manner in which the pressure of the weight of the patient, who has undergone the amputation of a leg, can be best sustained so as to give the least inconvenience or pain to the stump. They do not know what part or parts of the stump can best support the weight which originally rested upon the limb cut off. This is proved by the advice which many eminent writers on surgery have given, that the pressure should be borne on the end of the stump.

Now it has frequently happened that from this advice having been followed, great injury

has been done to the point of the bone of the stump, and a second operation, or amputation, been rendered necessary.

It was by the suggestion of a man eminent in his profession, Mr. Stanley, of Bartholomew's Hospital, that I was originally induced to publish these notices of my professional experience. I met that gentleman at a consultation, for the purpose of determining what kind of artificial limb would be most efficaciously made use of in the case of a young lady, a patient of his, the daughter of a medical gentleman in great practice in town.

After a good deal of discussion, and many questions put to me as to the kind of stumps I found most effective in the use of the artificial limb, and other questions more immediately relative to the case then under consideration,—for example, whether I found the circular, or the flap operation, in amputations, most easy to fit, and most adapted to my invention, and which sort of stump I found from my experience to be most serviceable to the patient,—I was called upon to state the reasons for my choice.

I gave them at great length, and I stated

my opinion to be (an opinion which I still retain), that for amputations above the knee I preferred the flap operation to the circular, and that for amputations below the upper third beneath the knee, I preferred, in some instances, the circular to the flap operation. I also gave my reasons why I considered a long stump preferable to a short one, and, according to my experience, a *good* stump *above* the knee was to be preferred to a *bad* one below it. It was very satisfactory to me on that occasion to find that my opinions, and the evidence and argument which I used in their support, were listened to with great attention, and that they convinced my auditors that I had taken a right view of the subject. Mr. Stanley, at the close of the consultation, had the candour to acknowledge that I had called his attention to what he had until then but little regarded, and that he had obtained from the conversation, and from my remarks, more knowledge about stumps than he had ever acquired before:—that he should in future operations avail himself of his newly-acquired ideas, and make use of the hints he had just received. “Why don’t you publish the information you have just given

me?" said Mr. Stanley. I now lay it before the public, and I trust, without assuming an arrogance of superior intelligence over other persons, I have done what will be of service to the medical profession and to the general community.

Since that conference took place, I have had consultations and conversations with other eminent surgeons on the same subjects, and I have been gratified in seeing that my advice has been acted upon to the great advantage and relief of patients.

I make mention of these facts more particularly, and I take the opportunity of stating them the more emphatically, because, if not attended to, the sufferings of those upon whom operations are performed will be prolonged and multiplied in a manner most painful to witness or describe; and because by attending to them the greatest amount of relief that art can furnish may be obtained.

Nothing is more common than to witness the regret of the operator, and to hear him express his sorrow when he finds, upon inquiry, that he has left a bad stump; whereas, if he had been aware what was required for future progression,

he could have left a good one ; and it is an every day occurrence to hear the want of information on this subject acknowledged and regretted by the most eminent professional men. I have been applied to repeatedly for advice ; and the first operating surgeons, both of this country and of the Continent, have done me the honour to listen to the results of my experience, and, let me add, have been candid enough to confess the advantage they have derived from having done so.

There exists, then, a demand for information which I consider myself qualified to afford, and I trust that I shall not only be acquitted of presumption in the publication of this treatise, but that it will be considered by the surgical profession an imperative duty on me to make public the knowledge which I have obtained by a long experience and sedulous attention to the subject ; and that, as I state nothing but what I have acquired by incessant practice and laborious investigation, these suggestions cannot fail to mitigate the sufferings of humanity.

I will take this opportunity of alluding to the kindness I experienced from a man whose great skill as an operator has diffused his reputation

over every part of the civilized world, and to acknowledge the additional insight I obtained into my own profession, from the suggestions which from time to time during my intercourse with him he was in the habit of making,—I mean the late Mr. Liston, to whom I was introduced by the Marquis of Anglesey.

I was concerned with this eminent surgeon in very numerous cases of amputation; indeed there is scarcely a variety of operation for the amputation of limbs, in which he did not apply to me to afford such relief for their loss as my invention could afford; and I may add, he was so convinced of the efficacy of my artificial substitutes, that he expressed his satisfaction in terms which I only abstain from repeating lest they might appear too laudatory.

He fully concurred with me in estimating the very great attention that is necessary for the adaptation of my invention to each particular case; the evil which would result from the indiscriminate use of one form of substitute for every amputated limb.

The original idea from which my invention is derived, and which I take the liberty of saying I have expanded to its present serviceability

for every variety of amputation, was conceived by the late Mr. Potts, whose fortune and ingenuity were brought into operation in his own case, he having unfortunately for himself, but as it eventually proved, fortunately for others, lost a leg. Mr. Potts was a natural genius in the invention of things connected with mechanical science. He was precisely the sort of man by whom improvements in those things which are of daily use were to be thought of and carried out. His claims to the thanks of the community for many valuable inventions have been allowed, and he may with justice be acknowledged as a public benefactor. Among other designs, we are indebted to this gentleman for many improvements in the structure and lines of ships, which have been adopted in our dockyards. He built and sailed a yacht, which in his day was one of the fastest and most commodious craft of its size and tonnage; and I have in my possession models and drawings of these improvements, and of others connected with mechanics, which show how completely he was a master of his art.

I give, then, due honour to Mr. Potts as the original inventor of the artificial limb, upon

which I have made improvements; but, whilst paying this tribute to his ingenuity, I must observe, that my improvements are of such a character, that I nevertheless insist upon my own claims to the extent of all I have added to, or altered from his design.

My late brother was Mr. Potts' only pupil, and derived from the experience and energy of so able a teacher that information and that zeal for the prosecution of his studies and his labours which kindred minds impart and receive. He made experiments upon the artificial limb in many essential respects, adapting the principle of the invention to several cases which had come more particularly under his own eye, and consequently rendering it available in a great number of instances with which Mr. Potts could not have been acquainted. His premature death, in great measure occasioned by a too close application to his profession, and to what he considered the demands of duty, cut short his further efforts for ameliorating the sufferings of others, and transferred to me, at a very early age, the task of carrying out those mechanical principles in the construction of artificial limbs, the importance of which I have

endeavoured to impress upon my readers, and that of rendering them applicable, by progressive improvements, to every form of case.

I submit that my experiments have been successful, and that I have acquired an amount of knowledge, and a capability of applying it, entitling me to offer and to afford such instruction as is to be derived from no other sources; and I take this opportunity to acknowledge, that much of this success has been attained by following in the path of my very able predecessors, and by the application of many valuable hints given me by the most celebrated members of the medical and surgical profession.

And here I may be permitted to allude to the very great kindness I received at the time of my lamented brother's death, and on many subsequent occasions, from the late Marquis of Anglesey.

I am aware of the great delicacy which it is incumbent on me to adopt, in mentioning the name of that nobleman, more especially when coupling it with any allusion to my own affairs; but I feel assured that the sincerity of my feelings, and the desire I have

to express my gratitude for his attention towards me, will, by the members of his family and by the public, be admitted as an excuse for what might otherwise appear intrusive.

He was pleased to send me a letter of condolence on the death of my brother, in which he paid a marked compliment to the skill of the deceased, and to express his regret at the loss I had sustained.

He was very anxious for my success on my taking upon myself the responsibilities which it was necessary for me to assume, and expressed a fear that I had not been sufficiently initiated into the details of my profession, and that my experience would be insufficient for the performance of my duties. I was at this time only nineteen years of age, and it was not surprising that he was a little sceptical as to my proficiency. He, however, resolved to put my abilities to the proof. He directed me to construct an artificial leg for him; and I am happy to say that I succeeded so well in the execution of his commission, that he observed it was, without exception, the best substitute he had ever tried; and, to prove that he thought as he expressed himself, he from

that time ceased to make use of the artificial legs he had before used, and told me to construct for him immediately a new set of four or five, kindly observing, that my labour "would not only be adding to his comfort, but would increase my experience."

It is mainly owing to the liberal patronage of this distinguished nobleman that in my hands the art I profess has reached its present state of perfection. He was a man active in the pursuit, and zealous in the encouragement, of whatever was useful in mechanical invention. If he detected a defect, he immediately applied his mental powers to the discovery of a remedy; and such was the clearness of his comprehension of what was requisite, and so perspicuous the mode of explaining his meaning to others, that his observations and his energy operated very favourably on me; I caught part of his enthusiasm, and applied it to my own pursuits. It stimulated me to exertion, and I cannot but attribute to my early introduction to the Marquis of Anglesey a considerable share of that activity of purpose and performance, which has supported me in my attempts at perfection, and

enabled me to bring my labours to a successful issue.

I will here also advert to the kindness I received from a foreign nobleman of high rank about the same period. This was Prince Ernest of Hesse (a patient), who proposed to me to go to Berlin, and prosecute my professional labours in that city. His Highness held out the most liberal inducements for me to adopt his proposition, promising that he would undertake to establish me in such a manner as to make my success a matter of certainty; and that in the capital of Prussia my arrival would be welcomed by Royalty itself.

It was arranged that I should leave England in 1846 for Berlin, and I had made every preparation for so doing, when the unexpected death of my brother, at the end of 1845, put an end to my plans, and made my arrangements in this country such as they have since continued. I do not mention these circumstances from any ostentatious desire to increase my own importance, but to show that from youth my attainments in my profession were appreciated by persons qualified to make an estimate of them; since which time, my un-

wearied attention to my pursuits, combined with an almost unlimited experience, have certainly not lessened my capacity for administering the aid which I profess to confer.

Prince Ernest of Hesse was cousin to her late Majesty Queen Adelaide. He lost a leg early in life in the military service, in which he held a command. His honourable conduct and his polished manners, both as a man and a gentleman, rendered him deservedly a favourite with all classes; and I have no doubt that many persons who may read these pages will cordially acquiesce in this humble tribute penned to his worth.

It is a curious fact, that whilst in almost every department of science or art the wants or comforts of man have been relieved or increased, little or nothing has been added in the way of improvement to those appliances by which the loss of limbs can be supplied. Our immediate ancestors appear to have paid the most scanty attention to such cases; and if we go further back into the history of inventions, we shall find the ground more barren, and no trace whatever existing of the information we seek. In the prosecution of my profes-

sion I have perhaps made more research into the history of mechanical inventions than most other people; I have been induced to do this, not only by curiosity, but also by a desire to profit from the knowledge which earlier practitioners might impart; but all my inquiries have been in vain. After wading through the descriptions of authors and mechanicians, in hopes of gleaning some scatterings of useful information connected with the construction of artificial limbs, I have returned as empty from my incursion as I was when I set out. I had a notion that such a writer as Polydore Virgil might afford some intelligence upon this subject, but my expectation was doomed to be disappointed; for from the date of his work, to the work of Dr. Gregory on mechanism, I could not discover anything that threw light upon the art. The only solution I can give as to why no such account exists is, that the thing itself did not exist of which the account was required; and the solution for the non-existence of the thing itself may be, that in remoter times, before the employment of cannon and shells in warfare, the necessity of amputation was rare, and consequently the requirement of

artificial limbs was commensurately infrequent. But be this as it may, the fact is as I have said, and therefore I may be permitted to assert, that to Mr. Potts and to those who have improved upon his substitutes, should be ascribed the merit of the invention and of its adaptation.

Mr. Potts, it must be inferred, from the total silence of writers previously to his time, derived no information by which he could be guided. It was the stern demand of necessity in his own person, that set the powers of a fertile and ingenious mind to work. The insertion of tendons into artificial limbs was exclusively his own idea; and although subsequent improvements have suggested themselves, in the course of my practice, still this idea, most beneficial in its results, originated with him, and to him are due the thanks of his fellow-men for his sagacity and toil.

I rejoice that this invention, and the improvements made upon it, have been duly appreciated not only in England but in other countries; and though I cannot but regret that recent events have rendered it necessary for so many persons to apply for artificial means to

render the loss of their limbs less painful and deplorable, I have the satisfaction of reflecting that that regret is greatly qualified by the knowledge of substitutes being now supplied, which, as far as human ingenuity can go, replace the loss, and render it comparatively unfelt.

I have consequently much pleasure in stating, that my artificial limbs are made use of very extensively throughout France, Prussia, Austria, and nearly all the German States, in Denmark, Sweden, throughout India, and even in many parts of China, North and South America, and Mexico ; Santa Anna, the President of the last-named State, is my patient, and has experienced the aid which I can afford him.

I have patients at the Cape of Good Hope ; and in Spain and Portugal there are many persons who have experienced the benefit of my practice, and are ready to testify to its merits ; and I sometimes feel astonishment, not so much at my success in affording relief—for of the certainty of my so doing in all cases I am fully convinced,—but at the extent of country over which the reputation of a successful practitioner may be spread, and at the rapidity with which his fame is diffused.

General Koupreanoff and Prince Gagarin have both been supplied by me with artificial limbs.

The first-named of these gentlemen (they are both Russians) was brought to me by Sir Benjamin Brodie in 1853. I fitted him so successfully with an artificial limb, that he was enabled to walk without pain or labour, and he was pleased to express to me his great satisfaction at what I had done for him; and in consequence I was honoured by an invitation from the Russian Government, to come for a time to St. Petersburg in my professional capacity. This invitation I should certainly have accepted, and I had made my arrangements after two interviews with his Excellency Baron Brunow, the Russian Ambassador, to take my departure from London, when the breaking out of the war rendered such an undertaking impossible. Sir Benjamin Brodie is acquainted with the nature of the invitation I received, and the late Marquis of Anglesey had written to the Czar Nicholas a very flattering letter concerning my attainments; so, that I have no doubt my reception would have been not only lucrative, but very honourable to me. Of the humane

policy which suggested this invitation there can be but one opinion. Although the Russians are now our enemies, I may be permitted to express my testimony to the liberality and disinterestedness by which many of the great men of that nation are characterized, and to add, that in the event of peace being restored, I shall feel the highest satisfaction in resuming my connection with them.

It will not, perhaps, be out of place here to recall to my reader's recollection the brilliant reception accorded, some years since, to the Marquis of Anglesey at St. Petersburg ; and that nobleman told me of the great interest then expressed by the Czar, in the mechanism which enabled him to exert himself so actively : his horsemanship, which was constantly displayed at reviews, &c., more particularly exciting the admiration of the Emperor, who considered his visitor one of the most accomplished equestrians he had ever seen.

CHAPTER II.

IN preparing these pages for the press, and in setting forth the cases contained in them, I have already stated my anxiety to avoid, as far as the nature of my subject would admit, all unnecessary technical digressions. I have purposely declined entering at large into those branches of physiology which have been very ably discussed by writers fully competent to the task of affording information. I have endeavoured to make my meaning intelligible to every reader; and as I wish my book to be read by the general public, I have not confined myself to the compilation of a dry, professional treatise, calculated to be understood only by professional men.

I believe that no work upon the construction of artificial limbs is in existence; at all events, I have not been fortunate enough to meet with one; and it is partly to supply that want, and to convey such information as may

be most beneficial to the public, that I have undertaken my present task, being fully impressed with the conviction, that however inadequately I may perform what I have undertaken, my intentions will be duly estimated; and that, however imperfect my performance, it will be productive of very many good results.

With the view of avoiding diffuse and tedious details, I have contracted into limits as small as the subject will admit, the information I seek to impart; and I trust that in so doing I have not fallen into the obscurity which sometimes arises from adopting too concise a method of condensation. I desire to offer such remarks as are indispensably necessary for exciting public inquiry as to the nature of the machine which I claim the merit of having brought to its present perfection, and which may enable those who feel an interest in the alleviation of human suffering to form a correct idea of what can be accomplished by the application of mechanical skill to the supplying those losses of limb which are occasioned by the perils of war, or by such vicissitudes and accidents as all of us are more or less liable to encounter.

In the application of artificial substitutes for the loss of natural limbs, let me observe, that a very great degree of judgment is necessary, and that such judgment must be built upon experience. Let me also observe, that although every case in which an artificial limb is to be fitted, is in a manner *sui generis*, and possesses its own peculiarities, yet the construction of the artificial limb is in every case referable to a common principle, a principle which must not be departed from, and which, by the skill with which it is adapted to the peculiarity of the case, is alone able to afford that relief to the patient of which he is in want, and can alone secure the amelioration of his condition which he is entitled to expect from the progress which mechanical skill has made of late years.

There are certain powers of mechanism of which the effects are unerring, and may be calculated upon with the greatest nicety. These powers, whether in their grander development in the stupendous creations of human genius, or in the minuter construction of those instruments by which we measure time, or obtain an accurate acquaintance with the wonders of nature, are unchangeable, and

the laws by which they are directed may be learnt by those who will be at the trouble of inquiry. I contend that the artificial limbs which I construct are governed by principles of mechanical science equally immutable ; that they are not susceptible of failure ; and that the certainty of their acting in accordance with the design of their constructor, will be obvious to the comprehension of every person who will be at the pains of an investigation.

The uniformity of rule which I have adopted in this invention has been the great source of my success. I have not hastily taken up a system without paying laborious attention to its merits, and its adequacy to the purposes to which it is to be applied. I have not been content to adopt a principle, and persist in a conceited admiration of its efficacy, in spite of failure and absurdity ; I have tested the invention, I have practically proved its excellence.

In this, as in all other inventions of mechanical skill, nicety of handicraft and delicacy of manipulation are indispensable ; but these are, of course, subservient to the inherent principles by which it is governed, which cannot be departed from without a total failure of the relieving process being induced.

In the contrivance of a complicated machine, it is obvious that simplicity of construction must be abandoned. The formation of each constituent part may, however, be simple, and simplicity may be adopted in the uniting of the different parts, so as to secure a harmony of action and a concurrence of the powers employed. Acting upon this principle, the machine which I have introduced is exempt from the possibility of disarrangement.

In Dr. Quain's work on the importance of comparative anatomy, a remark occurs which is so applicable to the invention of which I am the possessor, that I shall transcribe it, although he applies it to another topic.

"It is to be effected only by a close attention to facts and principles, and the adoption of a clear and methodical arrangement. It is by this mental process, by the steady consideration of a multitude of abstract facts, that the great remunerative verities of science are acquired, induction leading through a plain succession of inquiries by the exercise of that important intellectual operation which may be called method, or orderly distribution, as the exact sciences train the mind to habits of close attention and reasoning."

The age in which we live, is one of inquiry and investigation, and it is satisfactory to know that there never existed a period in the history of the arts and sciences, in which so few obstacles to improvement are to be encountered. The extraordinary but peaceful revolutions effected by recent discoveries have aroused the dormant faculties of the human mind, and a search after information in all relating to the development of the properties of nature and the powers of art has engaged the attention of people of every class in our community. This, whilst it deters pretenders from urging the obtrusive claims of quackery, induces the man of real information to invite the strictest scrutiny to his works. He is conscious that the result of his studies will be adequately appreciated by those qualified to form an opinion; and the depressing influence which is exerted by bigotry and prejudice being removed, he enters into the contest with certainty that fair play will be allowed him, and that what is meritorious will meet with its reward.

The healthy vigour of unfettered intellect has, after many struggles, overcome the obstacles so long opposed to success. Absurd-

ities, however hallowed by time, have been exploded. What was termed innovation no longer alarms anybody. Whatever has been proved to be useful and beneficial, is almost universally recognized. The misapprehensions of stubborn dulness have been rectified, and every work of learning, of science, or of art, every invention of genius, and every discovery of research, must stand or fall by its perfections or its defects.

It is under such a state of things that, feeling confident in the results of what I have effected, I court the most rigid and uncompromising inquest into the subject occupying these pages. I have convinced myself of the efficacy of my production. I can show that hundreds of people have been benefitted, to an extent not calculated upon before, by its adoption; and I feel no hesitation in affirming that it offers to all requiring such aid the most perfect substitution for the loss of their limbs that has hitherto been obtained by mechanical science. But to proceed.

In reference to the natural structure of the human leg or arm, we may apply the observations of Dr. Quain on the various amplifications

of the human skeleton ; and I do this that my readers may obtain a clearer notion of the principle upon which I have acted, and at the same time a more accurate knowledge of the whole subject.

“ The amplifications, as they are made up of several distinct bones, which differ from one another in form and size, are usually the objects of our first examination ; and as they are united together by certain means of connection, so constructed as to admit of various degrees of motion between the parts, the consideration of the joints or articulations, and of the textures which enter into their formation, in the next place engages the attention. The bones, with their ligamentous connections, constitute together the passive instruments of locomotion ; the active agents in progression, as well as the different efforts required to be performed, being the muscles, which, as the name implies, are the moving powers of the body.”

And here I will venture an appropriate observation. In certain instances, if a mechanician were to follow closely the model of anatomy, he would probably discover an im-

portant failure in his apparatus. One instance will be sufficient to enforce the truth of this remark.

The antagonism of the flexors and extensors of the living limb is an indisputable fact; it is equally so that the latter are endued with powers inferior to the former. Here, then, the mechanician is thrown upon his own resources to equalize the different amount of power, to assimilate, and not retain, the inequalities inherent in the structure of the living limb.

It is obvious that the apparatus, utterly detached from all communication with the vital system, is governed by no impulse of mere cerebral volition, and that progression must be effected by mechanical device alone.

When it is considered that, from a motive of duty, I am directing my endeavours to secure the greatest possible perfection of artificial limbs, and when it is considered what painful disappointment, what intense suffering arises from the imperfect construction of such artificial substitutes, I feel that, laying aside all false delicacy in giving my own opinions, I am bound by every feeling of humanity to advocate the advantages that seem inherent in the gene-

ral uniformity of "stump." To this important point I have devoted my incessant observation, and, arguing from the causes and effects by which my own conviction has been produced, I trust that when those causes and effects sanction and confirm my conclusions, they will produce a similar influence with respect to the form and length of the stump, upon those who perform amputations.

It was, perhaps, a daring experiment to controvert the high authority of the late lamented Mr. Liston. Feeling, however, that I had an imperative duty to perform; and being convinced that my view was right, I hesitated not to make the experiment, in opposition to his opinion, venturing to maintain my own on the nature of the stump as the best adapted, in connexion with my apparatus, to afford ease and comfort to the patient.

Mr. Liston, whose mind was free from every petty littleness, after an examination of my arguments was candid enough to acquiesce in them and admit their force. His concurrence has given a sanction to the ideas which I seek to inculcate, and corroborates their correctness.

There was nothing in the case to which I allude, to impeach Mr. Liston's customary foresight. The retractation of a preconceived opinion, when found to be untenable, was consistent with his love of truth, and honourable to his professional character.*

We must remember, that in the records of systems and discoveries, nothing is more common than to see the opinion of one day superseded by the opinion of that which follows; that science is continually progressing; that it is necessary, in the adoption of an opinion, to hear all that can be said in its support, and to investigate all that can be advanced against it. It is from the conflict of minds that we eliminate truth, and he who is anxious to obtain it must exercise patience in observing the progress and gathering varying opinions into one of general adoption.

Every person who has reflected upon the progress of the human mind must have ob-

* I allude to a paragraph in Mr. Liston's book on operative surgery, in which he prefers a short stump to a long one. Had he lived, another edition of the work would have been published, and this opinion corrected.

served the extraordinary revolutions of authority, the sudden influence of novelty, and its abrupt rejection; the unquestioned dogma of the day, supported by clamorous approbation, has become the detected fallacy of to-morrow; great names have been continually enlisted in support of theories precipitately taken up, and as quickly relinquished; and this useful truth has been taught, that though genius in its very errors may manifest a lustre, that brilliancy will be eclipsed by the better light which is derived from sober and matured experience.

The commotion in the learned world, occasioned by the first startling innovations of Pareus, affords a strong commentary on this point.

It was he who, in cases of amputation, first gave the hint of drawing out the arteries,—a practice which was by some adopted, to be afterwards abjured with anger. But truth in the end prevailed. His hint was acted upon, and his practice resumed.

I do not pretend to compare myself to Pareus, but I contend for the authority of practical experience, above all notions of men,

however eminent, which have been adopted without it. I am not, in my own practice, inclined to yield my convictions to any master.

“*Nullius addictus verbo jurare magistri,*” who has not had the experience that I have had; and I affirm that in my particular pursuits I have had an extent of experience such as no other person can claim.

Every offer at improvement is at least entitled to fair consideration; and reasonable probabilities, let them be suggested by whom they may, if found to be susceptible of practical adoption, cannot be recklessly dismissed without discouraging beneficial advances in behalf of the community which they profess to serve. With this impression, it is hoped that certain strictures on the “stumps,” both of the leg and arm, will neither be met with indifference, nor exposed to too precipitate a judgment on the points to which they allude.

I am too well acquainted with the candour of the Faculty at large, to enter into a defence of the remarks I have made on the stump. I am certain that, in inviting their attention to the shape and length of it, and in adducing instances on record of the evils and advantages

attending them, my observations will not be misinterpreted into a *modus operandi* prescribed to those eminent practitioners, either as regards the fact of amputation or the after-treatment of their patients. With this express disclaimer, I feel myself at liberty, on points within my own special province, to advert to such conditions of the stump as may accommodate it to the structure of the apparatus.

Should the subsequent suggestions, in their unpretending spirit, be courteously received, they will undoubtedly conduce to the safety, comfort, and convenience of such individuals as may hereafter be reduced to the employment of the artificial leg or arm; at the same time they will so appropriate, by ordinary practice, the configuration of the "stump" to the receptacle designed for it, that but few anomalies will be presented by which the construction can be embarrassed.

I am, moreover, especially desirous that these observations should be received by every branch of the Faculty abroad, in the same indulgent spirit, and that the eminent members of the various anatomical societies of Europe and America, at once conspicuous for

their attainments and the courteous character of their intelligence, will look upon them as *offerings for their consideration*, and not as the obtrusions of dogmatical authority. This express solicitation is addressed to those permanent exponents of science and practitioners in the schools of Bichat and Dupuytren, of Heister and of Hoffman, of Boerhaave and Haller, who, pursuing the respective mysteries of art and science, though with modifications somewhat differing from our own, are animated by the same ardour, and directed by the same interest for the benefit of nations.

This subject has been recently so ably treated, in the "Lancet" and in the "Medical Times," by Mr. Quain and Mr. Coulson, that I consider it important to transcribe, in my address to the profession, what they have sanctioned with respect to it. Those gentlemen are of such high authority, and are so perfectly acquainted with the subject, that any opinions coming from them are of the most unqualified value, and cannot be too much attended to by those who are to perform operations, or by those who supply artificial limbs, in cases of amputation. They are in great measure the

result of conversations and communications with me on various occasions. Both those gentlemen have had many opportunities of proving the practical value of what I have urged, and what they have adopted in consequence.

“ THE PLACES OF ELECTION ” FOR AMPUTATIONS
OF THE LOWER LIMB.

“ Having now considered the circumstances which rendered it, in my opinion, indispensable for me to remove the limb in the case of the patient Thomas Robinson, it becomes necessary to state why I performed the operation in the lower part of the leg. But, as this question involves principles applicable likewise to amputation elsewhere, I will take occasion to review the whole subject of these amputations,—first, considering how the place of operation is to be determined, and then continuing on to describe the plan or method of operation which I adopt in each case.

“ It used to be said, that in amputations of the upper limb, it was always important to

leave as much of that limb as possible ; but in the lower limb, a place or places 'of election' were indicated. So that, while a finger and each inch of the upper arm or fore-arm were allowed to have their value in the after-use of the arm, some portions of the lower limb were considered as 'in the way,' rather than useful ; and hence, in certain circumstances, it was deemed right that a good portion of this latter should be lopped off, in order to fit the stump to the apparatus to be afterwards worn, or even for sake of an easier operation. I have long been of opinion, that the portion of this rule which refers to the lower limb was not in any case expedient ; and I have, from time to time, during several years, pointed out in this place the grounds upon which I pursue a different course. These grounds I now proceed to lay before you.

“ In determining the place at which, amputation being necessary, the operation ought to be performed, we are to keep, it seems to me, two objects steadily in view,—namely, the recovery of the patient from the immediate effect of the wound, and the provision for the facility of his progression afterwards.

“1. As regards the first of these considerations, it may be stated in general terms, that by the result of a large number of amputations it has been shown, that the more remote the seat of the operation is from the trunk, the greater is the probability of the recovery of the patient. This may be owing, if to no other cause (and there is probably another cause), to the fact that, as the limb diminishes in size almost uniformly to its end, the wound of the operation in the distant parts is proportionately smaller.

“2. The facility of progression with an artificial limb is obviously a matter second in importance only to the consideration of the recovery of the patient from the immediate effects of the operation. In providing for it, we have to bear in mind the following facts:—

“*a.* That in no case where the operation is made through the leg or thigh, can the person afterwards rest easily the end of the stump upon the artificial support. It is only where a part of the sole of the foot is made to cover the bone, that the end of the truncated limb will sustain, without pain or injury, the weight of the body. In other words, it is only the

structures which are organized for the purpose, that will sustain the pressure in these circumstances, without causing pain, and suffering ulceration.

“*b.* It is likewise to be borne in mind, that the greater the length of the limb that remains after the amputation, the greater will be the ease, the steadiness, and the power, in commanding the artificial support, and the greater, therefore, the facility of progression. This general proposition is only limited by the necessity for leaving at certain points sufficient space for the joint of the artificial limb.

“When I seek to make special application of the foregoing general propositions, to amputations at various parts of the lower limb (with which only we are now concerned), it is not necessary for me to allude to the foot, as the importance of preserving a portion of it, where practicable, is generally admitted. I proceed, therefore, to—

“ AMPUTATION AT THE ANKLE-JOINT.

“It is only lately that this operation has been so performed as to bring it advantageously

within the limits of practical surgery. When the amputation was first performed in this place, the bones of the leg were covered, after the removal of the foot, with flaps of skin taken from the dorsum of the foot, or from its sides. I have not had an opportunity of seeing a case, in which the operation was executed in this way; but I have no doubt that the skin derived from either of the parts just mentioned, if it did not slough *ab initio*, would not support, without injury, the pressure to which it would be subjected if the limb were made to rest upon its end. This being so, the amputation through the lower end of the leg would be more advantageous as regards both the proper formation of flaps to cover the bone, and the adaptation of a mechanical support. But the operation in this form seems to have been discarded almost as soon as proposed. A few years ago, it was suggested by Mr. Syme, of Edinburgh, to cover the bones of the leg from the soft parts beneath the heel. Tested by reference to the two general rules or principles we have been considering, the operation appears to me to be free from any valid objection; and what is more important, the result has been found in practice to

be good. The person who has undergone this operation is enabled to bear his whole weight upon the end of the stump without inconvenience, and, on this account, the facility of progression is, with a proper apparatus, decidedly greater than when the amputation is performed at any higher part of the limb. Such an apparatus, I may add, has been constructed by that ingenious mechanic, Mr. Gray. There is at this moment a gentleman in the neighbourhood of the hospital, who, having undergone the operation we are considering, makes so good an appearance, and walks so easily with one of Mr. Gray's apparatuses, that with even careful looking for deformity or lameness, one can scarcely discover any. It was a source of regret to me that the disease of the soft parts above the ankle, as well as in the fibula, prevented me from performing the same operation in the case of Robinson. I may state, however, that even when this modification in the method of performing the amputation was first made known, I took occasion to perform it; and I then advocated the plan on the same grounds that I now offer in recommendation of it.

“ AMPUTATIONS OF THE LEG.

“The ‘place of election’ for amputation of this part of the limb used to be stated, nay, is now stated in books of authority, to be at a hand’s breadth below the patella, and this position has been advised on the ground of the adaptation of a stump of that length to the support upon which it was afterwards commonly made to rest. But how stands this operation, regard being had to the two general rules laid down in a former part of this lecture ?

“1. The wound necessarily made in amputation at the place adverted to,—through the calf of the leg,—is always larger, in some cases very much larger, than it would be in the lower part of the leg, and the operation is proportionately more hazardous.

“2. It may be that the shorter stump would be more convenient for the poor man, because it would fit better the supporting ledge of the common pin with which he is obliged to be content afterwards. I believe, however, the superior convenience in this respect to be outweighed by the greater risk attending on the larger wound. But in the case of all those

who can afford the expense of the better constructed artificial limb (and the poor man may be able to procure it at some future time) * the lower amputation is beyond all question the more advantageous one for the facility of progression. The reason will best be understood by observing the construction and manner of applying the apparatus, and as this is only to be done with the objects before us, I have had specimens of Mr. Gray's construction for different parts of the limb brought here to-day. The artificial limb is, as you see, hollow, and more or less of the truncated member is received into it. Here I may mention, that, inasmuch as the muscles of the leg, and even the bones, dwindle after the amputation from want of use, the wooden case needs to be but little larger, if at all, than the natural limb. The important point for consideration, in connexion with our present purpose, is this, namely, that the greater the length of the stump inserted into the wooden support, the greater is the power the wearer has over this; and this greater power is owing

* "Since Robinson's limb was amputated, his employer has sent to inquire if the operation was so performed as to allow of his wearing a 'cork leg.'"

to the mechanical advantage given by the longer lever. Influenced by these considerations, I have, during several years, regarded the 'place of election' for amputation of the leg, to be within the lower third, wherever a choice was admissible. Full space is of course left for the mechanism of the ankle-joint in the artificial support. You will find, in the wax preparations in the anatomical museum of the College, some models of limbs after amputations performed by me in that part, a good number of years ago. The same reasons, I need scarcely add, influenced me with respect to Robinson's case. You have an opportunity of seeing in that case, as well as in the models, that the cicatrix is a small and close one, and that the stump admits of being well shaped.

“ AMPUTATION AT THE KNEE-JOINT.

“ I believe the amputation through this joint to be objectionable, especially for two reasons.

“ 1st. On the score of the large size of the wound necessarily made. The condyles of the femur have been covered in the operations hitherto performed, with a flap raised from the calf of the leg ; and, as the flap must be long

enough not only to cover the large bone, but likewise to fold upon itself, it must necessarily be of great length.

“2ndly. It seems to me that to arrange an apparatus for future progression must be somewhat difficult, seeing that there is no space left for the usual arrangements of the mechanism for a knee-joint.

“The force of the first objection is not, I believe, diminished by the experience of the operation in the hands of any surgeon. For myself, I have never thought of amputating at this joint, in consequence of the reasons I have now alleged against it; and I have only seen two instances in the practice of others. The results of these cases, and of others that I have been made acquainted with, were not favourable.

“ AMPUTATIONS OF THE THIGH.

“If the facility of the surgeon’s manipulations, or the celerity with which he may go through his part, had any weight in determining the place of operation, the middle of the thigh would be the place selected. For in that situation the flesh is abundant, and the femur

is small, smaller than elsewhere ; while, on the contrary, the relative size of these structures is reversed towards the lower end of the thigh, the bone being expanded in all directions, and the soft parts not only relatively but positively very much smaller. Hence, to pass the knife across the limb (I speak of the flap amputation) in the higher operation is a matter very easily effected ; but to insinuate the instrument between the broad bone and its slender coverings in the neighbourhood of the knee, requires caution and address on the part of the surgeon. When, however, the subject is considered with reference only to the immediate and prospective welfare of the patient, the advantages are, in my opinion, plainly in favour of the lower operation, for—

“1st. The wound to be healed is here much smaller. Many years ago I had to amputate the limb of a very muscular person, in consequence of an injury. His thigh was prodigiously large at the upper and middle part, but, as usual, the knee, with the adjacent part of the limb, was of comparatively small size. The operation was performed in the latter situation, and the result was in every way favourable.

Ever since, I have invariably followed the same course wherever the state of the limb made it possible, and the results have been satisfactory.

“2ndly. When we turn to the second matter of consideration, namely the facility of progression with an artificial limb, the advantage is equally in favour of the lower amputation. With the common wooden leg or pin, the stump is inserted into the hollow at the upper end of the apparatus, and the pressure is made neither upon the end nor upon the circumference of the truncated limb, but upon the pelvis at its inner side ; still, the greater length of the stump gives the advantage of greater leverage in moving the artificial limb.

“Again, when the best form of artificial support is worn, the advantage of the longer stump is still more decided. In this case the apparatus does not reach the pelvis ; the thigh part is accurately fitted to the surface of the stump, and a great part of the comfort of the wearer depends upon the nice adaptation here, so that the pressure shall be evenly diffused over the sides of the stump, but without bearing upon its end. From the shape of the thigh, its gradual increase upwards, it is manifest that

the greater the extent of it that is inserted into the socket, the more easily will the adaptation be made. On the other hand, when the stump is short, the advantage of the conical shape (so to express it) of the thigh is lost, and practically, it is found by the mechanician that, in this case, he cannot construct his apparatus so that the weight of the trunk shall be effectually supported upon the circumference of the socket. Other expedients are then necessary. To these mechanical disadvantages in the case of a short stump, must be added the defect of leverage. Such then are the grounds upon which, when amputation of the thigh is necessary, and a choice of the place is possible, I prefer very decidedly the operation near the knee.

“ I have now arrived at the point where the methods or plans of performing the several operations should be described in detail; but in order to make these intelligible, illustrations upon the dead body are necessary, and I shall avail myself of an occasion to take up this part of the subject on another day. I will now only add, that the methods I pursue are not, in several of the amputations, those usually practised by other surgeons. Of one form of devia-

tion from the ordinary course, you have had an example in the case which called forth these observations."—*Medical Times, Dec. 27, 1851.*

"We stated above, that the artificial substitutes made by Mr. Gray act more or less successfully as the stumps are more or less adapted to the mechanical means he employs; we think of serving a useful purpose in adducing a few of the rules which should be followed when amputation is performed.

"Respecting the length of stump which it is advisable to leave in amputations of the leg, Mr. Gray states that when the surgeon can make a choice, he should regard the future convenience of his patient, by leaving such a stump as will enable him to use with the best effect the artificial limb.

"After much experience and attention to this subject, Mr. Gray's conclusions are, that in all cases where practicable, the amputation should be performed at the upper portion of the lower third of the leg. This leaves a stump of sufficient length to give the patient a complete command over the artificial limb, without being so long as to interfere with its mechanical arrangements.

“A greater length than this is not desirable, as it is no advantage to the patient, and merely adds to the difficulties in the construction of the substitute, the stump projecting so low in the socket as to interfere with the insertion of the artificial tendo-Achillis, and to render it necessary, in order to attain a requisite degree of strength, to make the ankle-joint of an unnatural thickness. When amputation cannot be performed at the lower third, any point between it and the commencement of the upper third may be determined upon.

“Stumps of the leg may be deemed relatively good in proportion to their length from the lower to the upper third; the greater the length preserved between these points the better, and in no case should the limb be amputated above the locality alluded to. It is to be regretted that several writers of authority have represented the proper point for amputation of this part to be ‘at a hand’s-breadth below the patella,’ no doubt with a view of preserving the knee as an admirable bearing to rest upon, the support being afterwards adapted to it. This may be judicious

when the social position of the patient appears to preclude the possibility of his availing himself of the improved artificial limbs of the present day, being thus compelled to resort to the common pin leg ; but in cases where there is a probability of his employing an artificial leg, amputation just below the knee should not be performed ; for, besides the objection to this proceeding in a surgical point of view, the stump, even should it not become contracted (which is nearly always the case), is, from its extreme shortness, and consequent defective leverage, comparatively useless, and frequently entails upon the patient no small degree of suffering from irritation produced by the incessant friction in walking. Therefore, in cases where an entire third of the leg cannot be saved, it is far more to the advantage of the patient to select the *lower third of the thigh* as the point for amputation ; this leaves a stump of sufficient length and power, to which the artificial support can be effectively adapted ; and it must be borne in mind that a good stump above the knee is far preferable to an indifferent one below.

“For all amputations of the thigh, when

choice of place is possible, the lower third is very decidedly preferable to any other. The defective leverage, and all the mechanical disadvantages in applying the substitute upon a short stump, are here avoided, and the great extent of surface that is inserted into the socket permits, by a nice adaptation, the equal diffusion of pressure on the entire extent,—a comfort duly appreciated by the wearer. When the limb is unavoidably removed at the upper third, the following substitute is made:—

“In amputations of this limb, and indeed of all others, it may be regarded as a general rule that the longer the stump the better, of course premising that due allowance be made for the room required by the artificial joint, which does not exceed a space of five inches for the knee. But, as stated before, no advantage is gained by retaining the extreme length of the lower limb, which might in some cases be practicable.

“Here, however, an exception should be made in favour of the operation performed by Professor Syme, and also respecting those cases of amputation of portions of the foot in which the ankle-joint is saved. These are certainly

the most favourable to the patients, as is evinced by the free and convenient manner in which they are enabled to walk after the adoption of the artificial aids.

“The foregoing rule is also applicable to cases of amputations of the arm, as regards the length of stump, with this *essential difference*, that in all cases where it is possible, the *elbow-joint* should be saved, be it ever so short, for it is impossible to construct an artificial joint which shall perform the varied movements constantly required from this important limb.

“Amputation of the leg should never be performed upon children, but the lower third of the thigh unhesitatingly selected, for this very important reason, that the amputated limb ceases to grow in uniformity with its fellow, and the patient is doomed to the additional inconvenience of having one knee-joint elevated perhaps some inches above the other, and imparting to his gait a peculiarly grotesque appearance.” — *Lancet*, January 14, 1854.

The propriety of this address to the faculty of foreign countries will be obvious when I

exhibit a short but striking list of the celebrities by whom my apparatus has been patronized.

To the eminent men who have attested their conviction of the efficacy of my artificial substitutes, and for the general diffusion of the knowledge, amongst the great body of operating surgeons in foreign countries, that such substitutes were in existence, a knowledge which has invested the invention with a growing popularity, I here take the opportunity of recording my obligation and my thanks.

As everything is of consequence which tends to illustrate this subject more fully, I will introduce some remarks made upon stumps by a man eminent in his day for his skill and success in amputations. The value of his testimony will corroborate my opinions, and give them an additional weight; and that a correct judgment may be arrived at of the importance of the formation of the "stump" in amputations, and of the manner in which this subject was viewed by an eminent operator of Liverpool, I will refer my readers to a work entitled, "Practical Observations on Amputations and the After-treatment, &c. &c., illus-

trated by cases, by Edward Allanson, Surgeon to the Liverpool Infirmary. London, 1782. Second Edition. Joseph Johnson, 1782."

It will be seen that ideas corresponding with my own were recognized and acted upon upwards of seventy years ago.

The book was dedicated to the President, Treasurer, and Trustees, of the Liverpool Infirmary, to whom the author felt himself *ex officio* bound to render an account of the successful system he had introduced into the establishment over which the suffrages of many intelligent and influential gentlemen had placed him ; I consider it as a volume of considerable merit, and to me of more than common interest. He sets forth many facts ; and in addition to the statement of his own opinions, he gives extracts from his correspondence with Mr. Rig, Mr. Freer, Mr. Bloomfield, Mr. C. White, and others, which are quoted to justify and recommend his own doctrine.

The cases cited by Mr. Allanson are remarkable for their success, and this success he attributes to his steady observation of the facts that came beneath his personal experience. He very properly observes, "All speculative rea-

soning on these subjects is very fallacious when placed in competition with experience, and it has been my aim to adduce the doctrine of this work from practice only."

It would not, however, coincide with my design, nor suit my limits, to travel with Mr. Allanson through his observations on his adopted plan of amputation, nor on the after-treatment of his patients; but I will allude to the particular attention he devotes in almost every instance to the formation of a "stump."

His strictures were written many years ago, and consequently long before the introduction of the artificial limb which I construct. At a time, too, when operations were performed in which the "stump" was to be shaped as far as possible to a level surface for the common "pin," then in vogue—considering that it was probable, or thought perhaps to be inevitable, that the "stump" might come in contact with the simple apparatus then of general use,—that the utmost possible extent and smoothness were desirable for realizing an equality of pressure and a spacious surface of support exempt from friction and contusion,—one might be tempted to suppose that Mr. Allanson's suggestions

were shrewd anticipations of my artificial substitute.

But, not to digress in curious surmises, it will be sufficient to reflect on the plain conclusions to which more recent reasoning has conducted me ; it is, however, gratifying to me to adduce a complete coincidence with doctrines which I have so long endeavoured to establish, and which, I am happy to say, are now confirmed by the expressed opinions of men at the very head of the medical profession.

It will be obvious to any one who reads attentively the cases described in Mr. Allanson's Report, that the descriptions are scrupulously accurate, and circumstantially minute, that his publications generally, were, by the first contemporaneous authorities then in active practice, held of high value, and that the formation of the "stump" was held by him and them to be an object of primary importance.

To that most essential point was the unremitting reflection of this benevolent and skilful man devoted ; and the object he most cherished seems to have lost none of the professional interest it excited at the date of

the very instructive publication of which he was the author.

In 1852, for the purpose of demonstrating the way in which the invention was to be applied, I invited several distinguished members of the medical profession to my house to view it, and to attend to such explanatory observations as were necessary to understand its properties and purposes. The "artificial limb" submitted to the judgment of the company, was one prepared by request of Lord Anglesey, in which the latest improvements had been introduced. On this occasion, I expressly courted the interrogations of my scientific visitors, and I had the satisfaction of receiving their undissenting approbation. A result of the inspection was a notice which appeared in the "Lancet" of June 5th, 1852, p. 545.

"*Artificial Legs.*—A good and efficient substitute for a lost limb is a matter as worthy the consideration of the operating surgeon as it is most important to the mutilated patient.

"The perfection to which this apparatus has arrived, and which is daily progressing, we saw this week beautifully exemplified in an *artificial leg* made for the Marquis of Anglesey. It

should be premised, that on the proper adjustment of the socket, into which the stump is to be received, depends not merely the comfort of the patient, but the very efficiency of the *artificial limb* itself.

“ Mr. Gray, of Cork-street, the constructor of the specimen referred to, in the first place makes a cast in wax upon the stump, and then, by a peculiar method, transfers, as it were, this impression to tight and tough desiccated willow, in such a manner that every swelling and hollow is represented in the socket. Thus it is the machine can be worn without the risk of undue pressure; *or if any part be more than commonly tender*, the pressure can be easily regulated or removed.

“ The next feature is the substitution of cat-gut in the place of the *tendo Achillis*, in such a manner that an elastic propelling power is exerted at every step, and thus does all for the *artificial leg* that the real tendon accomplishes for the natural one. The joints are even, and graceful in their action, and are regulated by tendons in place of springs, and the mere movement forward of the stump brings each to the performance of its proper duty. There is no

abrupt or jerking movement in the leg, and the free and noiseless action of the whole structure is most satisfactory to the wearer."

The most jealous egotism could hardly covet, and certainly could not receive, a more complete appreciation of a favourite performance, than this explicit and highly liberal description of the *apparatus*, so much so, that the invention could not be further recommended by the addition of either detailed or general encomiums. Like other contrivances, it has undergone the full ordeal of practical and theoretical tests, and I have reason to be amply gratified, not only with the suffrages of individual judges, but with the candid and enlightened spirit which has pronounced upon it in various columns appropriated to professional discussion.

CHAPTER III.

THERE would appear to be little analogy between building a ship and constructing an artificial limb; but nevertheless such analogy does exist, and some useful hints may be taken from the one, and applied with benefit to the other.

What I term the “lines” of an artificial limb, may be compared with the lines of a ship. It is on the scientific construction of these lines that the perfection of motion, both in the ship, and with the artificial limb, is obtained.

A ship that is erroneously constructed is little better than a log in the water; and an artificial limb that is formed without proper attention being paid to the “lines,” is a cumbersome, unwieldy, and useless apparatus.

There is nothing more tantalizing to a ship-builder than the uncertainty attending this branch of his art; and we may hear every day of the failure of the best naval architects in building vessels after the most approved models,

and which have turned out contrary to every calculation and expectation, in no way resembling, in their sailing or steaming qualities, the prototypes which they are meant to imitate.

This fact shows the failures that arise from minute causes, and, as applicable to the construction of artificial limbs, is evidence of the very great delicacy and the extreme care that must be applied to every separate case, in the formation of the substitute, and the attention that must be given to the discrepancies which every particular case exhibits.

It naturally suggests itself to the inquirer, that, if so much uncertainty exists in the attainment of an object, by means of an art on which the practical experience of ages has been employed, a corresponding amount of uncertainty may be predicted to exist in the formation of an artificial limb; and perhaps to a limited extent it is so. But here is the difference which exists between the two cases.

In the case of forming artificial limbs, he who forms them has Nature for his guide and instructress. She supplies the models, and lays down rules for his guidance which are unerring, and to which the exceptions are but few. She

teaches in an intelligible manner what he who imitates her must do; and if he follow her directions, his efforts will be successful.

But in the art of ship-building, the models which nature supplies are scarcely applicable to the requirements; indeed, she supplies no model of which an imitation can be practically produced. The ship-builder can only copy the work of the ship-builder who has gone before him, or attempt to construct a *fac-simile* of a previous production of his own; and the copy he produces, however apparently similar to the original, in point of fact is never so completely similar—owing to some difference in the quality of the article employed in its construction, or to some discrepancy of detail not perceptible in so large an object—as to be perfect; and the consequence is, that whilst the original is everything which the builder can wish for, the copy is worthless.

Since the invention of the artificial limb, and its subsequent very general adoption, it has not been unusual to hear those who have used it, make such observations as these:—“I cannot imagine, for the life of me, what is the matter with this leg! The socket fits me ad-

mirably ; it is much lighter than any other leg ; the joints do not bind, but are delightfully free ; the tendons are right, and yet when I walk, it causes me absolute fatigue. Can you explain what is the matter with it ?”

I can explain.

I know at once that we have not quite hit the correct lines, or in other words, that our joints are not in the right position ; that, though apparently free, they bind one upon the other.

There are three varieties of limbs (legs) with which we have to deal ; and if attention be not particularly paid to this fact, we, as it were, throw the body out of gear, and instead of assisting locomotion, we encumber it ; and let it be borne in mind, that very trifling variations in the shape of limbs, will cause a very considerable difference in the gait of those to whom they belong.

One person may be straight in his legs, another may be knock-kneed, and a third may be bow-legged. All these characteristics require different “lines,” and they must be varied according to the specific peculiarities.

And here it is that, on the nicety and pre-

cision by which the necessary deviation from the general principle is to be made, naturally depend the activity and comfort of the limb.

If this be not attended to, no matter how light the artificial substitutes may be, they will appear heavy and cumbersome ; and no matter how perfect the fit, the stumps, from the cross action which is going on, will be inflamed and tired, and all kinds of discomfort will ensue.

This shows in a very striking manner the absurdity, to call it by no stronger name, of those persons who profess to supply artificial limbs to patients whom they have never seen, and whom they invite by advertisement to send by letter a measurement of their legs.

If it were not too serious a subject to jest upon, the conduct of such wretched practitioners in an act that demands the nicest inspection and care, might be compared to the practice of tailors and shirtmakers, who, to extend their business, publish directions for customers who live at a distance from their shops, to send up the length, breadth, and thickness of their bodies and limbs, in order to ensure a perfect fit for a coat or other garment.

A knowledge of anatomy is, as I have said

on many occasions, of the first importance in the construction of an artificial limb. Without such knowledge all is guesswork and conjecture, and there will be no difficulty in imagining into what endless mistakes any person will be led, who attempts to construct a substitute for a limb, regarding the anatomical construction of which he knows nothing.

I repeat, that a knowledge of anatomy, and the experience of practice, are the necessary things to render a constructor of artificial limbs useful in his profession; without these he is certain to increase, instead of alleviating, human misery, and he incurs a responsibility regarding the extent of which, he can have but little idea.

Until very recently, no fixed rules were laid down for our guidance in this particular; but I have now established rules, and reduced the application of them to a matter-of-fact principle, so that with moderate care all the annoyances arising from defective lines can be easily avoided. By acting upon these rules, each portion of the limb will be competent to the performance of its destined functions.

In arriving at this knowledge, experience has

been my most useful guide; and I much question whether any man, however great his genius, and extensive his attainments, could dispense with its aid in such a matter as this. A close observer of nature will alone ascertain to what extent she can be followed, and where art must be brought in to aid, not her defects, but her deficiencies.

I purpose to speak of the socket for the stump of the patient.

This part of my mechanical contrivance is to an artificial limb what the key-stone is to the arch. No matter how elaborate and perfect the other parts of the limb may be, if it be not furnished with a socket fitting the stump as a glove fits the hand, the labour of the practitioner will have been in vain. The artificial limb will be a source of misery and pain, instead of an assistance to the sufferer. So paramount has the socket always been in importance that, I believe, it was the first thing to which Mr. Potts turned his attention. He was aware that if he obtained a socket that caused him no pain, he could afterwards elaborate and carry out his ideas with reference to the other parts of the artificial limb.

After numerous experiments, he hit upon a plan that was, in a majority of cases, satisfactory; but every now and then a case would come under his notice that baffled all his calculations, and not unfrequently obliged him to make from twenty to thirty sockets, before he could obtain one that would fit.

It may be supposed, how tiresome and annoying this was to the patient, and what a ruinous waste of money was incurred by the practitioner.

It is not my intention, nor would it answer any useful purpose, to enter into a particular narrative of the various experiments which, since the death of Mr. Potts, have from time to time been made to secure the perfection of the socket, nor the mode by which it was at last obtained. I will, by-and-by, explain how it was that the application of the machinery, of which I am now in possession, was suggested to me.

The socket of the artificial limb is formed of the wood of the willow-tree; this wood is both light and tough, and admirably adapted for the purposes for which I employ it. It is dried or steamed in hot chambers, and by this pro-

cess it is secured from warping, or from getting out of shape when formed. The least contraction would, of course, render it useless.

A cast in wax is first taken of the "stump," much in the same manner that a dentist takes the impression of the gums and inside of the mouth of a person who is to be fitted with artificial teeth; then, by the aid of a machine, this impression is transferred to the wood which is to form the socket; and so nicely can this be done, that every little projection or cavity is given, even to the swelling of a vein. The operator, as I have before insisted upon, must, of course, possess an anatomical knowledge of the parts with which he is to deal. He must know from experience what parts will, and what parts will not, bear pressure.

After this knowledge has been gained, it is not difficult to increase or diminish the pressure at particular parts of the stump.

This will be made intelligible by an instance.

Suppose a case of amputation above the knee, and the place of election to have been about midway up the thigh. We should have remaining about ten inches of stump. The socket, in such case, would be continued as far up as the

os ischium, and unless great care was taken to avoid pressure on the femoral artery, its action would be impeded, and circulation to a great degree stopped. The limb, in consequence, would speedily become swollen and benumbed, and the patient must, of necessity, either throw aside the artificial leg, or if he should persevere in keeping it on, he would be lamed more or less severely.

By a perfect socket, I mean one in which the patient can bear his whole weight for almost any length of time without pain or inconvenience.

During my professional career, I have seen and examined artificial limbs from almost every country,—from places the most civilized, and from places in the most early stage of civilization; but I never yet saw, with the exception of my own invention, even an attempt to construct a socket such as I make.

I have everywhere observed an extraordinary absence of method in the construction of all that has come under my notice. The object, in one and all, has evidently been *to make the stump fit the socket*, and not the socket fit the stump.

The former of these attempts is much more

easy to be accomplished than the latter ; only make the socket large enough to receive the stump, and not too large to prevent its binding at the sides, and it is supposed to fit sufficiently well. The patient begins to walk, and he does walk "after a fashion." Shortly he begins to complain of pain ; he is recommended to persevere, and told that the pain will go off. He continues for some time to do as he is directed, because he is ignorant of the proximate cause of his pain, and does not know what he requires ; and if he did, it is impossible he could point out in what manner it could be obtained.

After a few weeks or months, as the case may be, the stump, from continual pressure, becomes so much bruised, inflamed, and painful, that a medical man is called in. The medical man advises that the artificial leg should be left off for a day or two ; the advice is followed, and the leg laid aside : in a short time the stump assumes its natural appearance, and is again thrust into the socket. The same suffering follows, as a matter of course ; and this process goes on over and over again, until at length the sufferer is worn out with pain, and completely dispirited, and the artificial leg is thrown aside.

I neither wish nor intend to say anything by which an injury may be incurred by any person, and therefore abstain from more fully particularizing these facts. I have in my possession specimens of what may be called these instruments of torture. They have from time to time been left with me by the victims to whom they were applied. They tell a fearful tale of human misery occasioned by the blundering ignorance and cupidity of people who undertook a task for the performance of which they were totally incompetent; and for the information of those who may be interested in such things, I may here take the opportunity of stating that they can be seen at my establishment.

An inspection of them will verify what I have written, and the truth of my description corroborated by hundreds of persons now under my care.

Most dangerous it is for people to meddle with matters which they do not understand; but the most dangerous of all things to meddle with, are matters connected with surgical operations: this may indeed be called playing with edged tools. Where a failure in such undertakings as I have described, involves a

patient in so many dangers, the ignorance of the practitioner amounts to criminality, and deserves a punishment at least equal in extent to the agony he has inflicted ; and the surgeon who, from want of caution or from any other motive, has introduced a patient to those by whom such misery is brought about, is open to great censure.

I said I would explain how I first became acquainted with the machine by which I am enabled to make sockets, which, I undertake to maintain, are liable to none of the failures I have described.

Up to the year 1848, I had depended on the means introduced by Mr. Potts, which, like almost all other original inventions, had many defects, and was not applicable to all cases in which the aid of an artificial substitute was required.

Thus, the case of a fat man would baffle all our calculations, and the case of a thin spare man would present equal difficulties to our ingenuity.

It was, therefore, only in ordinary cases that the system of Mr. Potts, and the apparatus which he invented, would completely answer

our wishes. An unusually stout or thin person presented difficulties to our endeavours at affording relief, which we found insurmountable, and which compelled us to seek for something beyond what the original invention could supply ; and it was only after a great number of sockets had been made, that one was finally found to fit the stump in a proper and effective manner.

It was in the year 1853 that I called on my friend, Mr. Noble, the sculptor, to consult him on a matter in which I knew his advice could be of assistance. I then saw for the first time the instrument used by sculptors, called a pointing-machine. As I dare say many of my readers have never seen this instrument, which is the invention of an ingenious sculptor, it will not be out of place to describe its purposes. After the sculptor has once secured his bust or figure in clay, much valuable time is saved to him by its employment.

By its aid, an assistant can transfer the likeness of the bust or figure to the marble, giving it all the lines of the face, &c., with the most unerring accuracy ; so that the sculptor has little to do beyond correcting any want of

expression, or any exaggeration of it, or to give any peculiar expression.

It is wonderful with what facility, by means of this invention, the original likeness from the clay bust can be transferred to the block of marble, by a man who knows little or nothing of the fine arts, except the most common-place rules.

After having examined it with great care, I was struck with the idea that its powers might be turned successfully to my own profession; and I came at once to a resolution to have one made. I made drawings of what I wanted, and by admirable good fortune met with a man who readily caught my ideas, and went to work upon them; but it was not till great patience and great skill had conquered the obstacles offered to their success, and after a great many failures, that an instrument was provided that at the time answered all my expectations.

Subsequent improvements have rendered the instrument what it now is, and made it so perfect that little is left to desire. By means of it, I could, if required, transfer to the inside of a block of wood any kind of likeness I wished.

In fact, I could make a concave mould to a convex object, no matter how intricate and varied the outline. Every little hollow, minute protuberance, or partial inequality, would be represented with the most perfect fidelity; and every vein would have its allotted channel.

It is impossible to estimate too highly the importance of this instrument as an auxiliary to him who undertakes to make a socket for the reception of the stump of a natural limb; it is, in fact, an assistant without which perfection in his labours cannot be acquired; and I can readily understand how it is, that where it has not been had recourse to, so many distressing mistakes have been made, and so much labour has been bestowed in vain.

Those who attempt to form a socket without this essential aid to their task, are in a great degree wandering in the dark. By dint of extraordinary ingenuity, they may attain in part their object, and be tolerably correct. But in the same manner as the daguerreotype, or the more recent improvements connected therewith, transfers the portraiture of the features to the plate or paper employed, with an unerring accuracy to the minutest objects,

which the most eminent artist cannot attain with all his efforts, so does this instrument transfer to the socket those almost-imperceptible irregularities of surface which the most industrious scrutiny cannot detect, but which, if not attended to, produce a discrepancy between the remains of the natural limb and the cavity formed in its artificial continuation, and a much greater degree of annoyance and pain than can be imagined by those unacquainted with my art.

I would wish to be clearly understood to say, that in no instance, except in Syme's and Chopart's operation, can any pressure be taken at the end or point of the stump, as it is so exquisitely sensitive and tender; and I speak from experience, in stating that in all the numerous cases which have come under my notice, I cannot call to mind one exceptional case in a hundred.

In the living man, the vertical position does not depend entirely on the bones of the legs. The skeleton which is incased within the flesh, and the integuments of the human form, are not the only apparatus by which that position is obtained and continued. I am aware that

a contrary doctrine has been promulgated, but I am not a convert to that doctrine, though I admit, as I am bound to do, that the authority of the gentleman by whom it has been advanced is entitled to all respect. I contend that the muscles, as the agents of that volition of the brain by which their operation is called into action, the tendons, and the sinews, have all a part to perform, and do perform it, in producing and sustaining the upright position. The horizontal shape of the foot, and the elasticity of its component parts, covering a large space of ground, prevent the superincumbent pressure of weight of the body from pressing upon any point or surface of the bones, so as to throw upon that point or surface a weight which it does not and could not sustain.

If, then, a stump were to be so formed, and the cavity of the socket of the artificial limb so contrived, that the weight of the man—which in his perfect and unamutilated condition was carried down the perfect limb to its natural termination at the foot—was to be supported on the end of it, the provisions of nature no longer existing to counteract the pressure

and furnish auxiliary aid, the pressure would be so great that it would be, in the case of an amputation of both legs, impossible for the patient long to sustain an upright attitude; and in the case where an amputation of only one leg had taken place, the whole weight of the body would be thrown on the perfect natural limb; the artificial limb attached to the stump of the other would at best become an incumbrance, which he would have to drag about with him, and the use of which it would be much better to supply with a crutch.

It must also be borne in mind, that in a perpendicular attitude upon living limbs, the mysterious influence exerted by what is termed cerebral volition has a power in adapting to every physical agent its extent of duty in proportion to its capacity, and that it is by the obedience of each agent to that influence that its commands or dictates are carried out. Now that influence of volition cannot by any possibility be communicated from the point of a stump to an artificial substitute, so as to convey its dictates from the point of the stump to the termination of the artificial limb. My inference is, that all volition or mental power

can do is by the exerted unison of all the remaining parts of the amputated limb acting upon the inanimate socket, in the same manner as it enables the foot to act upon a shoe in adjusting itself to its use.

It is here, then, that the utmost nicety is required to secure the efficiency of my apparatus; and it is to this subject that I particularly wish to call the attention of surgeons.

I cannot understand that in the living man volition operates in the skeleton alone, or that other parts are only partially subservient. Everybody knows, that when the rigidity of death has reduced flesh, muscle, and sinew, to a state of stiffness resembling bone, it would be a most difficult task to place a corpse upon its feet so as to preserve an upright attitude without other support, and that to cause it to stand erect upon one foot would be an impossibility.

These hints are thrown out to induce those more capable than I am, to investigate with greater attention than I have hitherto paid to it, the nature of stumps in amputation; and I do so with more importunity, because, as before said, I have seen it asserted in several excellent

and standard works on surgery, that it is the usual mode to form the stump, to sustain the pressure of weight, that is, by resting the end of it on a pad, instead of suspending it, as it were, in the socket.

I conjecture, and I think I conjecture rightly, that this has arisen from the fact that few surgeons, after the operation of amputating the limb is over, and their patients recovered from its effects, know much of what occurs to them subsequently, or what relief can or cannot be afforded to them by the construction of artificial limbs. I repeat, that it is impossible for the weight of a patient to be supported on the end of a stump; and the surgeon who theoretically supposes that it can be so supported, can have but little practical experience on the subject. I have almost invariably found the point of the stump almost as sensitive as the ball of the eye, and in my own practice I take the utmost care that nothing whatever shall come in contact with it.

Much has been said of the necessity of bandaging the stump; but experience has taught me that, so far from this being necessary, it absolutely does injury to the patient.

I have known patients persist in using bandages with the artificial leg, and in the course of a few months the stump has become wasted and flabby; the bandage has been discontinued, and in a very short time the stump has resumed its healthy appearance, has become firm and muscular, and, in fact, presented an entirely renovated appearance.

In the construction of an artificial leg, it is of more importance than would at first be supposed, to make it a perfect match with the natural leg, of which it is to be the fellow. I can readily imagine that those persons who are not practically acquainted with the subject of artificial limb-making, may think the shape and outline of the substitute a secondary consideration, and that so long as it is fitted and constructed properly in other respects, these things are not worth much thinking about; but this is very far from being the case. Independently of similarity of shape and outline of the artificial limb with the real one affording greater certainty of gait and more lifelike appearance of motion, it is only by the strict resemblance of the one limb to the other that the artificial substitute can prevent detection from the eye

of an observer of even common discernment ; and it is, of course, desirable that such detection should, if possible, be avoided, both in regard to the feelings of the patient and to the idle criticisms which will arise from an apparent incongruity, where regularity of outline is not observed.

Thus we see that similarity of construction must be attended to, and that whenever it is not, an imperfect substitute is produced, and therefore the consequences are, both physically and mentally, excessively irritating and inconvenient.

The shape of the limb adds to, or rather forms, the lifelike appearance which creates character, if I may so term it, and is to the limb what, in painting a portrait or moulding a bust, an artist would call expression ; and any system of constructing artificial limbs, in which strict attention is not paid to that circumstance, must be considered incomplete and imperfect.

Unerring fidelity in forming the artificial limb on the model of the living one, of which it is destined to be the companion, must be obtained, and it is only by practical experience

and the skill of hand acquired by repeated efforts, that such fidelity can be rendered a matter of certainty by the practitioner.

At various times, and at this day, various means have been, and are, made use of to secure this essential point.

Thus, a cast in plaster of paris has been made from the living leg, as a model for the mechanism to form the artificial one, and this has been considered an unerring guidance; but it is liable to many objections, and is, moreover, a tedious and very unpleasant process. Again, a composition-mould of wax, &c., has been made use of, to obtain a cast from the living leg, as a pattern for the artificial one; but this method is liable to the same, and more, objections than the cast from plaster of paris, when reduced to practical working. A more simple means of getting the form of the living limb, and of applying it to the construction of the artificial one, is by the use of gauges taken at different portions of the living limb.

This mode is very simple, and is not attended with the inconveniences to the patient which arise from the others. It is very ingenious, and

very accurate in its operation, and what is in most cases of great importance to both patient and limb-maker, is a very expeditious mode of construction, after a comparatively short practice; indeed, whilst one cast of a limb is being taken in plaster of paris or in wax, three perfect artificial limbs may be moulded by the means to which I have alluded, and the amount of time and trouble avoided is almost incredible.

All these moulds, be it remembered, whether taken from the living limb or from casts of it, are only so many gauges for guidance in the construction of the artificial one, and are, by the skill and experience of the constructor, to be rendered subservient to his labour; they are to be his guides and assistants in his work; but in their use he has to exercise a discriminating judgment, without which they would rather impede than assist his designs.

“A workman of commonplace talents, however expert custom and habit may have made him in the use of his ordinary tools, is at a loss when deprived of those which he is accustomed to work with. The man of invention and genius finds out resources, and contrives to make such implements as the moment supplies answer his

purpose, as well and perhaps better than a regular chest of working utensils. The ideas of the ordinary man are like a deep rutted road, through which his imagination moves slowly, and without departing from the track ; those of the man of genius are like an avenue, clear, open, and smooth, on which he may traverse as occasion requires."

We may, therefore, conclude, that the science of artificial limb-making is neither a very simple nor easy acquirement ; it cannot be attained without great attention, great experience, and a habit of induction applied to facts. A very trifling discrepancy in the shape or outline, as I have already stated, will, in the formation of an artificial leg, give a very grotesque and absurd appearance to the wearer. A very small deviation from correctness in the shape and bearing of an artificial leg, will produce a very great amount of inconvenience to the patient, and tend greatly to mar what may in other respects be a very creditable performance on the part of the artist. Exactly as a pea or a small pebble in the shoe will cripple the wearer of it in a very little time, if it be not removed, so will a very small inequality or mistake in

the construction of an artificial leg reduce the wearer of it to a condition that will make him seek extrication from pain by discarding it altogether. He will be in a much worse predicament than the Pilgrim of Peter Pindar, with the peas in his shoes; for, unfortunately, *boiling* will not be found so efficacious a relief from his misery, as that process was to the ingenious individual who underwent penance in the poem of the witty satirist.

Having hitherto confined my observations almost entirely to amputations of legs, and to the appliances of artificial substitutes to cases of their amputation, I will proceed to offer some remarks upon the amputation of arms, and upon what art can do to supply their loss.

CHAPTER IV.

I HAVE hitherto addressed my observations exclusively to the subject of mechanism applied to the construction of artificial legs; I purpose now to say a few words on its application to artificial arms.

Whilst I have been advancing my ideas to perfection in the construction of artificial substitutes for one class of limbs, I have necessarily had my attention called to the construction of the others; and I make no scruple of affirming, that my success in one branch of my art has been equally decided with the other.

Mr. Potts, I believe, never entered into that branch of the art, by which substitutes for natural arms are constructed, although much of the mechanical apparatus originally conceived by him is applicable to that branch of my profession. My brother, who succeeded him, had scarcely time to apply himself to it

before he was seized with the illness which resulted in his death ; and, therefore, had not the opportunity of exercising, to any great extent, his ingenuity in reference to them.

At the time of his death, I confess, I knew nothing of the construction of an artificial arm ; and it was only as my reputation became confirmed as a constructor of artificial legs, that cases in which substitutes for arms were required, were presented to me.

One of the first that came under my care, was the case of an Italian nobleman from Milan, who lost his arm in the Italian war in 1848-9.

This nobleman had heard of the success of my practice with regard to artificial legs, having some years previously talked upon the subject with the late Marquis of Anglesey, who kindly bore testimony to the skill of my brother and myself ; and he came over to this country for the express purpose of ascertaining what I could do for him. I found, upon examination of the stump of the natural arm, that I could afford him the relief which he sought, and I made no hesitation in undertaking to provide him with a much better

artificial arm than the one he had been accustomed to make use of.

He was a man of an enthusiastic mind, and his energy imparted a portion of his enthusiasm to me. In all cases of this kind, the difficulties which present themselves can only be treated according to their peculiar character; and theorems, however apt their conception, cannot be carried out in practice without the greatest attention to peculiarities, and by numerous modifications. In the case of this nobleman, I found that such was the fact. We were both determined not to be beaten; we persevered, and our perseverance was at last rewarded by success. It was his right hand and part of his right arm that was to be replaced by an artificial substitute; and so perfect was the one that I constructed, that by it he was enabled very readily to button the wristband of his shirt with his right hand, draw on his boots, carve his food, ride and drive, and perform a great variety of things that, before I had fitted the artificial limb to the stump of the natural one, he had despaired of being ever able to accomplish.

Being a military man, it was very desirable that he should be able to use his sword with

his right hand, for the purpose of saluting, if not for defence; and by my contrivance that object was attained. He was able to draw the weapon from the scabbard, salute, and sheath it, in so natural a manner, that no person who did not know that he had an artificial arm, would ever have suspected that such was the case.

When he left England, he presented me with a very valuable token of his appreciation of my services, and I received the following note from him, which I here transcribe from the original.

“You may be sure, Mr. Gray, that I cannot leave your country without expressing to you how much I am satisfied with your art. I am very thankful to you for employing yourself in my service, and be sure that all my friends in the same position that I was in, shall know to whom I am indebted. I make no doubt Count Rohilant, after he has seen me, will come to London, and put himself in your direction. Accept, if you please, the little proof of my consideration, &c.”

The present was a valuable diamond ring.

During the practice I have had, since that time, in fitting artificial arms, I have had

many similar acknowledgments of my services, but from none of them have I experienced greater gratification than on the occasion I have mentioned.

I will say, at the risk of being charged with vanity, that my practice in the construction of artificial arms has been almost invariably attended with complete success. The principle of my contrivance is unerring, and though, of course, it must be modified to suit each particular case, the results will always be such as are desired.

A few remarks will be of use to surgeons. I know those gentlemen will not attribute them to an arrogant feeling of dictation, but will refer them to my anxiety to make my inventions as efficient as possible.

When the hand, from being crushed, or shattered by a gun-shot wound, or from any other cause, is compelled to be amputated above the wrist, no more of the fore-arm should be removed than is absolutely necessary; for here, as well as in amputation of the leg, length of stump is of the greatest advantage. The shortest or worst stump that can be made below the elbow, is infinitely more useful

to the patient than the best stump above the elbow ; for no artificial joint is at all to be compared to the real elbow-joint. In the lectures on surgery, recently delivered at Edinburgh, by Professor Syme, that eminent gentleman makes allusion to the cases of two patients of his, who had just then undergone amputation ; in both of which cases I was professionally concerned. He alludes to the importance of saving the arm, remarking that nothing that the ingenuity of man has produced, or can produce, is to be compared to the natural hand. This observation is undoubtedly true, and the learned Professor might have gone much further, and have said, with equal truth, that no artificial substitute, as compared with the natural member, can avoid evidencing its inferiority. The two cases to which he alludes are, however, admitted to be entirely satisfactory, as far as human ingenuity can supply a natural loss, and I take this occasion to acknowledge my obligation to that gentleman for his flattering allusion to my abilities.

In the course of professional intercourse, I was introduced to Mr. Dering, by a near relation of his, who required my assistance, and on

that occasion I discovered, in the course of conversation, that his ideas of mechanism, as applicable to artificial limbs, were sound and unusually original; I hope he will allow me to take this opportunity of acknowledging the value of many suggestions which I received from him, and publicly to return him my thanks. The reader will be gratified to learn that Mr. Dering, in addition to his great mental acquirements, is, at this moment, making important experiments on the applicability of the power of electricity as a propeller. In a recent conversation, he told me that he was sanguine of success, and that he had constructed a model engine, by which the truth of his opinions were corroborated.

It is not necessary that I should set forth the names of all those gentlemen, connected with the medical and surgical professions, from whom, on many occasions of amputations, I have derived advice, suggestions, and improvements; I feel an honourable pride in being able to associate the sanction of their approval with my handicraft. The testimony of such persons as Sir B. Brodie, the late Mr. Liston, Mr. Professor Quain, Mr. Stanley, Mr. Hodgson,

Mr. Guthrie, Mr. Professor Syme, Mr. Coulson, Mr. Fergusson, Mr. Solly, Mr. A. Key, Mr. Adams, Mr. Curling, Mr. Shaw, Mr. Lane. Mr. Ure, Mr. H. J. Johnston, Mr. H. C. Johnston, Mr. Cutler, Mr. Wakley, Mr. Wood, Mr. Erasmus Wilson, Mr. Morton, Mr. Erichsen, Mr. Lawrence, Mr. White, Mr. Headland, Mr. B. Cooper, Mr. Critchett, Mr. Kingdon, Mr. Paget, Mr. Pilcher, Mr. Partridge, Mr. Luke, Mr. Cæsar Hawkins, and Mr. Cusack, I cannot permit myself to pass over in silence. The approbation of those gentlemen is a most valuable testimony to my proficiency in my profession, and a guarantee to the public that I have not assumed to do that which I am incompetent to perform. To them, and to the surgical profession generally, I acknowledge my obligations, and return my thanks.

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CASES.

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BEFORE I proceed to transcribe some of the cases in which my mode of supplying artificial substitutes has been eminently successful, I will state my regret that, from the expense entailed by their elaborate construction, they are not within the reach of the poorer class of sufferers. This is the more to be regretted, because in the case of the affluent the loss of a limb does not reduce the sufferer to a state in which his relative position in life is rendered worse, whereas, when a poor man becomes crippled, he is reduced to a state of almost perfect destitution and misery. It is pleasing to have to state that, in some instances the active benevolence of the rich has been employed in alleviating the misery of their less opulent fellow-creatures, by paying for the means of affording them relief, thus enabling them to carry on such occupations as to secure them support; and it is no small tribute to the honour of the directors of the two leading Railway Companies of the Kingdom, that in various

instances in which their servants have suffered loss of limb in the performance of their duties, they have provided them with substitutes. This charitable conduct has been found to be, in fact, the most economical. Those who have been the objects of it have been rendered useful to the companies in many ways, and instead of remaining mere pensioners on their bounty, have become efficient agents in their service.

The Great Western Railway has a provident fund for the very purpose of supplying artificial limbs to those who have suffered in their employ, which has been of great use in removing misery, and in enabling many men to be again serviceable; but these are limited means to a great end, and I would suggest that, to the numerous benevolent institutions with which this great country abounds, the addition of an institution for furnishing artificial limbs to the poor, both military and civil, would be most desirable.*

* Since the above was written, it is singular enough that, through the active benevolence of a patient, R. Marsh Watson, Esq., an Association, having for its object the alleviation of this class of sufferers, is about being established, and with every likelihood of being well supported. I refer the reader to Case LXX., where he will see the origin of the scheme, and the liberality of the gentleman in question.

CASES

IN WHICH RELIEF HAS BEEN AFFORDED BY
MY INVENTIONS.

It is hardly necessary to say, that in describing cases in which relief has been afforded by my inventions to sufferers, delicacy and professional etiquette prevent me, with few exceptions, from giving names. As, however, I shrink from no investigation into my process of affording relief, and as I court publicity into my mode of rendering service to those by whom it is unfortunately required, I shall feel very happy in privately making such communications to persons who may be interested in their inquiries, as will convince them at once that every one of my statements are perfectly authentic, and at the same time can refer them to my patients in corroboration of what I state. My patients are, I am very sure, most ready to do justice to my truthfulness, and to confirm by their testimony whatever I have stated with respect to the success of my practice, and of the relief they have obtained from my labours.

In cases of those whose deprivation of limb or limbs

is well known, and where no pain can be inflicted by further publicity, the restraints to which I have alluded are unnecessary, and being therefore unrestricted by them, I feel no reluctance in becoming more explicit.

CASE I.

OF THE MARQUIS OF ANGLESEY.*

This distinguished nobleman, as is well known, lost his leg by a gun-shot wound at the battle of Waterloo. An operation was performed on the field; but the amputation not being satisfactory, a second amputation was performed, after his return to England, by Mr., afterwards Sir Everard, Hume. The leg was removed at about the middle of the thigh, and what is termed the flap-operation was adopted by the eminent surgeon employed.

His Lordship had a very excellent stump for receiving relief from, and giving effect to the mechanical aid which I afforded. The only fault, speaking in a professional tone, as far as I was concerned, was, that the stump was rather too short; the end of the stump in this case was well protected by a good covering of flesh,

* Wore the legs till eighty-five years old.

and was a little larger at the point than at three inches higher up. This is rather desirable than otherwise, as, when the limb is once nicely settled in the artificial socket, it makes the adhesion between the remainder of the natural limb and the artificial substitute more perfect; the stump in such a case fits into the socket in a manner similar to the cork in the neck of a champagne bottle.

It may not be amiss to take this opportunity of endeavouring to remove a good deal of misapprehension which has arisen from statements with reference to his Lordship's sufferings from the stump. The fact is, that he never experienced any pain whatever from it. Nothing could be further from the truth than to affirm, that he suffered from amputation of the limb having been badly performed. I can and do assert, that I have over and over again heard his Lordship say, that were not his attention drawn to the fact of the amputation by the observations made upon it, he should almost cease to remember that he had ever undergone it, as he felt little or no inconvenience from the loss of his limb, and, by the aid of the artificial substitute, was enabled to do everything he wished. The remarks as to his sufferings from amputation, I have no doubt, arose from a misapprehension of the origin of the afflictions to which he was a martyr for many years; and which were occasioned by *tic doloieux*; this was his only ailment, but unfortunately it was most intense, and nearly continuous.

This case is so well known, and his Lordship's extraordinary use of the artificial limb having attained such

a degree of notoriety, it will be unnecessary to say more concerning it. Any one interested in the matter, and who wishes for information on the subject, will be sure of a courteous reply by addressing a line to the Marquis. I make this known, because he has kindly given me express permission to do so.*

See page 4 of Correspondence.

CASE II.

MR. H..... S..... L.....

The case of the gentleman I am about to describe is in some respects similar to that of the Marquis of Anglesey. He received an injury to his knee in his childhood, by which, at the age of seventeen, amputation became necessary. The operation was performed by Mr. Heyes, of Leeds, at about the lower third of the thigh of the patient. It was the flap-operation. The stump in this, as in the previous case, is larger at the point than higher up. This peculiarity of shape of the stump does not develop itself until some years after amputation, and it is only in a few cases that it takes place. The way to promote its development, I submit,

* Since the lamented death of the late brave Field Marshal, the present noble Marquis has been equally courteous, and has most kindly wished me to avail myself of reference to him with respect to this most distinguished case.

is to leave good full flaps at the time of amputation, and to get the bone well covered at the point. Experience shows that the flaps do not absorb or become so small as the limb does at other parts, and as there is no pressure on the end of the stump, this may, perhaps, account for its undergoing no diminution.

The gentleman to whom this case applies is now about thirty-seven years of age, and has worn the artificial limb uninterruptedly ever since the amputation. His height is nearly six feet, and he is tolerably stout. His mode of walking is good, being natural and graceful; it would be difficult to detect a limp in his gait, and I am very happy to state, that he can walk eight or ten miles a day without fatigue.

See letter, page 181.

CASE III.

MR. C..... B..... Y... ..

In the case of this gentleman, who is now about forty years of age, and moderately stout, the amputation of the leg was performed nearly, or quite, twenty years ago. The leg was taken off above the knee, and the flap-operation was adopted. This gentleman had tried several descriptions of substitutes, but he received no relief from their use.

I have had him under my care for the last ten years. His case, from a peculiar muscular action of the stump, has been a very difficult one, requiring great delicacy in the treatment. He walks well and with great comfort, and can also ride. He enjoys good health; and altogether I consider this a very successful case. He has been fully sensible of the difficulties we have had to overcome, and has uniformly been most liberal in his acknowledgments of my services.

CASE IV.

CAPTAIN W..... W..... A....., H. E. I. C.

The case of this officer is a very peculiar one. He lost his leg from the bite of a tiger in Bengal, about eight years ago. The elephant upon which he was mounted, being a young one, became alarmed at the roaring of the tiger, and rushed beneath a tree. Captain A....., to prevent having his back broken by the branches, caught hold of one of them, and remained suspended by his hands and arms thereto for some time, the elephant meanwhile escaped. Immediately beneath the captain lay the tiger, which had been wounded by a ball. The captain's strength failing him, he at length fell, and the tiger seized upon him, lace-

rating his legs in so dreadful a manner, that one of them was obliged to be amputated above the knee. The flap-operation was performed by the regimental surgeon. The captain is now about thirty-six years of age ; he is moderately stout. He wore the common wooden leg, and suffered much from pressure ; the bone exhibiting such symptoms of disease, that had he persisted in wearing the wooden leg, he must have undergone a second amputation. He has for some time worn my invention, and his health and energy are perfectly restored. He can ride and walk with comfort and ease, and so completely is the loss of his limb supplied by my contrivance, that he is about to return to India to resume his military duties. He has most obligingly permitted me to publish his name, and a letter which he wrote to me.

In reference to this case, I have extracted a paragraph from an Indian newspaper, giving a full account of the accident.

“ We regret much to have to record a sad accident which occurred in the Dhoon on the afternoon of the 16th instant. Captain Hay, late of the first European Regiment, Fusileers, and Lieutenant Aubert (of the 34th N. I., Adjutant of Sumoor Battalion), having received information from some natives that a tiger had killed two bullocks and a man close to them, ordered out their elephants, and very soon reached the spot. Captain Hay was a little in advance on one flank of the jungle, and passed the tiger. Mr. Aubert immediately after perceived him feeding on the man whom he had killed, and fired four shots at him ; the roaring of the

brute frightened the elephant, who bolted; as he was running off, one of the Goorkha servants seized hold of the trunk of a tree, and Mr. Aubert did the same, but while the Goorkha fairly swung himself into the tree, Mr. Aubert fell to the ground, either in consequence of the branch breaking, or his being unable to hold on. The tiger instantly sprang on him, and seized him by one of his ankles; Mr. Aubert, kicking him with his other foot for some time, succeeded at last in getting away with his ankle completely smashed, and actually walked towards the tree, and was attempting to get up it, when the tiger again rushed at him, seized his other leg with his claws, dragged him down, and again fastened on the wounded leg just below the knee. Captain Hay's elephant had also bolted, but was brought back, and he reached the scene of the sad accident about dusk. He fired no less than thirteen shots at the tiger, when the latter charged the elephant, and commenced a regular fight with him; the rider being, on account of his extreme unsteadiness, unable to fire a shot at his assailant. After a short time the elephant got a fair kick at the tiger, who fell as if dead; but to make sure, Captain Hay fired at him, on which his elephant again bolted; when brought to, she was pronounced by the mahout to be in such a state of excitement as to endanger the rider's life if he attempted to dismount. Captain Hay was consequently obliged to remain for a time where he was, when presently he saw Mr. Aubert coming up on his own elephant, the sight of which quieted Captain Hay's so much, that he was able to go to the assistance of his wounded companion. It may

be understood in what a dreadful state the latter must have reached Dhera at about five o'clock in the morning of the 17th. One of his legs (that first injured) was immediately amputated above the knee; but the doctor is in hopes that, although dreadfully lacerated, the other may be saved, the patient bearing his sufferings with the utmost fortitude. The native who was killed by the tiger, was engaged in skinning the first bullock when he was attacked. It is a singular fact, that the father of Lieutenant Aubert (who is greatly esteemed by all who know him, and whose friends will grieve to hear of this sad misfortune) was thrown from his horse and killed; that one of his brothers was killed by lightning, and that another died from the effects of a fall from his horse at Delhi."—*Delhi Gazette*, 25th March, 1848.

It may not be irrelevant to mention another anecdote connected with this gentleman, more especially as the necessity which compelled the sufferer, in his eagerness for the sports of the stream, as well as of the field and the forest, to adopt a somewhat cumbrous apparatus, is by my means happily removed.

Captain Aubert, being for the time incapacitated from seeking "the lion in his dreadful haunts," or

"Beating the thicket where the tiger slept,"

resumed the amusement of the "contemplative man," viz., the "angle," of which he had always been a votary. He was extremely expert in hooking the giants of the waters; but he experienced some difficulty in the process of what is termed "playing" them, previously to landing them on *terra firma*. To accomplish the

desirable end of tiring out the prey which had swallowed the bait, he had himself placed on a seat similar to a sedan-chair, the upper part of the machine having been removed. His attendants acted as the chairmen, and took their places between the poles. No sooner did the Captain "get a bite," than the chairmen ran up and down the bank of the stream, according to the route of the fish, their master directing the pace, and manœuvring with the skill of old Isaac Walton. This curious expedient supplied the place, in a very peculiar manner, as may be imagined, of the power of spontaneous locomotion, and by it the sportsman was enabled to secure immense success to his sport. I have heard of a gentleman, whose lower extremities being paralyzed, was accustomed to take his position in an easy chair, at the corner of a wood abounding in pheasants, and get shots as the birds flew out; but I think the contrivance of my patient was a decided improvement on the *ex cathedra* popping of the shooter.

See letter, page 182.

CASE V.

MR. W.....

A young gentleman, a member of Lincoln's Inn, who lost his leg seven years ago, was recommended to me by Mr. Stanley. He had undergone mid-thigh amputation (the flap-operation). He wears my artificial substitute, and walks very well.

See page 183.

CASE VI.

MR. J..... L..... C.....

In the case of this gentleman the amputation was performed about seventeen years ago, and he has worn the artificial limb ever since. The flap-operation was adopted. He is now about forty years of age, rather stout; he can walk with great ease, and being a professional man in town, to be able to walk is almost an essential qualification to him. Few people would be able to detect the loss of his natural limb, and I consider him one of my best walkers. I publish his letter.

Correspondence page 183.

CASE VII.

MR. P.... B.....

The flap-operation in the amputation above the knee was adopted in Ireland in this case. The gentleman has worn my artificial substitute three years. He had previously undergone great suffering from other artificial legs. He can now walk and ride with perfect ease. He is a stout, thick-set man, about thirty years old. I publish his letter to me.

See page 184.

CASE VIII.

MR. W..... B.....

In this case the amputation above the knee was performed by Mr. Cæsar Hawkins about ten years ago. He has never worn any artificial leg but mine. He is now about thirty-six years old. He walks uncommonly well, and can go long distances without fatigue. It is the flap-operation, very well performed.

CASE IX.

MR. V..... B..... J.....

Is a young gentleman of fortune, and came to me ten years ago, being then twenty-one years of age ; he suffered some inconvenience at first, but this was soon overcome. He had never been under any other practitioner. It is a circular operation, and the place of election the upper third of the thigh. This is a very satisfactory case, and I call particular attention to his letter to me.

Page 185 of Correspondence.

CASE X.

MR. G..... C..... C.....

The patient in this case is a solicitor of great eminence. Amputation above the knee was performed upon him about thirty years ago. He has worn my artificial substitute continually, and walks well, suffering little inconvenience. He is now about fifty, and stout. The flap-operation was adopted.

I publish a letter from him, at page 186.

CASE XI.

THE REV. W..... J..... C.....

The flap-operation in the amputation was adopted in this case nearly thirty years ago. The patient, a clergyman, a near relative to a late bishop of great eminence, can ride and walk well; he is a rather stout man, about fifty years of age.

I have published his letter; page 187.

CASE XII.

MISS D.....

In the case of this lady, Mr. Fergusson, who performed the amputation in a very skilful manner above the knee, adopted the flap-operation. She is now about eighteen years old, and has constantly worn the artificial limb for the last twelve months. She has a good figure; and so successful have been my labours, that she scarcely appears lame, so that her friends can hardly believe that she has sustained such a severe loss. She is very active. I was most anxious to obtain success in this case, and I am happy to say, my efforts were rewarded with perfect success.

CASE XIII.

MISS B.....

In the amputation above the knee, Mr. Norman, of Bath, the operator, adopted the flap-operation. The lady is about twenty-five years of age, and has worn my artificial limb upwards of ten years. Her figure and gait are good, and she walks in an easy, natural manner. Her acknowledgment of my skill is very flattering and gratifying to me.

CASE XIV.

MISS P.....

This lady, who is about sixty years of age, and *very stout*, underwent amputation of the leg above the knee, by Mr. Heyes, of Leeds, who made use of the flap-operation; the amputation was admirably performed. She has worn my substitute more than seven years, and it has afforded her the utmost comfort. She had previously suffered great pain, the stump being much excoriated, &c., and bruised. This is, of course, a necessary consequence of a bad-fitting, ill-constructed leg, and a heavy, stout patient. Her expressions in acknowledgment of my assistance have been most gratifying to me, as, from the pitiable state of discomfort I found her in, I was naturally anxious about her.

CASE XV.

GENERAL BARON LANGENAU, AN AUSTRIAN GENERAL.

This foreign officer, who distinguished himself in the Italian wars under Marshal Radetzky, lost a leg in battle. He is now ambassador from his own country to

the court of Sweden. He underwent amputation above the knee in 1850, the flap-operation being adopted. It was by the recommendation of the Marquis of Anglesey that I was introduced to him, and I fully succeeded in furnishing him with an artificial limb, which, as far as art can supply the want of nature, I may say is perfect. He is able to ride and walk without inconvenience or fatigue. Prince Metternich, who saw the results of my endeavours in this case, was kind enough, in a letter written a short time ago to a friend in Brussels, to pass a very high eulogium on my skill.

I publish a letter from the General to myself, at page 188 of Correspondence.

CASE XVI.

CAPTAIN BARON SWINBURNNE.

This gentleman is also an officer in the Austrian service, and lost a leg in the Italian wars, at the battle of Chentza. He underwent amputation, in which the flap-operation was adopted above the knee. The stump, from the nature of the wound, is a very short one. I furnished him with an artificial limb, which enables him to walk and ride very well, and he is still in the military service. Before he was introduced to me, he had tried many foreign artificial legs without any benefit. My

efforts in his case, I am happy to say, have succeeded perfectly. Captain Swinburnne is about thirty years old, moderately stout, and of a good figure. During the time he was under my treatment, I introduced him to Prince George Gagarin, a Russian officer, who was then under my care. The Prince was much pleased, and quite astonished at my success in this case.

CASE XVII.

MASTER E.....

The amputation above the knee was performed in the case of this young gentleman by Professor Syme, of Edinburgh, about four years ago; the flap-operation was adopted. The patient, who is now nearly eight years old, is the son of Lord, and nephew to a late premier. He can walk, ride, and even climb trees, and is very active, and full of animal spirits. My success in this case has been very remarkable, and only shows what may be accomplished in a *moderately* good case. I have repeatedly received the personal thanks of Lord and Lady, and in all ways the case has been a most satisfactory one.

I have published a letter relating to it. See page 189.

CASE XVIII.

MR. S..... P.....

This gentleman, at the age of about forty, was thrown out of his carriage, and had the misfortune to so crush and bruise his leg, that it became necessary he should undergo amputation above the knee. Mr. Solly operated upon him with great success, and adopted the flap-operation. He was able, after six weeks, to walk. This case was published by Mr. Solly in the *Lancet*, and attracted much attention at the time. I was very successful in applying the artificial limb, and alleviating the discomfort attending the loss of the natural one. This was, however, a very difficult case, and it was only after repeated efforts that I was successful.

I have published a letter from him ; page 190.

CASE XIX.

PRINCE GAGARIN.

The patient in this case is a Russian general of Cossacks, who lost his leg in Circassia, in the service of the Czar. The limb was amputated above the knee, and the flap-operation made use of. The Prince is

enormously stout, and about fifty years of age. It is now about four years since he was introduced to me by the Marquis of Anglesey, through Baron Brunow. I fitted him with an artificial leg, and my labours, I am happy to say, exceeded my original expectations, though from his great weight the result was not so favourable as it otherwise might have been. He can, however, walk well: the first day he wore my artificial leg he walked to his lodgings. I mention this case to show, that under the most unpromising appearances, and the worst circumstances, very great relief can be given. The Prince had tried legs made in Paris, but they had been useless to him.

Circular Operations.

CASE XX.

CAPTAIN C....., R.N.

Although the majority of surgeons are favourable to the flap-operation, yet there are not wanting men very eminent in their profession, who prefer the circular mode of amputation. I must confess, I concur with the former. I consider the flap-operation, in all cases of amputation of the leg, by far the best; and as

far as relates to the assistance that I can administer by artificial substitute, it is decidedly superior to the circular. I have thrown out some reasons for this opinion in the preceding pages, to which I invite the attention of those who operate, as upon the mode of operation so much depends of the future comfort, or the future pain and annoyance, of the sufferers.

The gallant officer whose initial C..... is prefixed to this case, is in the Royal Navy. He lost his leg in action when about fifteen years old, and for upwards of thirty years he has worn various kinds of legs. He has experienced great relief from my invention. He is a tall spare man, of active habits. The stump, in this case, is one of the most sensitive and difficult ones I ever had under treatment, arising in great measure from the bone having been left too long in the circular operation. This and the next case are two of the very worst I have seen.

I subjoin his letter on his own case ; page 191.

CASE XXI.

SIR C..... DE V....., BART.

This officer lost his leg in action, and underwent amputation, upon the field, above the knee. He came to me in the year 1846. This case illustrates my

objections to the circular operation. The amputation had been badly performed, and a piece of bone projected from the stump, which was very sensitive to pressure. He had worn artificial legs for many years before he came to me, but had not experienced the relief he sought. He acknowledged in the most kind manner the comfort and ease I afforded him, and very candidly admitted the difficulties I had to surmount in his case.

See letter, page 192.

CASE XXII.

ADMIRAL SIR W. O. PELL.

Lost his leg many years ago, in action, above the knee, upper third. The circular operation was adopted. He had tried various artificial legs before he came to the late Mr. Potts, who fitted him at that time; and subsequently he was under the care of my brother and myself. He can walk with great comfort, and rides so well in hunting, as to be considered a crack rider; he is mentioned in the *Gentleman's Magazine* as a keen sportsman and accomplished horseman.

See his letter, page 193.

CASE XXIII.

MR. B.....

This gentleman is about fifty years of age, and very stout; lost his leg late in life. The operation was performed by Mr. Aston Key. The stump is short. From want of exercise, his state of health was bad, and he had undergone so much torture from inefficient and imperfectly contrived artificial limbs, that he was in despair. He is now doing well, and for these two years has been able to ride and walk with ease.

His health is also improving very rapidly.

CASE XXIV.

MR. M.....

Amputation was performed on this gentleman by Mr. Cusack, of Dublin; the operation was circular, immediately above the knee. He came to me about ten years ago, and I found that he had been a great sufferer, having received no alleviation for the loss of

his limb from the artificial legs he had worn, but on the contrary, had been reduced to a most pitable state of helplessness. He now rides and walks well. He is about forty years of age.

I publish his letter to me, at page 193.

CASE XXV.

MR. C.....

When sixteen years of age, about twelve years ago, the leg of this gentleman was amputated by Mr. Aston Key. The stump, for the circular operation, is a good one, and almost equal to the flap stump; and I had less trouble, in consequence, than I generally have had where the circular operation has been adopted. The patient can walk admirably, and is very strong and active.

CASE XXVI.

SIR W..... H.....

In the case of this gentleman, an officer in the army, amputation was performed after action, above the knee, and for a circular operation the stump is good. He has

worn the artificial limb upwards of thirty years, having previously tried others, which failed to administer relief. He is now nearly seventy years old, and can ride and walk well; occasionally he suffers from spasms in the stump.

CASE XXVII.

GENERAL SIR H. KING.

This officer lost his leg in action, and suffered amputation on the field. The circular operation was adopted, leaving a good stump. The General is now upwards of seventy years old. He has worn my artificial substitute for more than three-and-twenty years. He had previously tried others, without success. After repeated efforts, I had the satisfaction of affording him relief. He is in person very spare; he can now walk with great ease. Through this gentleman I have received many patients. He considered, what I had constructed concerned the general public, and should be made known to everybody; and, as far as he could, he was certainly the means of giving it great publicity. Mr. Potts, in his day, used to think the General one of his most difficult patients, and I am not greatly surprised that he should have done so.

See his letter, page 194 of Correspondence.

CASE XXVIII.

MISS L.....

In this case the patient is fifty-six years of age. The stump, the result of the circular operation, was a bad one, short, and very sensitive, and she was in a state of great debility. She had worn artificial legs for some years, and suffered much from the use of them. About a twelvemonth ago she came to me. I fitted her with an artificial limb, which afforded her great relief. She can now take exercise, and is recovering her health. She is very grateful for the relief I have afforded her.

CASE XXIX.

MR. G..... L.....

Amputation of the leg, according to the circular operation, was performed on this young gentleman in a very skilful manner by Mr. Hancock, about three years ago, when the patient was only sixteen years of age. He can, with the assistance I have afforded him, walk very well. His health, however, I am sorry to add, is very delicate, and he shows symptoms of a consumptive habit. He is, nevertheless, very active, and quite sanguine of recovering his health, now that he can take exercise.

CASE XXX.

MR. M.....

In the case of this gentleman, the circular operation, the amputation was above the knee, about the upper third of the thigh. Mr. M. had tried, before he came to me, about ten years ago, various kinds of artificial legs, and the stump had been very much injured by them; I fitted him with one of my artificial limbs, and the result has been perfectly satisfactory. He is a very stout man, about fifty-five years of age.

CASE XXXI.

MR. N.....

The patient in this case, a spare man, about twenty-eight years of age, was obliged to have his leg amputated in consequence of a railway accident about three years ago. He for some time used the common wooden or peg-leg, and suffered greatly from it. The stump was long, and the artisan quite ignorant of the proper mode of giving relief. His lameness, since he has worn my artificial limb, is scarcely perceptible, and he is able to walk and ride without difficulty.

CASE XXXII.

MR. R.....

This gentleman is the son of a late Baronet. He is about twenty-seven years of age, and stout. He came to me about ten years ago, previously to which he had suffered much from wearing the common peg-leg, and various kinds of artificial limbs. The amputation had been performed halfway up the thigh. Before I fitted him with my invention, he was obliged to walk with two sticks for his support. The first day he wore my artificial leg, he walked with ease from Cork-street to Charing Cross.

See his letter, page 195.

CASE XXXIII.

DR. T.....

The sufferer in this case is a professional man, and it is a matter of consequence to him that he should be able to get about. He is spare in person, and aged about forty years. He lost his leg six years ago, and amputation was performed on him by Mr. Cusack, of

Dublin, about halfway up the thigh. The stump was much contracted forward, and I had a good deal of difficulty in fitting him. I have, however, the means of overcoming contractions of this sort. He is now able to walk with ease.

See his letter, page 196.

Cases of Amputation below Knee.

CASE XXXIV.

THE HON. AND REV. FITZROY STANHOPE.

This gentleman, who is upwards of sixty years of age, tall and well made, had the misfortune to break his leg many years ago, by a carriage accident, which rendered amputation necessary. It was performed at Cambridge, below the knee. Before he came to me, which is about ten years ago, he had tried many artificial limbs, and had suffered much from excoriation of the stump. I have afforded him complete relief; he can walk and ride with ease and comfort, and being in the habit of shooting, is able to get over hedges and fences without difficulty.

See his letter, page 197.

CASE XXXV.

MR. R... B.....

This is a case in which the flap-operation had been adopted, at the upper third below the knee. The patient was very stout, and about forty-five years of age. It was a bad case; the amputation had been badly performed, and the flaps had torn away from the front, leaving no protection for the bone. He had worn the peg-leg and an artificial substitute, without relief. I have had him under my treatment for four years. He can now ride and walk well; his sufferings no longer exist.

See letter, page 198.

CASE XXXVI.

MR. B.....

In this case the patient lost his leg on a voyage to Australia, about three years ago. The amputation, the flap-operation, was well performed at Melbourne. When he returned to England, he came under my care. He is a stout young man, about twenty-three years old. He can walk well.

CASE XXXVII.

THE REV. G..... F..... B.....

This gentleman, who is spare, lost his leg by an accident from a gun, in 1851, when about twenty-three years old. The amputation was made by Mr. C....., of Bruton, immediately below the knee. The knee became stiff. The mode of stump produced was very troublesome, and no advantage is derived from it; it is, in fact, very disadvantageous; and I am sure the operator will, having seen the ill effects arising from it, not again adopt it. The reverend gentleman has been under my care since 1852; after great trouble, I succeeded in affording him relief; and have since that time been engaged in several shooting excursions with him: it is quite remarkable how he gets through thick hedges and over walls.

See his letter, page 199.

CASE XXXVIII.

MR. C..... H..... B.....

The patient, who is stout, and about twenty-three years of age, lost his leg in consequence of a gun acci-

dent. He has been my patient about four years. The amputation was very well performed by Mr. Lingen, of Hereford, the flap-operation being observed; the results are perfectly satisfactory. Mr. C. H. B. can play at cricket, and has frequently walked fourteen miles a-day with the help of my invention.

See page 200.

CASE XXXIX.

MAJOR C.....

This is the case of a gentleman who was spare at the time he lost his leg, but who has since become stout. He is about thirty-eight years old. He lost his leg at Maharajpore, and amputation was performed, the flap-operation, on the field of battle. When he came to England, after having worn the common wooden leg for four or five years, he came to me, and I fitted him; his leg had been amputated at the upper third. The results of my labours were quite satisfactory, and he is now at Calcutta, attending to his military duties.

See his letter, page 201.

CASE XL.

MR. P.....

This gentleman, who is now about fifty years old, lost his leg about ten years ago. The flap-operation was used at the upper third, and a good stump obtained. He wore an artificial leg, which, from the inconvenience and pain it caused him, he was obliged to discontinue. He was then sent to me by Mr. Stanley, and I succeeded in fitting him with an artificial limb, by which he can walk and ride well. He is stout, but very active. He is fond of field sports, and can join in them without inconvenience or much fatigue. He is a large landed proprietor in Lincolnshire, and is well known there.

CASE XLI.

MR. D.....

Amputation of the leg was performed on this gentleman, who is between fifty and sixty years of age, and stout, at the upper third, by Mr. Solly; and for some time he wore the common peg-leg. In 1851, he came to me. He now walks a great deal, with ease, and feels no pain whatever.

CASE XLII.

MR. T.....

Mr. T..... is stout, and about fifty-five years old. He lost his leg in 1851, and amputation was performed by Mr. Stanley. He came to me at once, and I am very glad to say I have furnished him with an artificial substitute for his lost limb, which is perfectly satisfactory. Mr. Stanley saw this gentleman, a short time ago, and was much struck with his walking and perfect independence.

See his letter, page 202.

CASE XLIII.

GENERAL KOUPREANOFF.

This gallant foreigner, who is a stout man, about sixty years old, lost his leg in battle. Amputation was badly performed, and the knee is slightly contracted. He came to this country from St. Petersburg, and was sent to me by Sir Benjamin Brodie. I succeeded so well in furnishing him with an artificial limb, that he now rides and walks with great ease; and I had the honour of having a high compliment paid to my skill

in this case, by Baron Brunow, to whom the General was well known, and also receiving an invitation to St. Petersburg, from the Russian Government—alluded to elsewhere.

CASE XLIV.

CAPTAIN H.....

This is the case of a Danish officer, a spare man, about forty years old, whose leg was amputated at the upper third. For some time he wore the common peg-leg, and underwent pain and great inconvenience. He came to me from Copenhagen, and I had the satisfaction of so fitting him with an artificial limb, that he now walks well, and I am sure has never regretted his journey or his application to me.

CASE XLV.

MR. N.....

Lost his leg when a boy. Has tried all kinds of artificial and the common pin-legs, and suffered great

agony for many years. From not being able to take exercise, his health suffered greatly, and he became depressed and irritable. When he came to me, ten years ago, he was quite out of heart. He is now sixty; has worn my legs uninterruptedly for ten years with great comfort, and is quite a different man in all ways.

CASE XLVI.

MISS S.....

This lady lost her leg by an accident some twenty years ago, and during sixteen of that period had experienced great torture. Had tried various kinds of artificial legs, but, from having a naturally bad and irritable stump, got no relief until she adopted those made by me. Although the stump is very short and tender, she walks considerable distances, and gets up and down stairs with ease. Scarcely any peculiarity of gait. She has worn the artificial limb four years, and is much improved in health.

CASE XLVII.

THE REV. J..... S.....

This gentleman lost his leg while at Oxford, many years ago. Has tried many kinds of substitutes, and has been a great sufferer. He is a clergyman, and naturally has a good deal of walking in an extensive and populous parish,—it is of great importance to him to be able to do so. Has worn my legs ten years, with great comfort; his age is thirty-eight; he is spare and active. The stump is short and difficult to fit.

See letter, page 203.

CASE XLVIII.

MR. W..... H..... R.....

This patient lost his leg fourteen years ago. He has tried various substitutes, and suffered much. The stump is contracted back, and in consequence an artificial joint is made use of, as in case 37. Mr. Kingdon, who operated,

advised the use of a wooden leg ; hence the contraction. Is now thirty ; has worn my limbs nine years ; experiences great comfort, and walks remarkably well.

See Correspondence, page 204.

CASE XLIX.

MISS A..... H.....

This young lady lost her leg six years ago. Mr. Stanley operated, and when she was sufficiently recovered, introduced her to me. Her stump is a very good one, and from the circumstances of the case, I took an unusual interest in it. My endeavours were perfectly successful ; she walks, without any appearance of lameness, great distances. She can dance, and frequently does so. She mounts up and down stairs quite as readily as most people, and in short, can do almost anything she pleases.

Mr. Stanley was good enough to compliment me very highly on my success, and her case is well known amongst the profession.

See letter, page 206.

Middle of the Leg and Lower Thirds.

CASE L.

LIEUTENANT B.....

This gentleman, who is rather stout, and aged about twenty-one years, lost his leg at the battle of the Alma, and the amputation, in which the flap-operation was adopted, was made on the field. He then went to Scutari, and from thence came to me. The result has been perfectly satisfactory, and it is hoped he will be able before long to resume the duties of his profession. He is very active; can dance well, and run very rapidly for a short distance.

It is a remarkable circumstance, that his father, a gallant officer, was formerly a patient of mine, and experienced great relief from the artificial limb.

CASE LI.

MISS B.....

This young lady is twenty-three years old; she is moderately spare. It is ten years since her leg was amputated at the lower third. Previously to her

coming to me, she had worn other artificial legs, and had suffered much from excoriation. She has now been under my treatment eight years. She can ride and walk as well as ever she did, and exhibits no appearance of lameness. She is an elegant dancer, and rides very gracefully.

CASE LII.

MR. T..... B....., M.P.

In this case the patient is about forty years of age ; he is spare and very active. He lost his leg by a carriage accident four years ago, and underwent amputation by Mr. Mallett, of Bolton, who performed it very skillfully at the lower third. Three years ago he put himself under my care. He is now able to walk remarkably well, and leads a very active parliamentary life. He rides well.

See his letter, page 207.

CASE LIII.

MRS. B.....

This lady, who is now about three-and-twenty years old, lost her leg when sixteen. She came to me at

once, and I fitted her. She had undergone the flap-operation at mid-leg. She walks with ease, and goes about a great deal without suffering from pain. She is quite independent with the artificial limb, and not the least lameness is observable.

CASE LIV.

MISS G.....

This young lady, who is a governess, is about twenty-three years old, and slightly made. Amputation, the flap-operation being adopted, was performed below the knee, by Mr. Coulson, who presented her with the artificial leg I constructed. She now walks with ease, and by the benevolence of Mr. Coulson, has been enabled to resume her duties as a governess.

CASE LV.

THE HONORABLE C..... H....., M.P.

This gentleman, who is about thirty years old, lost his leg at Hungerford-pier, some twelve years ago, by a steam-boat accident. Mr. Lawrence and Mr.

White performed the amputation at the lower third (the flap-operation). He tried for some time various artificial legs made in London and Paris, all of which were thrown aside as useless. Ten years ago I fitted him; previous to which he had been my brother's patient; and he is now able to walk, ride, and dance, being very active. I feel no scruple in mentioning the name of this gentleman, because his case has been publicly alluded to, very frequently; and I am sure he will not object to it.

See his letter, page 208.

CASE LVI.

MR. D..... J.....

This gentleman, now about forty years old, spare and active, lost his leg in 1843, at Nice, by falling over a precipice whilst shooting. The operation made use of was the circular amputation, being moderately well performed. He has, however, a troublesome stump, and it is affected by change of weather. He came to me at once, and I am glad to say he can now walk very well,—nearly as well as ever he did. Through him I have had ten or a dozen cases entrusted to my care.

CASE LVII.

THE REVEREND B..... J.....

This clergyman is rather stout, and aged about fifty years. He underwent amputation of the leg (the flap-operation) by Mr. Hodgson, at about the mid-leg; the stump is a good one. For some time he wore the peg-leg, and was a sufferer. Mr. Hodgson advised him to come to me; he did so, and by my aid is enabled to ride and walk, and to perform his clerical duties with great comfort.

See his letter, page 209.

CASE LVIII.

CAPTAIN L.....,

Who is about twenty-seven years old, lost his leg in India, at Sobraon; amputation was performed on the field (the flap). It is rarely the case, in India, that the patient recovers after an amputation. He had a leg made in India by a native manufacturer, but it was of no service to him. Having made Mr. Hardinge's acquaintance, he came, by that gentleman's recommendation, to me, and the result has been perfectly satisfactory. He now acts as a captain in a militia regiment.

CASE LIX.

MR. P..... H..... M.....

In this case the leg was lost by accident, when the patient, who is now about fifty years old, was twenty years of age. He used various artificial legs without relief for some time, until he came under the care of the late Mr. Potts, about thirty years ago, since which time he has uninterruptedly made use of the legs I manufacture. Though stout, he is remarkably active, and can walk, &c., very well. He has done much to raise my reputation in Brussels, and elsewhere.

See his letter, page 209.

CASE LX.

MR. R..... M.....

This gentleman is a surgeon. He suffered amputation at mid-leg, Mr. Liston operating (the flap), about ten years ago, when the patient was twenty years old. For a long time he made use of artificial limbs, that were worse than useless. About eight years ago he came to me, and can now walk well. I have been complimented on this case by Mr. Quain, who is well acquainted with it.

See letter, page 210.

CASE LXI.

MR. M'C.....

The patient, who is now aged about forty, is moderately stout. He lost his leg by an accident, and amputation (the flap) was performed by Mr. Key at mid-leg. He suffered great torture from various artificial limbs, and in consequence he came to me about six years ago, having accidentally met one of my patients in Wales. I fitted him, and he is now able to walk and ride with ease, and follow his commercial pursuits. He is a very active man.

See letter, page 212.

CASE LXII.

DR. M.....

The patient, a medical man at Bremen, aged about fifty, and of spare make, came to England in 1845, and having suffered amputation, by advice of Mr. Liston placed himself under my care. He had previously worn artificial limbs made at Paris, and elsewhere on the Continent, and undergone great pain. From the ulcerated state of the stump, arising from uneven pressure, I had great difficulty in fitting him; I did, however, suc-

ceed, and he now walks a great deal, and takes long journeys on horseback. In 1849 he went through the campaign under Charles Albert, without experiencing inconvenience, and was a marvel to all who knew him.

CASE LXIII.

MR. J..... V.....

The patient, who lost his leg many years ago, is a stout man. He has never worn any artificial legs, but those constructed for him by Mr. Potts, my brother, and myself. He is very active, and can walk with ease. He is very well known in Oxford, in which city he has resided many years. The amputation is at mid-leg, and circular mode observed.

CASE LXIV.

MISS S.....

This lady is moderately stout, and is about thirty years of age. She lost her leg by an accident. Amputation was skilfully performed by a surgeon at Horn-castle, and she came to London to procure an artificial leg. She suffered a great deal from having placed her-

self in the hands of those who could afford her no relief, and she ultimately came to me. I succeeded so perfectly in fitting her, that she is able to walk with ease and comfort. Leg amputated at lower-third, and the flap-operation made use of.

CASE LXV.

MISS S.....

Aged about twenty-nine years; moderately stout. Having broken her leg by a carriage accident, she underwent amputation at the lower third (flap-operation) by Mr. Irving, of Keswick, who performed his part very skilfully. After suffering great inconvenience, pain, and disappointment, from the use of artificial limbs inadequate to their purposes, she by chance met a lady, one of my patients, in Leeds, about four years ago, and in consequence came to me; she now walks very well, and feels no pain.

CASE LXVI.

MISS B.....

Is a young lady aged about twenty-one years. Her leg was amputated at the lower third below knee; the



flap-operation was adopted. The amputation was very skilfully performed by Mr. Field, who invited me to be present. Mr. Coulson was also present. I, at their request, pointed out the place of election. Miss B..... now walks well, and suffers no inconvenience. This case is well known to professional men, and from the success which attended my labours, is considered a very remarkable one.

CASE LXVII.

MRS. C.....

This lady is the wife of an opulent merchant, and mixes very much in society ; she is now about fifty years of age, and rather stout ; she was a patient of Mr. Potts. Amputation was performed below knee, about midway. She walks so well, that the loss of her natural leg is not perceptible.

CASE LXVIII.

MR. A.....

The patient, who is a cabinet-maker at Bolton, in Lancashire, was a member of a benefit society, from the funds of which the expenses he incurred with me were

defrayed. Notwithstanding the loss of his leg, he is able to follow his occupation, and earn his own livelihood. He was operated upon by Mr. Levy ; the circular operation below knee. He came to me with an excoriated stump, attended with a great discharge, the result of wearing a bad artificial substitute. He is now free from pain or discomfort, and can walk well.

CASE LXIX.

MR. C.....

Mr. Erichsen performed the amputation of this patient's leg, at the lower third below knee, adopting the flap-operation. My success in fitting him with an artificial leg was so complete, that, at the request of Mr. Erichsen, he attended, within a week after he had been under my hands, at the University College Hospital, in order to show the pupils there how perfectly my substitute supplied the place of the limb he had lost.

CASE LXX.

MR. R..... M..... W.....

This gentleman, who is now about thirty years of age, was the last private patient on whom Mr.



Liston performed an amputation. The leg was removed below knee, the circular operation being adopted by that eminent surgeon. For some time he suffered the usual course of torture which arises from the use of badly constructed artificial limbs. Eventually he came to me; and, as will be seen from his letter, my mode of treatment has afforded him the ease and comfort for which he some time sought in vain.

See Correspondence, page 213.

Syme's and Chopart's Operations.

CASE LXXI.

MISS A.....

In the case of this young lady's amputation, the Syme's operation was very skilfully performed by Mr. Lawrence, of Brighton. She for some time endured great pain and suffering, from wearing an artificial limb totally unsuited to her case. She came to me about two years ago, and I fitted her with an artificial foot, by the aid of which she walks up and down stairs with perfect ease, takes a good deal of exercise, and never feels fatigue.

See letter, page 215.

CASE LXXII.

MRS. B.....

This lady had the misfortune to be run over by a waggon. The Syme's operation was performed on her by Mr. Erichsen in a very skilful manner. She came directly to me, and I have fitted the mutilated leg with an artificial foot, which has rendered her loss almost imperceptible ; she takes active exercise, and never experiences discomfort of any kind.

CASE LXXIII.

MR B.....

The patient, who is a gentleman of independent fortune, aged about forty years, moderately stout, was sent to me by his brother, Mr., after he had undergone Mr. Syme's operation by Mr. Wilson, of Manchester, about five years ago. I have afforded him the most satisfactory aid, and I beg to return my thanks to Mr. Quain, who has mentioned my name in connexion with this case in the *Medical Times*.

CASE LXXIV.

MR. B.....

This is a case in which the Chopart operation was performed on the patient, a young man about twenty years old, by Mr. Wakley, in a very excellent manner. It is a remarkable case, and as such is mentioned in the *Lancet*, in connexion with the artificial foot which I supplied. He can now walk as well as he did before the loss of his natural limb rendered my services necessary.

CASE LXXV.

MR. D.....

The Chopart operation was adopted in this case by Mr. Foster, of Huntingdon, in a very admirable manner. The patient, a young gentleman, aged about twenty-one years, the son of a large landed proprietor, had the misfortune to be mutilated by a thrashing-machine. The aid I afforded him has been so complete, that he walks with as much ease, and with as little fatigue, as before he suffered amputation. He is a keen sportsman, and when out shooting, gets through brushwood, turnips, grass, &c., and over hedges and ditches, without diffi-

culty. I have shot in his company, and I consider myself a good walker, but he has tired me by his activity and power of getting over the ground. Since he has worn my artificial limb, he has made a trip to Australia.

See letter, page 216.

CASE LXXVI.

MISS G.....

I was so successful in fitting this young lady with an artificial limb, that on the application of Mr. Critchett to her father for the particulars of her case, with a view to its publication in the *Lancet*, he objected, on the ground that the loss of her foot had been so perfectly supplied, that nobody was aware of it; and he, very naturally, under the circumstances, did not wish to enlighten such happy ignorance. She is now about twenty years of age. She underwent the Syme's operation, performed with great skill, about six years ago, by Mr. Critchett. It was a very difficult case.

CASE LXXVII.

MR. S.....

The sufferer in this case was operated upon by Mr. Syme himself in a very skilful manner; he is about thirty years of age, stout, and active. For some time he wore the "Syme's boot," but in his case it did not answer well. He now wears an artificial foot made by me, and he walks great distances with perfect ease.

CASE LXXVIII.

SIR T. TROWBRIDGE.

This gallant officer had the misfortune to lose both his legs at the battle of Inkermann. Syme's operation was adopted on one leg, the other amputated about mid-leg. Soon after his arrival in this country from Scutari, I met him with Mr. Fergusson, who from the first took the greatest interest in my successful treatment of the case. As he can already walk about the house and lawn, and mount a horse with ease, I have no doubt but that in a short time he will be rendered very independent, and suffer comparatively little inconvenience from his loss. I may be permitted to say, that Her Majesty the Queen testifies her great solicitude in the case of this gentleman, which is, without doubt, one of the most remarkable I have been engaged in.

Supplementary Cases above Knee.

CASE LXXIX.

MR. J..... C.....

This gentleman is the son of a baronet ; he suffered amputation of the leg about twenty years ago, and was a patient of my late brother. He had previously used other artificial legs, without benefit. He now rides and walks with ease and without pain. The amputation was above knee, at the upper third.

CASE LXXX.

CAPTAIN S. LIDMAN.

This gentleman, who is about twenty-six years of age, and of stout make, is an officer in the Swedish service. He lost a leg by an accident at a review, from the ramrod of a cannon which exploded. The King of Sweden, who saw the accident, felt a great interest in his case, and sent him to England to me, through the introduction of Baron Rehausen, the ambassador. Amputation

had been performed at the upper third, the flap-operation being adopted. He had worn an artificial leg, made at Stockholm, before I fitted him, about three years ago, but it was of little use to him. By my means he now rides and walks well, and is at this time attached to the Swedish Embassy at Constantinople. I have heard from him, and he has expressed his satisfaction to me. I have also heard from other persons who have seen him at Constantinople, that my artificial limb affords him most satisfactory results.

CASE LXXXI.

DON FERNANDO DE SOUZA.

This gentleman, a Portuguese of noble birth, and nephew to the Duke de Palmella, lost his leg by a gunshot wound in a revolt at Lisbon. He is now thirty-two years of age, and came to me about twelve years since. Amputation (the flap-operation) was performed at the mid-thigh. He has never worn any artificial limb except mine, having come direct to me, on the recommendation of the Marquis of Anglesey. I fitted him with great success, and he experiences great comfort and freedom from pain.

CASE LXXXII.

COLONEL F.....

This officer, who is aged about sixty years, lost his leg in the Peninsular war; amputation was performed above the knee, the flap-operation. He is a remarkably tall, strong, and active man, a personal friend of the late Lord Raglan, and well known to a large circle of friends and acquaintance. After having tried a variety of artificial limbs, from which he received no assistance, he applied about thirty years ago to Mr. Potts, and he subsequently came under my hands; he is now enabled to walk with perfect ease.

CASE LXXXIII.

CAPTAIN F.....

This patient, who is upwards of fifty years old, and who is the brother of a baronet, lost his leg in Holland; amputation was above the knee. He came to me after having tried various artificial legs, all of which had failed to afford him relief. I found his case a very perplexing one to deal with, but I at length succeeded in overcoming the difficulties, and he now rides and walks well.

See page 217.

CASE LXXXIV.

MR. J..... A.....

This gentleman was originally a patient of Mr. Potts, and has worn the artificial leg about twenty-five years. He is a native of Geneva, and about fifty years of age; he can ride and walk in a manner so remarkable, that few people in Geneva are aware that he has ever suffered amputation. The place of election was at the upper third of thigh, and the circular operation.

Arms.

CASE LXXXV.

MR. H..... A.....

This gentleman is about thirty years of age. He underwent amputation immediately above the wrist-joint, by Mr. Hodgson, and came at once to me. I have fitted him with an artificial limb, by which, amongst other things, he can feed himself, unbutton his wristbands, and hold the reins of his horse in riding.

CASE LXXXVI.

CAPTAIN C.....

Captain C..... is twenty-six years old, and lost an arm by a gun accident. About six years ago he came to me, through his relative, Lord; amputation having been performed halfway up the forearm. He was very anxious to continue in the army, and all that art can effect has been done for him. He is now in the Crimea, with his regiment.

See his letter, page 218.

CASE LXXXVII.

MAJOR I.....

This gentleman distinguished himself at the siege of Moultan, where he lost an arm by a ball. Amputation was performed at the upper third of fore-arm. Through the recommendation of Sir Benjamin Brodie, he came to me about six years ago. He has returned to India, where, in consequence of the artificial limb with which I fitted him, he is perfectly able to perform his military duties. He is a remarkably tall man, about thirty years of age, and of determined courage.

See his letter, page 218.

CASE LXXXVIII.

MISS P.....

This young lady, who is only sixteen years of age, is slight. Her arm has been amputated at the lower third fore-arm. She can "crochet" and feed herself, and it would be difficult to discover that she is indebted to one of my inventions. She was placed under my care by Mr. Stone.

CASE LXXXIX.

MISS H.....

This young lady, who is one of the aristocracy, is in person slight, and aged seventeen years. She underwent amputation at the wrist, and was placed under my care, nine years ago, by Sir Benjamin Brodie. She can do all things as if she had not lost a natural limb, and the loss is not perceptible.

CASE XC.

MISS H..... K.....

This young lady, aged fifteen, is the daughter of a distinguished officer. She suffered amputation of the arm. Her case was a difficult one, but I succeeded in rendering her able, by an artificial limb, to do everything that was required. She was placed under my care by Mr. Headland.

CASE XCI.

MR. W.....

A gentleman well known in fashionable life, aged about twenty-eight years. He unfortunately lost an arm when a child from an explosion of fireworks. After having tried various artificial limbs, to no purpose, from their weight and clumsiness, he, through the recommendation of Lord Anglesey, came to my brother, who was then living. His case has been perfectly successful, and by the use of the limb which I construct, he is enabled to hunt, shoot, drive, &c., and to make his own toilet.

CASE XCII.

THE REVEREND C..... J.....

This clergyman lost an arm in India, and underwent amputation (the flap-operation) at the forearm. The stump is a good one. He came to me three years ago, previously to which he had suffered much from inefficient treatment in fitting artificial limbs. I have the satisfaction of stating, that, by my mode, he is now able to do what he requires, and suffers neither pain nor inconvenience.

CASE XCIII.

MR. J..... W..... L

Aged about twenty-eight, stout. He lost an arm when a child, and amputation was performed about an inch below the elbow. He was under the treatment of my brother for five years, and has been under mine for these last ten years. Mr. Hodgson sent him to me. He can now feed and dress himself, and shoot and ride.

CASE XCIV.

MR. P.....

This gentleman, who is only twenty years of age, is of great promise and attainments. He has undergone amputation of the arm, an inch below the elbow. He was, by the recommendation of Mr. Hodgson, placed under the care of my brother, and subsequently under mine. He is, by means of the artificial limb with which we furnished him, able to dress himself, &c., and remain independent of the assistance of others.

See page 219 of Correspondence.

CASE XCV.

MR. P..... K.....

A stout young man, twenty-three years of age ; he has undergone amputation at the mid-forearm. He was placed under my care by Mr. Tamplin, about twelve months ago. He had, before that, worn an artificial arm that did not answer ; he now experiences little or no inconvenience.

CASE XCVI.

MISS T.....

This lady is about thirty years old ; amputation of the arm in her case was very admirably performed by Mr. Syme. She came under my care about a year ago, and by my aid she can perform all requisite things with an artificial limb. She presents a very good appearance. Mr. Syme has done me the honour of mentioning me, in his lectures in Edinburgh, in high terms in connection with this case.

CASE XCVII.

COLONEL R.....

The Colonel lost his arm in action in Burmah. After his return home, amputation was performed (the flap-operation) in a very skilful manner, at the middle forearm, by Professor Syme. He came to me at once ; about a year ago I completely succeeded in rendering him all the assistance that art could afford, and he is now again in India, fulfilling his military duties. The learned Professor has stated in his lectures that this is also a very satisfactory case.

Cases of Amputation above Elbow, and at Shoulder-Joint.

The great use of the artificial limb in cases of amputation above the elbow and at the shoulder-joint, is to preserve the appearance of the figure, and to protect the mutilated parts. The moving power is necessarily gone by the removal of the elbow-joint, as far as the lower part of the limb is concerned ; unfortunately, art can do but little here ; it can only supply a comparatively imperfect substitute for nature. Appearance and symmetrical outline can be preserved by art ; but the extensor and flexor muscles being gone, it is in vain to attempt anything beyond this.

CASE XCVIII.

MR. S..... M..... F.....

The arm, by an accident from a gun ten years ago, was so shattered as to render amputation necessary ; it was accordingly performed close to the shoulder-joint, and I supplied a substitute. The artificial limb has given great satisfaction.

See letter, page 220.

CASE XCIX.

MRS.

This lady was one of the victims of the horrible tragedy enacted a few years ago in Norfolk, the perpetrator of which expiated his crime on the scaffold. Her arm was amputated halfway up, between the elbow-joint and the shoulder, by Mr. Solly, by whom she was introduced to me, for the purpose of having an artificial limb supplied. The result of my labour is completely satisfactory, as far as appearance is concerned, the loss of the natural limb being scarcely perceptible.

CASE C.

MASTER B.....

This patient had the misfortune to lose an arm by an accident occasioned by a thrashing-machine. Amputation was performed halfway up, in a very skillful manner, by Mr. Ringrose, of Potter's Bar. It is an instance of the assistance afforded by my artificial limb. He can wash and feed himself, and do many other little things without assistance. The arm having been lost in childhood, the wonderful manner in which nature repairs such a deprivation is illustrated. He is now about twelve years old, and has worn my substitute for three years.

CASE CI.

LORD S.....

This nobleman, who is about forty years of age, lost an arm about three years ago, by an accident. Amputation was performed immediately above the elbow-joint. I have afforded all the assistance that art could supply. Mechanical aid in such a case is defective in supplying the loss of motive power. The stump is, however, protected, and a good appearance given.

CASE CII.

MR. P.....

This gentleman is about twenty years of age, the son of a landed proprietor in Lincolnshire. He was thrown from his horse about a twelvemonth ago, by which the amputation of his arm, close to the shoulder, was rendered necessary. The flap-operation was adopted. He was introduced to me by one of his neighbours, who is also a patient of mine; and I fitted him with an arm, which is at once a protection to the stump, and, as far as appearance goes, a perfect substitute. He returned to the country, perfectly satisfied with my treatment.

CASE CIII.

This case is a very recent one. The sufferer, Isaac Church, a private in the Grenadier Guards, lost an arm at Inkermann, and was placed under my treatment by command of Her Majesty the Queen, whose benevolent interest in the circumstances of those who serve her need not be eulogized here. Amputation was performed at the upper-third forearm. He is enabled to do almost anything he pleases, by the use of my artificial limb.

CORRESPONDENCE.

CORRESPONDENCE

CORRESPONDENCE.

It will be seen that in the testimonials to my skill and experience which I have laid before the public, I have not cited any from members of the Surgical or Medical profession. I considered the evidence which is contained in letters from patients, more conclusive of my successful claims, and of the benefits to be obtained by those requiring my assistance. Indeed, the testimony afforded by these letters renders that of professional men unnecessary, and it would be a work of supererogation to produce them. I am so well known to the members of the Surgical profession generally, that to select the testimony of individual members would be invidious, and to give a long list of favourable opinions would be tedious ; neither would it be fair to call upon those gentlemen, for whom I entertain the highest respect, to put themselves to the trouble of writing letters which are not required.

CASE I.

*Beaunesert,**November 19, 1845.*

MY DEAR SIR,

I have just heard from the Archbishop of York of the death of your brother William. Although I thought him very unwell when I saw him in town, I was not prepared to hear of his death so soon; and you may believe me when I assure you that no one regrets it more than I do, not merely on my own account, but because I consider him a public loss.

From the account he gave me of your capabilities when I last saw him, I hope to hear from you that you feel competent to succeed to his position, and continue the assistance that he afforded with so much credit to himself and benefit to those who required his aid. The Archbishop is very anxious about you, and I have written to him to-day, saying, that if you continued in the same profession, I would certainly do all in my power to forward your views. Probably in a day or two you will let me know what they are; and with my unfeigned condolence for the loss you have sustained,

I am,

Your well-wisher,

ANGLESEY.

F. Gray, Esq.

CASE II.

*London,**August 11, 1855.*

DEAR SIR,

Having now worn an artificial leg of the description you have so much improved and perfected, for the long space of twenty-three years, I think it only common justice to you to acknowledge, which I do with very grateful feelings, that of late years, under your skilful and scientific auspices, I have experienced a most sensible increase of comfort and relief in the use of this wonderful and valuable substitute for the natural limb; the real merit of which, as a work of the nicest art, requiring, as it does, a modification of the principle of construction to the respectively varying cases of those seeking its aid, can only be fully appreciated by the actual experience of those who use it.

I shall always gladly embrace every occasion that presents itself in future, as I have done hitherto, for manifesting my sense of the value of your exquisite mechanical appliance; and whenever you think I can be of any service in bringing others acquainted with this truly beneficent invention, I beg you will make any suggestions to me, with this view, which may occur to you.

I remain, dear Sir,

Yours truly and obliged,

H. S. L.

Frederick Gray, Esq.

Cork Street.

CASE IV.

*London,**May 25, 1855.*

MY DEAR GRAY,

I must be permitted, before leaving England, to record my gratitude for the very great comfort and relief I have derived from your skill in the manufacture of artificial legs.

It is now eight years since it was my misfortune to suffer amputation of the leg above the knee. I then applied to you to make me an artificial limb, which for ease and comfort, both in walking and riding, cannot, in my opinion, be equalled, and certainly not surpassed. To one in my situation, the benefit I have derived from your skill is incalculable, as it enables me to return to an efficient performance of my military duties

I remain, dear Gray,

Very sincerely yours,

W. W. A.

Capt. Bengal Army.

F. Gray, Esq.,

&c. &c. &c.

CASE V.

DEAR SIR,

The aid you have afforded my son is most gratifying. I think him very much improved in his walking, and he never complains of any discomfort; under his severe trial, I have every desire that he should have every advantage.

Believe me, dear Sir,

Yours gratefully and obliged,

Fred. Gray, Esq.

.....

CASE VI.

London,

August 15, 1855.

MY DEAR SIR,

In begging your acceptance of the accompanying I am anxious to take the opportunity of expressing my very grateful acknowledgment for your services, which, for nearly twelve years, have added so much to the comfort of my existence.

Unfortunately, long experience has afforded me, perhaps,

better means of judging, than your patients generally, the merits of the various contrivances of other mechanics. I feel bound to admit that you have far outstripped all, both as regards simplicity of construction and power of locomotion. This opinion, I know, is entertained by those friends who, like myself, have had recourse to your assistance.

I most sincerely trust you may, as I believe you will, always continue to hold that pre-eminence which your skill and diligent application deserve.

Yours truly,

.....

F. Gray, Esq.

CASE VII.

Mount Rothe,

March 29, 1854.

DEAR SIR,

I did not receive the new leg until yesterday ; it surpassed my utmost expectation as to its perfectness as a piece of mechanism ; and I think I might add, that in my opinion it is the *ne plus ultra* of skill in that way. I have now to thank you most sincerely for the promptitude with which, and the elegant manner in which, it has been executed. And now, dear Sir, wishing you every good fortune,

I remain

Your much obliged,

P. B.

F. Gray, Esq.

CASE IX.

*Shandrum Castle,
Charleville,
February 23, 1855.*

MY DEAR SIR,

I was very glad you got the cheque all right, as I feared by your long silence that it had not reached you. The leather case of substitutes came over without any damage. They are perfect specimens of art, and are a great comfort to me. I think it is now more than ten years since I commenced using your legs, and during that time, thanks to your valuable assistance, I have been enabled to enjoy myself in the way of shooting, fishing, and particularly hunting, to the astonishment and delight of my friends, who are often at a loss to know which is the artificial limb. By the first opportunity I will forward the old leg, which is a little knocked about.

I remain,

My dear Sir,

Yours sincerely,

V. B. I.

CASE X.

*Sevenoaks, Kent,**May 30, 1855.*

MY DEAR GRAY,

I respond to your note at once, and with all the confidence that upwards of thirty years' wear and tear of your artificial legs have created in my mind. Here I am, at the age of fifty-eight years, healthy and hearty, and with my stump as firm and free from pain, and other attendant ills, as can be. From the time I took to your substitute, I have not had any drawback, and I assure you at times I have quite forgotten that one leg is my maximum; the durability, too, of the article, adds no little to its value. All I can add is, that if the maimed wish to see, not only the leg, but the wearer, I would with pleasure benefit mankind, by showing myself without cost or charge. I have been induced to see many patent legs, and one recently, and I don't hesitate to say, with thirty years' experience, all others are failures. Say anything I can add to this, and it shall be done with truth—"the whole truth, and nothing but the truth."

Yours faithfully,

G. C. COLE,

Solicitor, &c.

F. Gray, Esq.

P.S.—As to the walking part—I have to say that I not unfrequently, when in town, walk from the Bank of England to Hyde Park, and other distant places.

CASE XI.

Chipping Sodbury,
May 30, 1855.

DEAR SIR,

There cannot be very many among your patients who go back as I do to the days of Mr. Potts, the first maker of the Anglesey leg.

You have not, and I trust never will have, one of the advantages which he, as a practical artificer, possessed.

Nevertheless, the tradition of his art has come down to you in a very near and complete way, while in some instances you have improved upon the original.

So do not think of cutting off a limb by way of defying competition; but simply do for brave Sir Thomas Trowbridge and others what you have done for me, and you will have plenty of friends.

Meanwhile, as a friend of thirty years' standing (to the house, if not to yourself personally)—for when I began you were but a boy—I have pleasure in subscribing myself,

Yours truly,

W. J. C.

CASE XV.

*Vienna,**March 24, 1855.*

DEAR MR. GRAY,

The courier reached Vienna on the 22nd, and brought me your letter and the two legs, with which I am very much satisfied. A few days after you receive this letter, you shall have your bill paid on calling at Baron Rothschild's, whose house in London received order from here to do so.

The legs being stronger in the ankle, as you say, I hope now to be provided for a long time, if I have no more accidents. General Doll has the intention to go to London very soon, at least I heard so, and the poor man, walking with great difficulty, and being very tall and stout, has great confidence in your art. You can be sure, Mr. Gray, that all people who are in the same dreadful position as I am, and who ask me for counsel, I shall address them to you, because I don't believe that there can be a better and more comfortable kind of artificial leg.

I am, Sir,

Your obedient servant,

LANGENAU.

CASE XVII.

Brighton,
July 1, 1855.

MY DEAR SIR,

I must apologize for not having more quickly replied to your letter, which reached me while on a tour in the West of England, from whence I have only now returned. He is getting on well here, improving not only in his walking powers, but becoming also an accomplished horseman.

It was of greater consequence to him than to other boys, to be early grounded in the elements of horsemanship, and he has, therefore, been sent twice a week to the riding-school here, pretty regularly for some time, with very satisfactory results. His natural bodily activity is fortunately great, and he begins to be so much at home in the water, that I am not without hopes he will learn to swim. I have been trying in my head to contrive an apparatus to fix on the stump, with a view to assist his swimming, but without much success. Had the leg been amputated below the knee, nothing would have been simpler than to attach to the leg something like a swan's foot, by an opening and closing valve of India rubber, or other substance, but anything of this kind is made more difficult, and less certain of succeeding, by the shortness of the stump.

Perhaps your more inventive genius may suggest some

contrivance to facilitate the act of swimming, as it has already done in the case of the much more difficult one of walking.

Believe me,

Yours sincerely,

M.

CASE XVIII.

August 13, 1855.

DEAR SIR,

I most readily bear my testimony to the efficacy of the legs constructed by you. I have used one for more than three years, and during that time I have travelled thousands of miles by railways and steamboats, with very little inconvenience.

I have frequently conversed with fellow-sufferers, who have tried artificial legs constructed by others, and their general testimony has been, that there were none equal to those constructed by you.

I am, dear Sir,

Yours truly,

S. P.

F. Gray, Esq.

CASE XX.

*Royal Hospital, Greenwich,**July 13.*

DEAR SIR,

It is always a pleasure to me bearing witness to your high respectability, and any testimonial I can give as to your skill and abilities, I feel you are justly entitled to at my hands, few having been so much concerned with you as myself, owing to the peculiar state of my case. I cannot forget, also, with what spirit and energy you set to work (and so young at the time) at your brother's death, showing your great capability for improvement of artificial legs. Very happy I am, for the sake of humanity, and for your own sake as well, that many a sufferer can, and no doubt will, derive the greatest assistance from you. May they all appreciate as highly as I do your valuable assistance.

Believe me,

Yours very truly,

W. CUPPAGE,

F. Gray, Esq.

Captain, R.N.

CASE XXI.

Belgrave Square,
August 14, 1855.

SIR CHARLES DES VŒUX willingly, and with pleasure, bears his testimony to the great superiority of Mr. Gray's legs over all others that he has made use of. From the long experience he has had in the use of those substitutes, he is enabled to state that it has been his misfortune to have made use of legs fabricated by different artists, and he has no hesitation in stating that Mr. Gray's are in every respect preferable to all others, and more particularly in respect to their weight, which is lighter nearly by one half to the others. Sir Charles des Vœux takes this opportunity of expressing his acknowledgment to Mr. Gray for his attention and care in carrying out many little comforts he has suggested to him.

F. Gray, Esq.,
Cork Street.

P.S. Mr. Gray can make any use he pleases of this note.

CASE XXII.

*Royal Hospital, Greenwich,**August 11, 1855.*

SIR,

I have much pleasure, after thirty years' practical experience in various climates, in bearing testimony to the great ease and comfort of your artificial legs, both as regards walking and riding.

I walked for many years with the common stick leg, and for some years with an artificial leg, made at Bradford; I can, therefore, justly estimate the superiority of your make

I am, Sir,

Your obedient servant,

W. O. PELL.

CASE XXIV.

*Dublin,**June 6, 1855.*

DEAR SIR,

Having received so much relief and satisfaction from artificial legs made by you for me, gratitude, as well as fellow-feeling for those similarly circumstanced, impels me to request you will place my name in the catalogue of those your genius has served.

Yours faithfully,

W. M.

Mr. F. Gray.

P.S.—I ride a good deal latterly.

CASE XXVII.

7, *Sussex Square, Hyde Park,*
July 20, 1851.

MY DEAR SIR,

I am glad to be able to report very favourably of the new leg. Lady King and I took a long walk round Kensington Gardens to-day, and though I am now an old man and not in very good walking condition, as you know, I took the entire circuit, and walked it with the greatest ease. I am perfectly free from any kind of excoriation, and you have succeeded in giving me the propelling power we have so often talked of, and which makes a walk so pleasant. I can only thank you most sincerely for your care of me, and I am quite sure your brother and yourself have contributed very considerably to prolong my life, for with my ailments I could not exist without exercise; I shall see Mr. Fergusson in a day or two, and will tell him what you have done for me in the new leg.

I am,

My dear Sir,

Yours very sincerely,

HENRY KING.

F. Gray, Esq.

CASE XXXII.

*Loretta, Cheltenham,
June 30, 1848.*

MY DEAR SIR,

According to promise, I send you a line to say how I am progressing, now I have got settled down at home. I never could have believed in my present independence, and I look upon my introduction to you as one of the happy days of my life; I can walk any distance without fatigue and inconvenience of any kind, and from being a helpless cripple, and in constant pain, I am now one of the most active men in Cheltenham; at least, there are few who get about more, either riding or walking, than I do.

Mr. — will call upon you in a few days, and without your betraying to him any of your secrets in the art, I am sure he will be very much interested in the process, if you will kindly show him over your studio, as you promised me you would.

I can only repeat what I have before expressed to you, that I never can sufficiently repay you for what you have done for me; and I can only therefore ask you to believe that

I am, sincerely

And gratefully yours,

E. O. R.

Fred. Gray, Esq.

CASE XXXIII.

*Bally Philip,
Killenaule, County Tipperary,
July 26, 1849.*

DEAR SIR,

According to promise, I write you a line to say what progress I am making in walking with the artificial leg you made for me.

I am happy and glad to inform you that I am getting on favourably, and beg to return you my grateful thanks for having contributed so much to my comfort in this life ; I could scarcely have credited any person telling me that I should have felt so much at ease, and walk so well as I can now, in so short a time ; I can safely say I have walked two miles with pleasure to myself.

I am using the first leg you made me at present, and I had also to shorten the suspender.

In conclusion, I beg to say I shall be most happy to bear testimony to any person you may wish, as to the superiority and wonderful mechanism of your artificial legs, and remain,

Dear Sir,

Yours very truly,

CHRIS. J. TUTHILL, M.D.

Fred. Gray, Esq.

CASE XXXIV.

*Trevor Square,
March 2, 1855.*

MY DEAR SIR,

I am told that you are making a collection of testimonials concerning the goodness of your artificial legs. Now having used them for many years, I feel that I am but doing you justice when I say that I find them (as I have often told you) perfection. I do not think they can be improved; they are most strong, durable, light, and not complicated; and you make them to fit to perfection. I shall be happy at any time to show any of your patients how well and comfortably I get on with them. Previous (many years back) to knowing you, I got on very badly; since that time I have done as well as possible. My firm opinion is, that no one but yourself understands making an artificial leg.

Faithfully yours,

FITZROY STANHOPE.

CASE XXXV.

Bungay, Suffolk,
June 1, 1855.

DEAR SIR,

Herewith you will receive one of my artificial legs to be repaired, which please to return as soon as finished.

I cannot refrain from stating how glad I am that I met with you in the time of need, and how very comfortably I can walk about, certainly much better than I ever expected. I have found all you told me quite true, although I doubted it at the time, being then so depressed in spirits; you will remember how I suffered at first from the effects of my former leg; but for the last three years I have found your leg the greatest comfort of my life, and with my weight (being sixteen stone) I can now walk very comfortably a few miles, and this is all I really care for, having always a pony and gig at hand.

I daresay you will ever remember the state of mind I was in when I first called upon you. This arose from previous suffering and disappointment. After eighteen months of misery from the unskilful treatment of . . . I went to the Exhibition of 1851 with a friend, in hopes to meet with the best leg that science could produce there, but in that expectation I was disappointed. . . . I then called upon you at the request of . . . and shall never forget the relief I felt, the weight that seemed to leave my mind, when you showed me a finished leg; I felt

convinced instantly that I could walk with it, hope and confidence then drove away the despair which had half killed me. . . . I much regret that your skill is not available in the cases of my poorer fellow-sufferers, and my horror at their inconvenience and suffering is very great.

I am, gratefully yours,

R. B. B.

F. Gray, Esq.

CASE XXXVII.

DEAR GRAY,

At the time of my accident it never occurred to me that I should ever be able to get about as well as it is possible to do with your artificial legs, without feeling any inconvenience from pressure on the stump. In our very hilly country I frequently walk ten or twelve miles a day without being much fatigued, and very often at the rate of more than three miles an hour. Again, with regard to riding; I thought I should never have been able to have mounted a horse again, but now find myself able to ride nearly as well as ever, and although having ridden hitherto with a common hunting-saddle, I find the Somerset saddle, which you recommended me to use, much easier to keep my seat with. Altogether, through your invaluable assist-

ance, I am able, between walking and riding, to perform my clerical duties, although I know that I am one of your worst cases, with great ease and comfort to myself.

Very truly yours,

G. F. B.

Frederick Gray, Esq.

CASE XXXVIII.

Cambridge,

June 8, 1855.

DEAR SIR,

. . . . I have much pleasure in bearing testimony to both the efficacy and comfort of your artificial legs ; indeed, I have found myself able (much to my own satisfaction) to join in field sports, such as cricket, fishing, shooting, &c., which I thought I should have been obliged to give up altogether, as far beyond my reach.

Believe me, dear Sir,

Yours very sincerely,

.

F. Gray, Esq.

CASE XXXIX.

*Dumdum,**October 30, 1851.*

MY DEAR SIR,

I have just seen a number of the *Morning Post*, containing a well-merited encomium on your admirable artificial legs, and as, having worn one upwards of a year, I consider myself tolerably *au fait* to their merits, take the opportunity of pointing out what appears to me to be a defect in their construction,* and which I am convinced has merely to be brought to your notice to be remedied, whilst its removal will decidedly be a great improvement, more especially when they have to be used in tropical climates. . . .

In making these observations, you will not, I trust, for a moment imagine that I am actuated by any wish to disparage the present most useful substitutes for the lost member; my sole reason for submitting them is the hope that you may have it in your power to add still more to their utility. In a cold climate, perhaps, the defect to which I have referred is, comparatively speaking, of little or no importance; but under the tropics it is absolutely necessary, for nearly half the year, to have every part of the person lightly covered. . . . Now it is

* The defect complained of was in subsequent legs removed, and the alterations introduced were quite satisfactory.

tolerably cool, and I can wear it throughout the day, and I need not say that I thoroughly appreciate the comfort it bestows.

Believe me,

My dear Sir,

Yours faithfully,

A. C.

Town Major, Calcutta.

Frederick Gray, Esq.

CASE XLII.

New Bond Street,

July 3, 1855.

DEAR SIR,

After two years' experience of the use of your artificial legs, I can honestly say that I hardly think them susceptible of improvement; they are light and durable, and your mode of fitting very wonderful. I frequently walk from Bond Street to Bayswater, without fatigue or inconvenience from chafing. Through your aid I am enabled to attend to my business, which otherwise I should have been totally incapacitated from doing; indeed, until I experienced your valuable assistance, I was not able to do anything.

Accept my sincere thanks for your aid.

Yours truly,

J. T.

Frederick Gray, Esq.

CASE XLVII.

The Lawn, South Lambeth,

March 12, 1855.

DEAR SIR,

In reply to your note, I have much pleasure in testifying of the convenience and comfort I have found in the use of the artificial legs you have made for me. It is now about ten years that I have worn the long ones, and in all respects I have found them superior to the short ones I used before. I can walk five or six miles with ease, and without resting; and when my duties require me to be standing or walking about for several hours together, I can do so without inconvenience or much fatigue; nor do I find any difficulty in walking up and down stairs, which my duties so frequently require of me. I can climb as you would, not advancing one leg and dragging the other, but alternately, and without requiring, unless they are steep, the use of the handrail. Though I use them so much, it is very seldom that I suffer from excoriation, which troubled me greatly in using the short ones. Indeed, this may be altogether avoided by having two or three in use with sockets of different bearings. Another advantage of them is the rest they afford to the other leg, by the greater pressure that can be taken on them. On all accounts I should recommend those who require such assistance, to use the long ones in preference to the short, as the difference in comfort and convenience is very great.

If the stating this should be of any use to you, or should lead any to the adoption of two sockets instead of one, it will give much pleasure to,

Yours very truly,

I. S.

Incumbent of

CASE XLVIII.

Old Broad Street,

December 29, 1854.

DEAR SIR,

At the risk of being thought somewhat egotistical, I am induced by a sense of public duty, and a feeling of sincere sympathy for fellow-sufferers, to place upon paper my grateful experience of your valuable and important services, and to state my belief that all other artificial substitutes have completely failed in their object. I feel the less hesitation in speaking of my own case, since I consider doing so, both as regards myself and your other patients, an obligatory act of justice at this sadly eventful era, when so many of our countrymen return to the land for which they have fought, maimed and crippled, and requiring every alleviation that science can afford to prevent their existence from becoming a burthen to themselves and their friends. None but the sufferer himself can realize the hourly distress occasioned by the loss of a limb, or can appreciate the value of such services as replace it. Pardon me, therefore, if I obey my feelings of gratitude to you, and dwell at length upon my own case, for the sake of those similarly situated.

I may, on the onset, state that an eminent man, Mr. Kingdon, operated upon me at the age of eighteen—an operation performed below the knee; that for some years I used the common peg leg, on account of proofs which I had of the utter uselessness and inconvenience of ordinary artificial legs as advertised—that I made an object of testing their efficiency by the experiences of the wearers, who one and all, together with my doctor, advised me to remain as I was. It was not until (as you are aware) a maker, a stranger to you, leaving this country, privately gave me your address, and candidly informed me that you were the only maker whose substitutes could be used with perfect ease and comfort, that I decided upon availing myself of one of them. So strong, however, was my prejudice against everything “artificial,” that it was not before I put you through the same ordeal of calling upon several of your patients, that I felt satisfied of their perfect efficiency.

I afterwards waited, myself, upon Mr. Kingdon, and entirely removed from his mind the belief he entertained, of there not being an artificial leg yet invented which could be worn without pain and injury to the health of the wearer.

I may also here allude to Mr. Critchett’s testimony, borne privately and publicly, in favour of the mechanical superiority of your inventions, and especially of your method of equalizing the weight of the body in your various kinds of sockets.

I believe the great comfort of your artificial substitute arises from the peculiar adaptation of the socket. In the peg leg, pressure in my case was taken on the knee; this always caused pain and excitement to the parts, and I believe to be dangerous, inasmuch as blisters and broken skin were a continual annoyance.

My own case was especially peculiar, as my thigh, in

consequence of an early amputation, and from wearing for so long a time the pin leg, had become a different length and size, rendering the skill required in removing the difficulty very great. I can now walk with perfect ease, and am no longer conscious of the loss, which for so many years occasioned me great distress.

Offering you my grateful testimony and warmest thanks,

Believe me,

Very truly yours,

W. H. R.

P.S. I ought not to omit in my commendation of your substitutes, the fact that I do not use any strap or bandages, and that I am free from those appendages which are always so unpleasant.

To Frederick Gray, Esq.

CASE XLIX.

London,

June 16, 1853.

MY DEAR SIR,

By train, this morning, I have forwarded you my leg, which requires a little of your attention. I am rejoiced to tell you I get about most beautifully, and thanks to your skill, with perfect comfort. I feel very much indebted for the extent of relief you have afforded me, and I never can repay you.

I am, dear Sir,

Gratefully yours,

F. Gray, Esq.

.

CASE LII.

*House of Commons,
July 13, 1855.*

MY DEAR SIR,

I have no doubt you will be receiving many applications from sufferers like myself, for the aid which your skill can give, and which they are anxious to receive; and as they will probably feel the doubts which I felt respecting the efficiency of that aid, and may be gratified to be assured of its value, I beg to trouble you with a line or two for this purpose, as well as to bear my testimony to the excellency of your workmanship.

I have used one of your legs for three years, and have been agreeably disappointed in my anticipations of the extent of the assistance I should probably receive. I did fear that, while it might give me a moderate amount of assistance, I should feel it as a perpetual clog and inconvenience; I feared also that its use would be accompanied with more or less of pain. But none of these fears have been realized. I have been able to go about without any pain, and with as much convenience and comfort as I think is possible to one labouring under such a loss.

I am now so accustomed to it, and so little inconvenienced in my locomotion, whether on foot or on horseback, as often to forget what I have lost.

I wish all your patients may be as well fitted, and feel, as fully as I do, the value and completeness of your aid.

I am, dear Sir,

Yours truly,

T. B.

F. Gray, Esq.

CASE LV.

Calcutta,

July 3.

DEAR SIR,

The leg you sent out to me has answered so well, that I wish you, on the receipt of this, to set to work with as little delay as possible, and to make me a riding leg. You will have no difficulty in doing this, as there will be no doubt of its fitting sufficiently well, and I shall be then well provided. Your legs stand the heat and damp of India admirably, and I am quite convinced that you are the only man who can make artificial legs, which can be worn with comfort, and at the same time with utility to the wearer.

Yours obliged,

C. S. HARDINGE.

CASE LVII.

Market Drayton,
March 30, 1855.

DEAR SIR,

I am sure that I have great reason to speak well of your artificial legs, for I have derived the greatest comfort from them. I can ride and walk with perfect ease, and have often been complimented by my friends upon my appearance, and have been told by them that they can scarcely distinguish the one from the other.

I have had some experience, having worn your artificial leg since 1849.

I am

Yours truly,

B. E. I.

F. Gray, Esq.

CASE LIX.

Brussels,
May 22, 1855.

DEAR SIR,

It is now above thirty years since I was amputated below the knee, when I had recourse to your predecessor,

the late Mr. Potts, for an artificial leg, which I wore with great comfort; I had afterwards legs made by your late brother, and since, by yourself, and I must say I think you have now attained the *ne plus ultra* in the construction of these legs. It is true, that in this age science makes such rapid progress, that there is no foretelling what may not yet be accomplished; but that they will be constructed so as to be worn with greater ease and comfort than those now made by you, I hardly can believe.

I remain, my dear Sir,

Yours, very sincerely,

P. H. M.

F. Gray, Esq.

CASE LX.

London,

August 13, 1855.

MY DEAR SIR,

I think a plain statement of facts, showing the misery which I had gone through, prior to my introduction to you, and the comfort which I have experienced since that period, may serve as the best testimonial which I can furnish you with, and may further your views by directing others simi-

larly afflicted to the only spot where bungling is never known.

It is now ten years since I suffered amputation of the leg, and being a surgeon myself, took care, immediately after I left my bed, to avail myself of some recommendations which my medical advisers gave me, respecting an artificial leg. One recommended an upholsterer at (and who calls himself a leg-maker), another a truss-maker at who styles himself a leg-maker, but who, for humanity's sake, should confine himself to trusses and bandages; these men, and many other of the same class of pretenders, I consulted, and sought relief in vain. At last I was dispatched by a medical friend to the metropolis, to consult a party of no small pretensions in ——— Square. My misfortunes, however, still continued, and generally I was confined to my bed, every two or three weeks, with ulceration and excoriation of the stump. This is the manner in which I spent my first three years after amputation, when I happily was introduced to you by my esteemed friend, Mr. Quain.

The sequel is soon gratefully told; from the hour I was fitted with your admirable contrivance, I never have chafed, or suffered from the slightest excoriation, but walked with the greatest ease and comfort to myself. For three years I held the appointment of House Surgeon to a public institution, where a considerable amount of out-door visiting also devolved upon me, and for the last four years I have been engaged in private practice; and to speak candidly, the only time I think of my crippled state is when dressing or undressing, for sitting on the side of my bed I see only one leg longer than the other.

Use this communication as you please; and that you may

prove the same comfort to other sufferers as you have been to me, is my earnest wish.

I am, my dear Sir,

Yours obliged

And most sincerely,

R. E. MARTIN.

F. Gray, Esq.

CASE LXI.

London,

August 27, 1855.

DEAR SIR,

Having now used one of your artificial legs for more than four years, and being able during that time to follow my former occupation, that of a commercial traveller, I feel called upon thus to express to you my kind thanks for the very great benefit I have received at your hands.

I can the more confidently speak of the superiority of your aids, as I had the misfortune to get into other hands at first, and would certainly have been obliged to have given up travelling, through the one I then used so frequently breaking, and also causing so much pain and uneasiness in walking, which I have been entirely relieved from since I have used yours.

I am travelling fully more than ten months out of the

twelve, and during all the time I have worn your artificial leg. I have never been put to the slightest inconvenience, when in the country, from breaking or getting out of repair. As I have a great deal of walking when in town, I think there are few who can bear better testimony, both as to their durability and comfort.

I am, dear Sir,

Yours very truly,

W. M. C.

CASE LXX.

The Rectory, Great Snoring, Norfolk,
December 28, 1854.

MY DEAR SIR,

I take this opportunity of returning my sincere thanks for the kind attentions I have received from you, since I have been your patient. The comfort and superiority of your artificial leg, over every other that I have heard of, is unquestionable. It is now upwards of seven years since I lost my leg, and during this period I have naturally given great attention to the various systems of making artificial legs, and I assure you, those I have now got from you are the only legs I have ever been able to use, with any degree of comfort; indeed, I have frequently had my leg much galled, and the misery I have suffered continually, none but those similarly situated can form the least idea of. And

now, in bearing this grateful testimony to your abilities and skill, a query arises in my mind, "*Must these great blessings be confined to the rich alone?*" Cannot some plan be devised by which the poor might partake of these inestimable benefits, and you, at the same time, have your rightful interests protected?

So deeply do I sympathize with my poorer fellow-sufferers that I declare myself ready to come forward at once, and devote my whole time and energies in endeavouring to found a society that shall have for its object the providing artificial legs and arms *of your make*, to those who from their needy circumstances are unable to procure them.

The fact of the Emperor of Russia having made repeated overtures to you to go to St. Petersburg, in a professional capacity, after having had ample proof of your ability, clearly proves the correct estimate he formed on this important subject, and corroborates me in my view that your services should be, some way or other, more generally diffused, especially amongst the poorer classes of our countrymen; let me therefore most earnestly beg of you to give my proposition your serious attention, and I can only say, that if upon my solicitation you should be induced to lend your aid, not only will I thankfully give my personal services in the matter, but I will commence the subscription list with a donation of Two Hundred Guineas, and be further prepared with pecuniary support, should the public (as I will not believe) be slow in seconding me.

I remain, yours very faithfully,

R. MARSH WATSON.

Frederick Gray, Esq.

CASE LXXI.

*Horsham,**August 10, 1852.*

DEAR SIR,

I promised you I would let you know how I got on with my leg after a month or two's use; I now do so. Since I last saw you I have constantly used the leg, without having experienced the least inconvenience, and I have walked a good deal. All my friends think me much improved in health since I have been able to take exercise, and I feel myself quite a different person.

I never shall forget your kindness to me, and only regret that so many poor creatures are doubtless suffering, without hope of relief, the agony I endured before I was under your care. I shall come to London in a week or two, and try while I am there to get part, at least, of the money I paid Mr. , in Square, returned to me. Can you advise me how to act in this matter? for I do think it most unjust in him to have inflicted so much misery as I endured.

I now see what I did not before perceive—that it was his want of skill, and *not my stump*, that was the cause of it all.

I will call upon you while in London, and meantime,

I am, very gratefully, yours,

M. A

CASE LXXV.

*Hemmingford Abbots,**August 16, 1853.*

MY DEAR SIR,

I am very thankful to say my leg answers capitally, and I can walk almost any distance, without showing a limp even. My father begs me to thank you very much for your great kindness to me, and as the shooting season is now so near, we hope to have the pleasure of seeing you then, as you promised.

By that time I hope to be able to show you that I can do all I have said I can, in the way of walking, and I can ride just as well as ever I did. If you should see Mr. Quain, will you kindly tell him that I shall call and show myself when I am next in town. I regret I had not time to do so the other day.

I remain, my dear Sir,

Very sincerely yours,

J. O. D.

F. Gray, Esq.

CASE LXXXIII.

Burwood Park,
July 20, 1851.

DEAR SIR,

After a fortnight's use of the new leg, I feel bound to express my great admiration of your skill in what I consider a very delicate branch of surgical science. I have always considered myself a difficult patient to deal with, from the peculiar muscular action in my stump; but you seem quite to have overcome, and without difficulty, what I have for twenty years, more or less, been annoyed with. I attribute your success mainly to the means you have of diffusing pressure, and knowing where to give it—it only required this to make your substitutes perfect.

I shall send up my shooting leg for repairs in a day or two, and shall be obliged if, at your leisure, you will have it repaired so as to be ready by the time I go to Lincolnshire.

I am, dear Sir,

Your much obliged,

ROGER FREDERICK.

Frederick Gray, Esq.

CASE LXXXVI.

*Buttevant Barracks,
March 4, 1852.*

DEAR MR. GRAY,

I received the case all safe on Tuesday last, and am much pleased with the whole apparatus. The arm fits so comfortably and acts so well, that I am quite forgetting all about my accident.

My friends here think there never was such a masterpiece of ingenuity. I have written to Lord, and you will no doubt hear from him in a day or two. I feel much indebted to you for your great kindness to me, and beg to remain, dear Mr. Gray,

Very truly yours,

F. M. C.

Frederick Gray, Esq.

Captain.

CASE LXXXVII.

*Glenkindie,
December 10, 1849.*

DEAR SIR,

You will probably ere this have received the amount of your bill ; if not, it will be paid to you in a few days, by

Messrs. Forbes and Co. Both hand and arm have given me complete satisfaction, and I feel much indebted to you for the skill you have displayed in my case.

Your obedient servant,

D. L.

CASE XCIV.

Brighton,

Tuesday, November 12, 1850.

DEAR MR. GRAY,

I received the arm safe and sound; it answers admirably, and I feel much indebted to you for the care and attention you have bestowed upon me. *My* invention for the knives answers admirably. I will send you the old arm up in a few days (that is, when I have an opportunity), and it had better be thoroughly repaired, so as to do for common use; and if you will kindly see to this when you have leisure, I shall feel much obliged.

The *screw* principle is very nice, it moves so easily. Then you will change the wrist-plates, and have done any other little thing that may be wanted.

I remain,

Yours obediently,

W. P.

Frederick Gray, Esq.

CASE XCVIII.

Crediton, Devon,
March 16, 1854.

DEAR SIR,

I have great pleasure in being able, after two or three years' use, to speak very favourably of your handiwork. I find the arm a great comfort to me, and would not on any account be deprived of it. Few people who meet me are aware of my loss, and I find it very useful.

Yours truly,

S. M. F.

I have elsewhere stated, that the foregoing cases are taken from amongst many, illustrative of the mechanism I have applied with such happy results, and are, necessarily, mere outlines; as, however, the reader may, from personal or other motives, feel a more particular interest in some instance analogous

to his own case, or to that of some one he may desire to serve, I will, with great pleasure, enter with him into any detail he may desire.

As my statements are those of plain truth, so do I wish a full and free investigation of all relating to them, in the full assurance that I do not offer a benefit I cannot confer; and feeling, in all sincerity, that I should be culpable did I withhold from any who require it, the advantage of an experience that has been so widely extended and greatly varied as my own has been.

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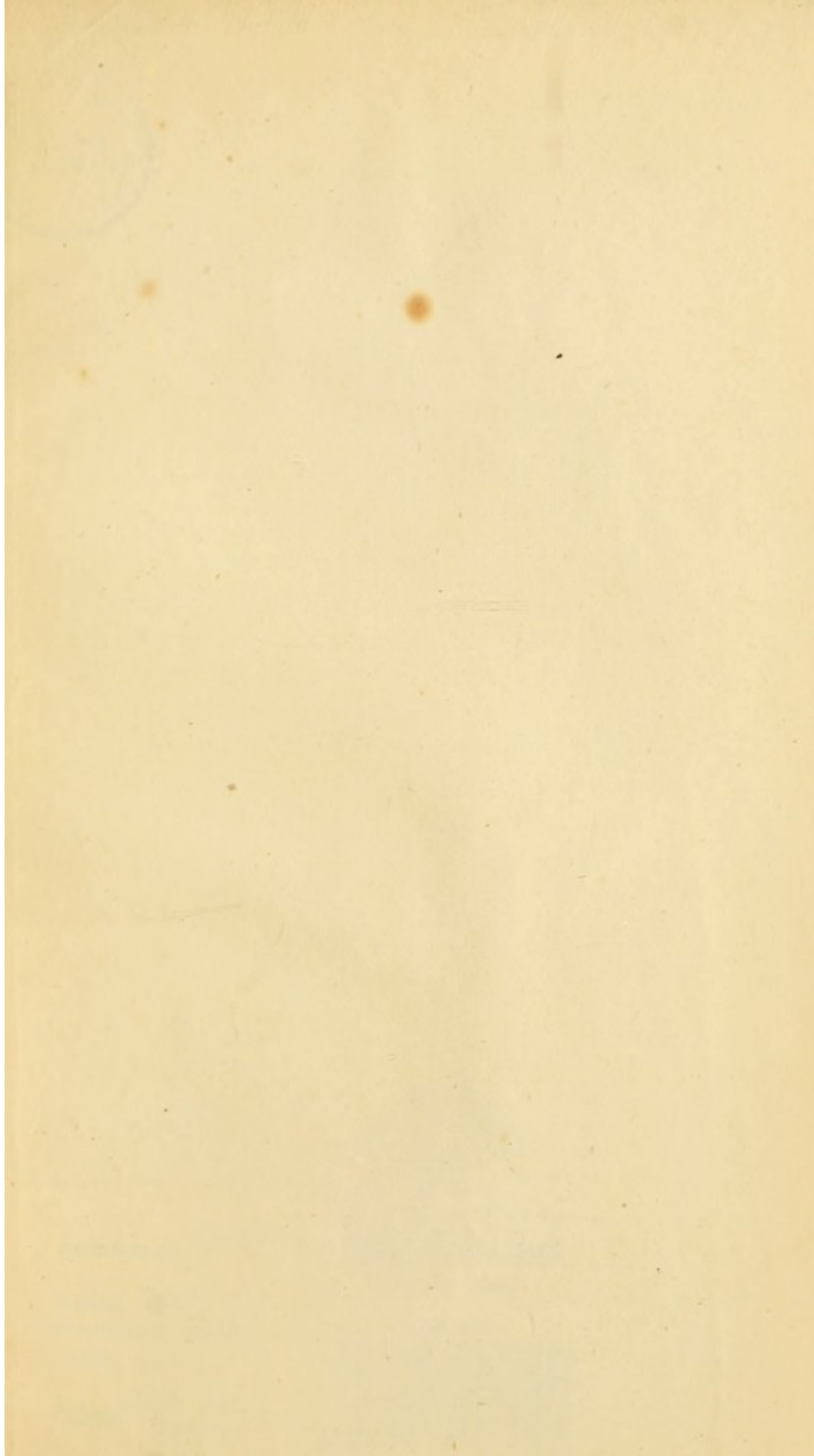
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