DESCRIPTION

OF

NEW ARTIFICIAL LEG

INVENTED BY DR. BLY,

OF AMERICA.

ADDRESSED TO THE MEDICAL PROFESSION

BY

H. HEATHER BIGG.

LONDON:
JOHN CHURCHILL AND SONS,
NEW BURLINGTON STREET.
MDCCCLXIV.

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This beautiful invention has been placed by Dr. Bly in the hands of Mr. Heather Bigg, Assoc. Inst. C. E., and Anatomical Mechanician to Her Majesty the Queen and H. R. H. the Prince of Wales,

56, WIMPOLE STREET, LONDON
(Late 29, Leicester Square),

from whom alone it can be obtained, and who will gladly give every information on the subject to any one favoring him with a visit in Wimpole Street, between 12 and 3 o'clock.

DR. BLY'S

NEW FORM OF ARTIFICIAL LEG.

In introducing this invention to the profession, it is necessary to state the ground upon which a claim for novelty is founded, as well as how far it supersedes the plans already adopted in analogous instances.

To do this satisfactorily, the arrangements hitherto employed are contrasted with the advantages offered by the proposed improvement, and a brief description is given of the different constructive forms which serve to distinguish those appliances now in use as substitutes for the human leg. When amputation has created a need for the skill of the anatomical mechanician, it becomes requisite to obtain such a useful artificial appendage as fulfils in the least objectionable manner the mechanical office and uses of the absent limb.

Great care and experience are necessarily demanded for the supply of this desideratum, and it is only from the hand of those who have long made the application of mechanism to the human body their *spécialité* that it can be really obtained. Many surgeons must in their experience find, after successfully amputating a leg and producing an admirable stump, their patient hastily adopting the first form of artificial limb which either accident or private recommendation suggests to their notice; hence to those who feel an interest in their cases after they are free from the need of further surgical attendance much annoyance is created by discovering that the loss of a limb has entailed unceasing trouble, on account of the imperfect substitute with which their patient is encumbered. The remedy

for this is, however, clear and simple, and cannot be too strongly enforced, namely, that the patient should ask his surgeon to select for him that artificial limb which he judges capable of fulfilling most efficiently the anatomical conditions required, and not only to do this, but personally witness the adjustment of the mechanism when the limb is finally applied. Were this more frequently done, but little chance would exist of the wearer of an artificial leg obtaining those clumsy and unscientific productions so often seen, whose greatest attraction has possibly been the low cost at which they were originally obtained. In addition to this a medical man would appreciate far better than any one else the approximation which occurs in a really well-devised artificial limb between nature and art, in the arrangement of the substituted tendons and articulations.

Dr. Bly's leg, having been devised by an anatomist, fulfils in a manner hitherto unknown the conditions which an English surgeon would naturally look for in selecting a limb for his patient; it is therefore confidently recommended to their attention. The following gives a brief statement of its general advantages:

1st. Rotation and lateral action of the ankle-joint, thus affording a kind of ball-and-socket motion, whereby the patient can rotate his limb without engendering the least friction against the sides of the stump.

2nd. Power on the part of the patient to walk with ease upon any surface, however irregular, as, owing to the motion of the ankle-joint, the sole of the foot readily accommodates itself to the unevenness of the ground, which is an advantage never before possessed by any artificial limb yet invented.

3rd. The ankle-joint is rendered perfectly indestructible by ordinary wear, owing to its centre being composed of a glass ball resting in a cup of vulcanite; thus it never gets out of repair, as the Anglesea leg but too frequently does, and the original cost is almost the only one the patient incurs.

4th. The action of the ankle-joint is created by five tendons, arranged in accordance with the position assigned to them in a natural leg, and which tendons are capable of being rendered tight or loose in a few instants, so that the wearer of the leg has the power of adjusting with precision the exact degree of

tension upon which he finds greatest comfort in walking, and also giving the foot any position most pleasing to the eye.

5th. There is a self-acting spring in the knee-joint, urging the leg forward in walking and imparting automatic motion, thus avoiding the least trouble to the patient, who finds the leg literally, and not metaphorically, walk by itself.

6th. The whole is covered with a beautiful flesh-coloured enamel, thus avoiding the clumsy appearance of the wood as is always found in an Anglesea leg, and admitting of its being washed with soap and water, like the human skin.

7th. At the knee-joint there is a mechanical arrangement, representing the crucial ligaments, and affording natural action to that articulation by which all shock to the stump in walking is avoided.

These special advantages are quoted previously to entering into a competitive comparison between the kind of legs used and the one now advocated as superior to any.

Two varieties of artificial leg have, on account of their mechanical excellence, hitherto been familiar to the medical profession.

The first of these is of English origin, and, owing to its having been adopted by the late Marquis of Anglesea, is called the Anglesea leg. The second is known by the name of its inventor, and bears the appellation of the Palmer leg.

Both possess indisputable merit, which readily accounts for their long-standing popularity, yet neither can fully claim the true desiderata demanded by those patients who seek to obtain a perfect representation, in action as well as form, of the human limb. One glaring fault in both these pieces of mechanism is that the natural motion of the ankle-joint exhibited during the act of walking upon an irregular surface is entirely unprovided for, hence the pain and abrasion so frequently experienced by those who use either of these limbs. To explain this more fully, a brief description must be given of the construction of both. To commence with—

THE ANGLESEA LEG.

The Anglesea leg consists of a wooden frame, formed to represent in external shape a human limb, and having ordinary mortise-and-tenon joints for producing the knee and ankle

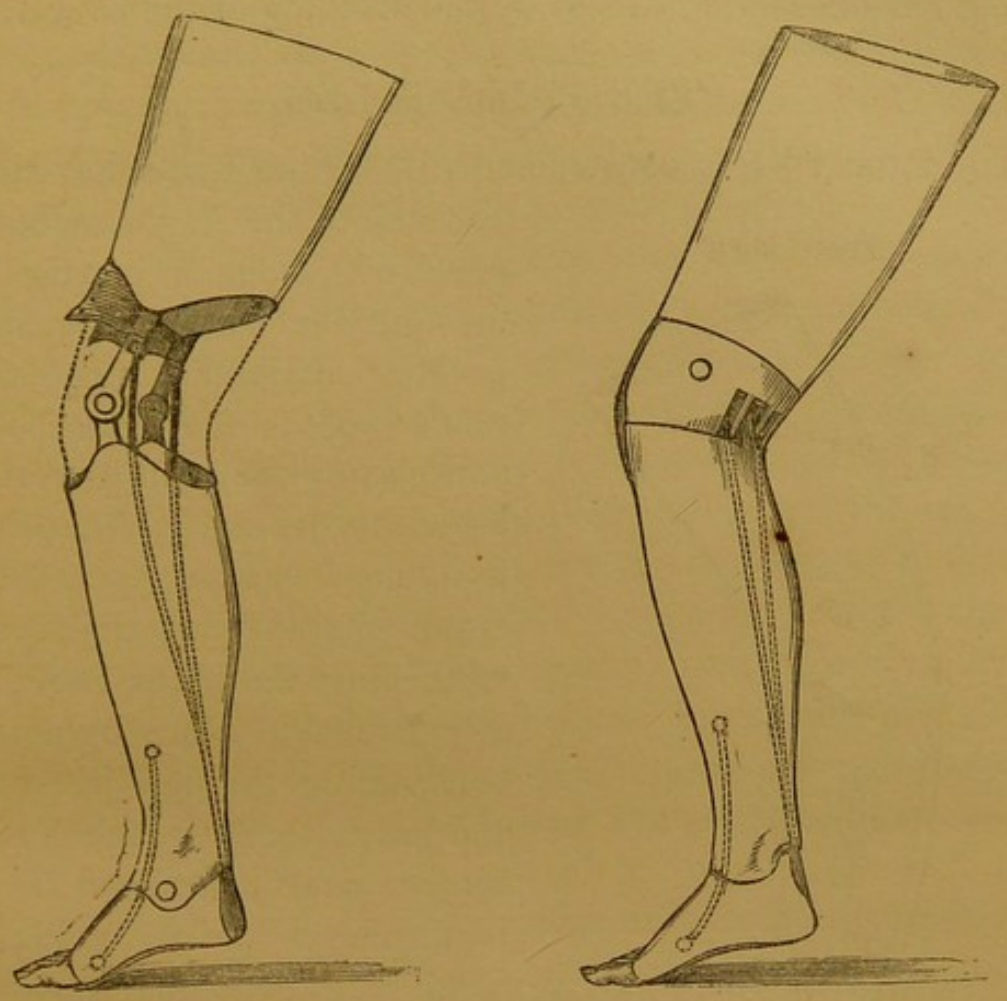
motion. These joints are joined together by steel bolts passing through their centre, and the joints themselves are brought into action by a long piece of catgut fixed at the back of the heel and terminating at the knee, which serves as a representative of the flexor muscles of the knee and extensors of the foot, whilst an india-rubber band fixed in front of the ankle, and attached to a piece of wood in the centre of the calf, effects the purpose of counteracting the catgut cord already mentioned, and flexing the foot upon the leg. An india-rubber band is also fixed in front of the upper part of the leg, to aid in impelling its lower portion forward whilst walking. The upper portion of the wooden frame is likewise hollow, for the purpose of receiving the stump of the patient, and giving attachment between the artificial leg and the body. The original idea of this contrivance was that of representing the action of the muscles of the human limb; for as the catgut cord is fixed to the back of the knee and terminates in the heel, it serves to extend the foot when the limb is straightened, as in standing, whilst the india-rubber front band, becoming tense, tends to uplift the toes from the ground when the leg is flexed in walking. This idea, though at first sight appearing to be very ingenious, loses all claim to positive merit when the entire absence of all lateral motion in the ankle-joint is found to comprise part of its arrangement. Yet notwithstanding a defect so palpable as the one just named, it has been almost the only leg hitherto adopted in England.

To render this description intelligible, two drawings are given, representing an Anglesea leg for amputation above and below the knee:

In these the action of the knee- and ankle-joints is seen to be purely ginglymoid or hinged, so that, if the wearer were to tread on any slanting or irregular surface, only a slight edge could possibly rest upon the ground, whilst the stump of the patient would be submitted to considerable strain and pressure. In the former instance great instability is occasioned, and in the latter abrasion of the skin generally results. This highly reprehensible condition is entirely attributable to a want of lateral motion in the ankle-joint, as will be proved when the new invention about to be advocated is explained.

In addition to other disadvantages is the fact that, owing to

Above knee. Below knee.



The position of the tendons is shown by dotted lines.

the manner in which the catgut is affixed to an Aglesea leg, the toe becomes pointed, like a dancing-master's, every time the leg is thrown forward in walking; thus only a small portion of the foot rests upon the ground until the patient's weight brings down the remainder, with generally a heavy thud-like noise. It must also be evident to any one who observes the human foot whilst thrown forward in the act of walking, that the heel first touches the ground, whereas in the leg just criticised the toes come in contact prior to any other portion of the foot. Hence the Anglesea leg has always to be made rather shorter than the natural limb, which necessarily imparts a limping action in walking. This error of construction is entirely avoided in the new American leg, by which means the toes readily clear the ground, and all chance of accidentally striking against a stone or other impediment is set at rest.

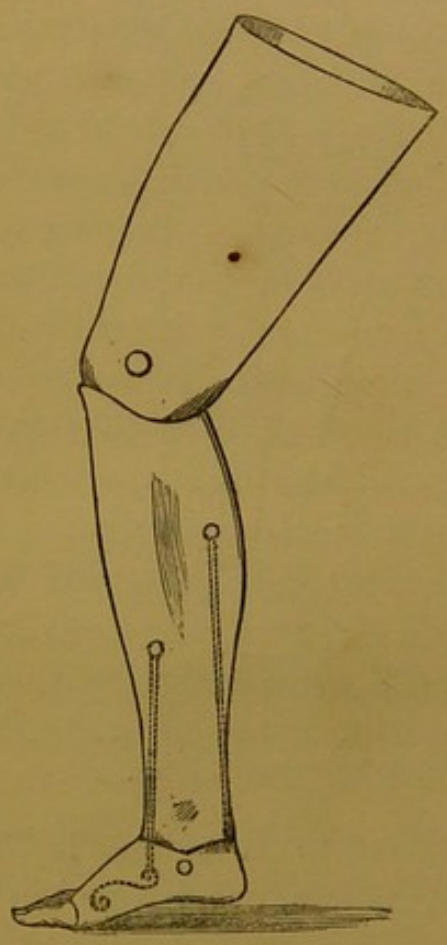
An Anglesea leg also, at its best, presents an extremely ugly

external appearance, owing to the wood of which it is composed being left uncovered, except by the stocking of the wearer.

THE PALMER LEG.

The Palmer leg is constructed with errors somewhat similar to those of the Anglesea, but, instead of a common mortise joint forming the ankle movement, a peculiar adaptation is gained by rendering the foot part hollow, and placing the solid part of the leg within its cavity, thus producing a neater external appearance, although at the same time greatly weakening the joint itself; for as it is held in place by a metal bolt passing through its centre, and has no other check but the catgut band mentioned in the arrangement of the Anglesea leg, it is evident that, upon any stretching or fracture of the catgut occurring, the front of the instep must become violently torn away, and the patient permitted to fall forward, most probably to his serious injury. The method by which action is given to the ankle is also by means of a catgut cord at the back, and an india-rubber or wire spring in front, one representing the gastrocnemius, the other the anterior tibial muscles. From its lightness and ease in walking, although its imperfections are great, it has, however, long superseded the Anglesea leg in America.

Above knee.



DR. BLY'S LEG.

The fault so palpable in both the legs which have been alluded to is, however, entirely conquered in an ingenious piece of mechanism invented and patented by Dr. Bly, of America, who, having the advantage of anatomical knowledge, and care-

fully examining the human leg by frequent dissections, devised an exact imitation of the action of the ankle-joint, and placed *in situ* elastic cords representing the human muscles so perfectly that the resulting motion gives free lateral rotation and antero-posterior movements, thus fulfilling with precision those conditions which are preferred by nature in the formation of the human foot and ankle. Such patients as have used either an Anglesea or Palmer leg must frequently have experienced the disagreeable sensation which results from the stump being harshly pressed by the sides of the artificial receptacle on standing upon any uneven surface; for as the vertical centre of the stump should always coincide with that of the artificial limb when the patient stands or walks, it necessarily follows that any circumstance which has a tendency to disturb the coincidence between the line of the stump and the line of the artificial limb must materially influence the natural gait of the patient, in addition to imparting unequal pressure to that portion of the stump which receives support from the surface of the sheath in which it is placed.

When a human being performs the act of walking he sustains his body in equilibrium almost entirely through the mobility of the ankle-joints. It is true that walking can be accomplished where the ankle-joints are anchylosed, yet a very lame and ungraceful gait is the consequence, which is but slightly diminished on mere antero-posterior motion being restored to the ankle. It may thus be easily proved that upon the yielding of the lateral ligaments of the ankle-joint in walking almost exclusively depends the rapidity with which brisk walkers are enabled to perform their pedestrian exercise. Yet so important an element in the construction of an artificial limb as the lateral motion of the ankle was never adopted until Dr. Bly so successfully demonstrated its necessity in the invention of his American leg.

The following drawings and description, extracted from the patent specification, is perhaps the readiest method of explaining the construction of this new form of leg, and its attendant advantages. To which is appended those certificates which have been forwarded by the inventor from America, where, owing to the facilities afforded by the war, the invention is now making the most rapid progress.

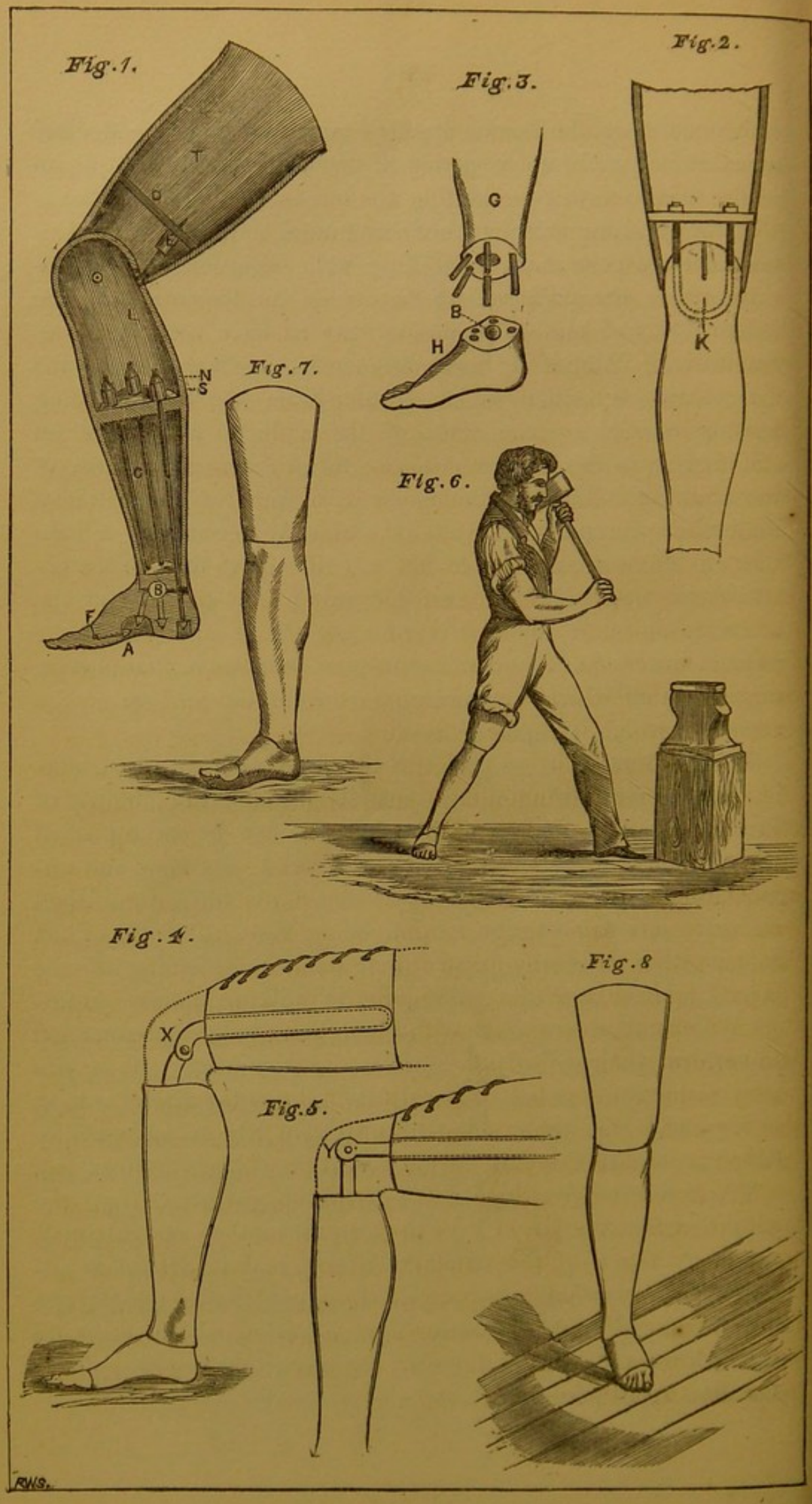


Fig. 1.
T
O
E
L
N
S
C
B
F
A
Fig. 2.
K
Fig. 3.
G
B
H
Fig. 7.
Fig. 6.
Fig. 4.
X
Fig. 5.
Y
Fig. 8
RHS.

"Fig. 1 is a section of Dr. Bly's ball-and-socket-jointed artificial leg.

The ankle-joint is formed by a ball (*B*) of polished ivory, which is a joint that admits of every motion that the natural ankle does, without an exception.

The cords (*C*) assume the position and functions of the natural tendons. Only three are shown in full, but the ends of all are seen in fig. 3.

S is three of the five rubber springs which take the place of the muscles of the natural leg.

N is the nuts, by which the tension of the cords and springs are regulated to suit the wearer.

E is the spring which operates the knee-joint.

Fig. 2 is a posterior view of the leg and thigh; the thigh in section—showing the knee cords (*K*) which takes the place of the crucial ligaments of the natural knee.

Fig. 4 shows the curved joints (*X*) on either side of the knee, as constructed by Dr. Bly, for amputations below the knee. The curve corresponds with the natural knee, and allows the dress to set smoothly.

And fig. 5 shows the joints (*Y*) for the same purpose, as constructed by all other makers.

Fig. 6. The right leg of this figure shows one of Dr. Bly's artificial legs, worn by a mechanic, and flexed laterally at the ankle-joint, the same as a natural leg. It assumes every other position of the natural leg with equal facility.

Fig. 7 represents the ankle-joint flexed diagonally, as is often the case when one side of the foot happened to be placed on a small stone or other obstacle.

Fig. 8 shows the action of the ankle-joint when walking on the side of a hill or on an inclined plain, the foot accommodating itself to the surface like the natural foot.

The joints in this leg are made without iron or any kind of metal, therefore the leg is extremely light, much lighter than any other. The liability of metallic joints to rattle and make a noise, after the leg has been worn a short time, is well known, and the annoyance which it causes the wearer at every step is also well known. Now, as there is no metal about the joints in this leg, there is no noise. The ankle-joint is formed by a

ball of polished ivory, plying in a socket of vulcanized india rubber. (See fig. 3.)

This joint accomplishes the great object which the artificial leg makers have hitherto sought for in vain, viz., it admits of motion in all directions like the natural ankle-joint, and thereby allows the artificial foot to accommodate itself to the varied inequalities of the surface, the same as the natural foot. This enables those who wear it to walk so well, that it is not even suspected, much less detected.

Furthermore, this is a joint that requires no oil, a fact of no little importance, as those will testify who have worn legs with metallic joints, and been obliged to carry pocket oil-cans.

In the places corresponding to those occupied by the muscles of the natural leg are placed rubber springs (see fig. 1), with catgut cords (see figs. 1 and 3) of sufficient strength, extending downward in place of the natural tendons; and it is really interesting to see how well the action of the rubber springs imitate those of the natural muscles. These rubber springs or artificial muscles, together with the ball-and-socket joint, produce every motion of the natural leg, without an exception.

The springs are made of railroad-car spring rubber, and used by compression, therefore it is not possible to overtax or break them. This will be appreciated by those who have worn legs with metallic springs, especially by those who have worn the Anglesea leg.

The power and action of all the springs in this leg are regulated simply by turning a nut, so that the wearer may adjust them to suit his own peculiar gait with the greatest facility.

Then, instead of the mechanical motions given a limb by metallic springs, the rubber springs impart easy uniform motions to the limb, like those of the natural muscles, which give it, when in use, a remarkable life-like appearance.

In walking, when the weight of the body rests upon the ball of the foot, the spring representing the gastrocnemius and soleus muscles is firmly compressed, and when the weight of the body is thrown forward on to the other foot the spring rises and carries the foot forward to its place, with very little effort of the wearer.

In ordinary walking, with the toes turned outward, the foot,

like the natural one, is flexed diagonally, or in the line of motion, which makes a graceful step. Artificial legs made heretofore roll the foot to compensate for this diagonal flexion, hence the uneven gait so often seen.

If the foot is turned out sidewise to brace the body or to work at a bench, as in many kinds of mechanical labour, the ankle-joint flexes laterally and the foot remains flat on the ground, and gives a firm base of support, which is of great importance in all kinds of labour. (See fig. 6.)

Furthermore, when walking, if one side of the foot happens to be placed on a stone or elevation, or into a hole, the mobility of the ankle-joint allows the foot to yield just enough to accommodate itself to the inequality, and thereby prevent stumbling or falling, which necessarily takes place more or less with all legs which do not admit of lateral and diagonal motion at the ankle-joint.

The knee-joint for amputations above the knee has no side or lateral motion, because there is none in the natural knee. The joint is constructed in such a manner that no bushing is ever required; consequently, the annoyance and expense of sending the legs to the maker to have the joints bushed every now and then, to keep them tight, is entirely avoided. The joint is so arranged that the wearer may tighten it in a moment whenever he chooses.

The knee-joint is operated on by a spring similar to those already described. Its motions are limited and controlled by two cords which take the place of the crucial ligaments of the natural knee-joint; consequently, there is no unpleasant jar caused by any solid parts coming in contact.

For amputations below the knee no artificial knee is required, but there is a jointed steel strap on each side of the knee, which supports the leather lacer. In the construction of these straps there is another nice little invention, which, like the rest, takes nature for its guide.

By laying a femur (thigh-bone) on paper, and drawing a line on each side, I obtained the exact curve of the lower end of the bone. Then I gave the jointed extremities of the straps (*X*) the same curve, consequently they work in harmony with the

natural joint, and conform to the contour of the knee, which allows the dress to remain smooth when sitting with the knee flexed. (See fig. 4.)

The square or angular straps (*Y*), used by all other makers, (represented in fig. 5) make a very bad appearance when the wearer is sitting, and are ugly uncouth things, to say the least. They demonstrate the necessity of taking nature for a guide in all things pertaining to artificial legs.

Formerly the manufacture of artificial legs was left entirely to common mechanics and those who had undergone amputation, but who have little or no knowledge of anatomy; consequently, the construction of artificial legs has been merely mechanical, and not anatomical.

They have imitated some of the motions of the natural leg quite well, but others not at all. Indeed it could hardly be expected that any one but an anatomist should be able to model a leg so close to nature as to imitate all the varied motions of the natural leg.

To obtain an artificial leg with all the varied motions of the natural one I have devoted much time, and by frequent dissections have accomplished the object. I saw that nature used no bolts or pins to bolt or fasten the foot to the leg, but that she nicely rounded the bones at the joint, and held them in place by means of ligaments, tendons, and muscles. Then, taking nature for my guide, I dispensed with all the hinges, pins, bolts, and cumbrous metallic joints generally used in artificial legs, and simply rounded and shaped the joint like the bones of the natural leg, and supplied the place of the natural muscles by means of india-rubber springs, and the tendons by catgut cords of sufficient strength, and the leg was a complete copy of nature. Like everything which takes nature for its guide, it is very simple, and not liable to get out of order.

In form, the limb is always made to correspond exactly with the natural one, then it is covered with a delicate skin, which is enamelled with the most delicate-tinted flesh-coloured enamel, shaded to suit each particular case; and the whole is so natural in appearance, and so life-like in all its motions, that it is often mistaken for a natural limb."

It is adapted to all amputations, either above or below the knee.

"DR. D. BLY, ROCHESTER.

"Artificial Leg. ☞ Award, DIPLOMA and LARGE MEDAL.

"This 'artificial leg,' presented to your Committee for inspection, was brought in direct competition with 'Palmer's artificial leg,' before noticed in this report; we were, therefore, necessarily required to decide relative to their comparative merits—and, after a full investigation of their mechanical construction, materials used, and the adaptation to the accomplishment of the object of their creation, found no difficulty in arriving at a conclusion satisfactory to ourselves, and which, we are confident, will be adopted or approved by our unfortunate fellow-citizens who are compelled to supply the want of natural by artificial legs. We are unanimous in the opinion that the leg presented by Dr. Bly is the best, and that it possesses advantages over the 'Palmer leg' very desirable to the user and creditable to its maker. These are—1st. Its weight is less. 2nd. No metallic springs are used in its construction, demanding frequent repairs. 3rd. But one metallic bolt (that at the knee-joint) is used. 4th. The ankle-joint is so constructed as to admit of a lateral, rotary, or side motion of the foot (in exact imitation of that in the natural ankle), thereby enabling the wearer to walk upon uneven surfaces, or step upon small stones or other light obstructions, with less liability to stumble or fall —lighten the tax upon his caution as to where and how he steps to secure safety, and, in an equal ratio, diminish the physical effort necessary to its use.

"This leg combines the desirable qualities found in Palmer's, with the improvements above enumerated, and is a nearer approach, in its anatomical structure and motions, when in use, to its 'model,' the natural leg.

"We award the first prize to Dr. Bly, for his improvements,

and the evidence of progress in the mechanic arts, found in the construction of his 'artificial leg.'"

I certify that the foregoing is a true abstract from the original report made by Department No. 72, of the New York State Fair, held at Syracuse, October, 1858.

A. P. Sigourney,
Chairman of Committee.

Testimonials of Surgeons.

We, the undersigned physicians and surgeons residents of the city of Rochester, take pleasure in stating that we are well acquainted with Dr. Douglas Bly of the said city, and are familiar with his improvements of the artificial leg. That, in our opinion, the leg, as improved and manufactured by him, has a marked superiority and many advantages over all others heretofore offered to the public.

The ball-and-socket joint of the ankle is the great characteristic of his improved artificial leg, which not only gives the foot an easy, graceful motion, quite natural in appearance, but renders it flexible and adjustable to uneven surfaces, desiderata not heretofore attained. It is constructed without metallic springs, bolts, or joints, requires no oil, makes no noise, and is not liable to get out of repair. It is very strong and durable, and is moreover finished with great neatness and beauty. The structure and motions of it so admirably supply those of the natural leg, that we have no hesitation in recommending it to the notice of those who have been so unfortunate as to lose a limb and require an artificial one.

Rochester, May 14th, 1860.

W. W. Reid, M.D.,	E. W. Armstrong, M.D.,
E. M. Moore, M.D.,	H. W. Dean, M.D.,
T. F. Hall, M.D.,	W. W. Ely, M.D.,
P. G. Tobey, M.D.,	Wm. H. Briggs, M.D.

VALENTINE MOTT, M.D.

New York, Feb. 10, 1860.

When the Palmer leg was invented, I recommended it to all who needed anything of the kind, because it was an improvement on the old Anglesea leg. And now I have the pleasure of informing them that Dr. Bly has invented a leg which is a great improvement on the Palmer leg. The advantages it possesses over the Palmer leg are—

First. The ankle-joint admits of motion, not only antero-posteriorly, but laterally, which allows the wearer to walk on any grade, or on rough and uneven surfaces, without inconvenience.

Second. The ankle-joint is constructed without iron, steel, or metal of any kind; in fact, little or no metal is used in the limb, which renders it very light.

Third. The joints, instead of being bushed with buckskin, which requires a renewal at the hands of the maker when worn, are adjustable, and under the control of the wearer.

Fourth. The springs are made of india rubber, and imitate more closely the action of the muscles.

Fifth. The action of the springs can be increased or diminished at the option of the wearer, whereby each can adjust the motions of the leg to suit his own peculiar gait.

Valentine Mott, M.D.,
Emeritus Prof. of Surgery and Surgical Anatomy in the University of N.Y.

ALFRED C. POST, M.D.

New York, Feb 10, 1860.

I concur in the above recommendation.

Alfred C. Post, M.D.,
Prof. of the Principles and Operations of Surgery in the University of N.Y.

JAMES R. WOOD, M.D.

New York, 2d mo., 15th, 1860.

I have examined with care the ball-and-socket jointed leg invented by Dr. Bly, and am satisfied that the mobility of the ankle-joint, whereby the foot can accommodate itself to grades and inequalities of the ground, is a great improvement upon all artificial legs made heretofore.

James R. Wood, M.D., No. 2, Irving Place,
Surgeon to Bellevue Hospital, New York.

A. B. SHIPMAN, M.D.

Syracuse, N. Y., April 25th, 1860.

I am familiar with Dr. Bly's ball-and-socket jointed artificial leg, and must say that it meets the wants of patients the best of any artificial leg ever brought before the public. A flexible ankle-joint that is susceptible of every motion of the natural one is what has long been wanted. This Dr. Bly's leg has, and it is this that marks its superiority over all others.

A number of my patients are wearing the Palmer leg, and their motions are stiff and cramped or confined. They seem to want a freedom of motion, especially if on uneven ground. There are also a number of my patients who are wearing Dr. Bly's leg, and their motions are natural, free and easy, so much so that one of them came into my office, and his gait was so natural that I did not mistrust that he was my patient, or that he was wearing an artificial leg until he showed it to me.

With utility Dr. Bly's leg combines durability. One of my patients, a large, powerful man, who works in a saw-mill, where he rolls logs and carries lumber over all sorts of rough places, has worn one of Dr. Bly's legs for a year without its giving out or getting out of order in the least.

A. B. Shipman, M.D.,
Late Prof. of Surgery in the Indiana Med. College.

WILLARD PARKER, M.D.

I have examined the artificial leg of Dr. Bly, M.D., of Rochester, and have formed a very favorable opinion of its character.

WILLARD PARKER, M.D., 37, East 12th Street,
Prof. of the Principles and Practice of Surgery in the College of Physicians and Surgeons, New York.

ALDEN MARCH, M.D.

ALBANY, N. Y., Feb. 22, 1860.

I concur in the above.

ALDEN MARCH, M.D.,
Prof. of Surgery in the Albany Medical College.

CHARLES A. POPE, M.D.

ST. LOUIS, Aug. 17th, 1860.

Dr. D. BLY:—DEAR SIR,—Your artificial leg seems to me to possess evident advantages over all others hitherto invented. I doubt not that it will speedily become the favorite substitute. So far as I know, those who have worn it are abundantly pleased.

Yours, &c.,
CHAS. A. POPE, M.D.,
Prof. of the Principles and Practice of Surgery in the St. Louis Medical College.

TESTIMONY OF THOSE WEARING THE LEG.

MICHAEL RYAN.

NASHVILLE, TENN., Sept. 10, 1859.

Dr. BLY:—DEAR SIR,—I send you a few lines for the benefit of those who are situated as I was before I used your newly invented artificial leg. I had heard that you had invented a leg by dissecting; and that, by taking nature for your guide, you had made a leg which has all the flexibility and motions of the natural leg, which makes it remarkably useful and life-like; still I was afraid to write to you to make me one, because I thought the story too good to be true. And I should not have got one had it not been for Dr. Carow, of Nashville. He told me that he had seen it, and that it was really modelled after the natural leg, and that it is one of the finest things ever invented, and I had better get one. I took his advice, and I am a thousand times obliged to him for his kindness. Notwithstanding all that I have heard and read, my highest expectations are more than realised. And to all who have any doubt after reading this, I say come and see my leg, or go to Dr. Bly's establishment and see for yourselves, for in this case seeing is believing.

Respectfully yours,

MICHAEL RYAN.

LAWRENCEBURGH, INDIANA, Aug. 29, 1859.

Dr. BLY:—DEAR SIR,—My leg operates very satisfactorily. My friends are all pleased with its natural motion; in fact, some have told me they could see no difference in the motion of my feet when walking.

I can walk on boulder pavements with ease—your ball-and-

socket ankle-joint allowing the foot to adjust itself to the unevenness of surface very much like the natural one.

The whole appearance is so good that but few notice that I have an artificial leg. In three weeks after leaving your establishment I travelled about twelve hundred miles, and have been in company with people for half a day, in hotels, cars, and stages, who did not suspect but I had both my natural legs.

Respectfully yours,
WILLIAM LEAL.

ADDITIONAL TESTIMONY FROM WILLIAM LEAL.

AURORA, IND., May 13th, 1860.

DR. BLY:—DEAR SIR,—In answer to your inquiries about the leg you made me, I would say that it still remains in as good order as when I wrote to you last summer. It has needed no repairs whatever, and has no appearance of needing any yet. The ankle-joint is superior to any other in use; it gives an easy motion, no jerking against the stump, on the roughest ground; it is always tight, and mine shows no wear yet.

A stranger came to work in the establishment where I am employed, and he had been there a month when I made a remark about my leg; he looked surprised and said, "What do you mean?" I said, "Do you not know that I wear an artificial leg?" He said he "had not thought of such a thing."

My P. O. is now at Aurora.

Respectfully yours,
WILLIAM LEAL.

JAMES BOLTON, M.D.

RICHMOND, May 16th, 1860.

DEAR DOCTOR,—It gives me sincere pleasure to testify to the satisfaction which has been given by the limb fitted by you upon my ward, Master ——. On his arrival home, all his friends were most agreeably surprised by the improved appearance

which it gave him, and by the remarkable easy gait with which he walked, after but a few days' use. He has continued to wear it to the present time, without having been compelled to lay it aside for a single day, and of course he now uses it with increased dexterity. The chief advantages possessed by the limb appear to me to consist of the beautiful imitation of the natural mechanism of the ankle-joint. Instead of the heavy metallic hinge-joint, with its rivets, requiring frequent oiling, often working loose and clattering, or working too stiffly and creaking, your limb has a beautiful substitute for the ligament, and tendons of the natural joint. This not only avoids the objections to the metallic joint, but gives a graceful elasticity to the step, by a contrivance far more durable, and more resembling that of nature, than the metallic springs in ordinary use. In addition to this, the ball-and-socket give a sufficient lateral rotation to the foot to adapt its sole to the uneven surfaces upon which it may be placed.

Very respectfully yours,

JAMES BOLTON, M.D.

Dr. Douglas Bly, Rochester, N. Y.

MEDINA, OHIO, May 11th, 1860.

Dr. BLY:—SIR,—Since the 1st of January last I have worn an artificial limb manufactured by you. It far exceeds my expectations, and I can confidently believe it is only excelled by "Nature's own." In form and finish it is so perfect that it may be dressed the same as the other foot.

I have tested the utility of the ankle-joint, and find the lateral motion of great assistance in walking on an uneven surface.

Whoever uses it and tests its merits, I am sure will add testimony to its superiority.

I am happy in being able to recommend to any one whose misfortunes render such a substitute necessary a limb which has thus far served me so well and promises to meet future exigencies.

Yours, gratefully,

MARY S. BECKWITH.

OGDEN, MONROE CO., N. Y., Sept. 1, 1859.

I have used artificial legs of various constructions for twelve or fifteen years, and latterly have worn one of Dr. Bly's ball-and-socket jointed legs, which, in principle and operation, is a great and essential improvement on those heretofore used.

The motions of this limb are more natural than any I ever saw before. The universal motion at the ankle-joint is worth everything to a farmer; it enables me to go about my farm and do my work, no matter how uneven the ground. I can chop, make rail fence, dig ditch, and do most all kinds of work, though my leg is amputated above the knee.

It is now more than a year since I obtained this leg, and it has given me no trouble in breaking or giving out, as all my others have done.

EASTMAN COLBY.

ADDITIONAL TESTIMONY FROM EASTMAN COLBY.

OGDEN, MONROE CO., April 27th, 1860.

I hereby certify that I have worn one of Dr. Bly's ball-and-socket jointed legs for two years, and that the ball-and-socket joint and the cords connecting it have not broken, given out, or got out of repair in the least. It is the first and only leg I have ever had which did not require tinkering. I have worn artificial legs of different patents for fifteen years, but have never worn any with which I could walk with the ease and facility that I can with Dr. Bly's, especially on rough and uneven ground.

EASTMAN COLBY.

J. H. DAVIS.

LE ROY, N. Y., April 2, 1859.

DR. BLY:—DEAR SIR,—It gives me pleasure to inform you that the leg I bought of you last September is of the greatest service to me. I am in the grocery business, and on my feet

from morning until late at night. I can roll and lift barrels and boxes of goods out and into the waggon and cellar, deliver goods, and do everything pertaining to my business. The leg is all right, and works well, though I have not put a drop of oil into the ball-and-socket joint since I got it. I wish I had one of your improved knee-joints, so I would not be obliged to use any oil at all, for it is a great nuisance. You can recommend the ball-and-socket or universal motion at the ankle-joint as highly as you like, for it cannot be overrated.

Most truly and thankfully yours,

J. H. Davis.

ADDITIONAL TESTIMONY FROM J. H. DAVIS.

Le Roy, May 10, 1860.

I have worn one of Dr. Bly's artificial legs for a year and a half, and I hereby state that there has not been a single cord broken, neither has the ball-and-socket joint got out of order, in any way, shape or manner. And in regard to utility and comfort to the wearer, the universal joint can not be gainsaid. I have been keeping a grocery store, rolling barrels, and carrying boxes up stairs and down cellar, and I would say to all those who are suffering as I was that Dr. Bly's artificial leg will do all he recommends it to do.

Most sincerely and thankfully yours,

Jonathan H. Davis.

A. W. GILBERT.

Tully, Onondago Co., N. Y., March 30, 1859.

Dr. D. Bly :—Dear Sir,—From a sense of duty to you, and those who have been unfortunate like myself, I send you the following, which you can make any use of you think best, and you may refer to me whenever you choose.

I am now happy and comfortable, and I attribute it all to the artificial leg which I purchased of you last December. I have

worn the limb every day since, and have experienced no trouble. Some of the cords I unscrewed a little, and others I screwed up a little, as you told me, until I got it to suit my particular step or gait, and it has run like clockwork ever since. I have not put a single drop of oil in either the knee- or ankle-joint; yet, if I am not mistaken, it works better than when I got it. The limb sets perfectly easy, and does not hurt the stump, as other limbs do which I have seen in use. The mobility of the ankle-joint prevents the stump from prying against the socket when the foot happens to be placed on any inequality.

The Palmer and Selpho legs are both in use about here, but it is the prevailing opinion that yours is the best, because I walk the best. They walk quite well on a carpet, except that their step or gait is not quite as even and natural as mine, and I think it is because they lack the diagonal motion of the ankle; this may be a small matter to you, but it is a great one to us. But when we come to walk out of doors, on all sorts of rough and uneven places, then the superiority of the ball-and-socket joint is unmistakeable—it is the thing. It surpasses my expectations, and I would not be without it for any consideration.

Yours truly,

A. W. Gilbert.

ADDITIONAL TESTIMONY FROM A. W. GILBERT.

Tully, Onondaga Co., N. Y., May 25, 1860.

I hereby state that I have worn one of Dr. Bly's patent legs about a year and a half, and that it is still in the most perfect order. The joints show no perceptible wear yet. They never rattle, creak, or make any noise whatever; and to me what is very remarkable is that they never require any oil.

A. W. Gilbert.

H. J. DRAKE.

Chelsea, Mich., Aug. 15, 1859.

Dr. D. Bly:—Dear Sir,—After so long a time, I write to inform you how I am getting on with the artificial leg you made

me. I have been wanting to give it a fair trial. I cannot find words to express my satisfaction.

I have mowed my grass and made my hay myself, and that, too, on the marsh, where it was very boggy.

I have cradled my oats myself, and raked and bound them. In fact, I can do most all kinds of work.

I liked to forgot to tell you about threshing. I have been all round the neighbourhood threshing; and by thus changing work, have got help to do my own threshing. Doctor, if I could not get another leg of this kind, I would not take one thousand dollars for this one.

Most sincerely and thankfully yours,

H. J. Drake.

Windsor, Canada West, May 18, 1860.

D. Bly, M.D., Rochester:—Dear Sir,—In answer to your inquiry as to my opinion of the qualities of the artificial leg which I obtained from you, and am now wearing, I cannot hesitate to state that I have been by no means disappointed in it.

I wore a leg manufactured by Mr. Palmer, of Philadelphia, several years, and felt well satisfied with its usefulness; but I consider that the lateral motion of the ankle-joint in your leg is a decided improvement—the action of it being very useful. The knee-joint and the adaptation of the leg to the stump at the hip are also improvements on the leg which I had from Mr. Palmer.

I am, dear sir, your obedient servant,

John O'Conner, Jr.,
Warden of the County of Essex.

BONEVENTUE GROSS.

St. Louis, Mo.

Dr. Bly:—Dear Sir,—I am not able to express my thanks to you for the artificial leg you made for me. I find that it has merits which I did not know of until I began to use it.

The doctors here told me that you had invented a leg with the ankle-joint patterned right after the natural one, and that it would bend sideways and every way, just as well as the natural ankle—therefore I expected a good deal; still it more than fulfils my expectations.

Besides all this, I find there is no iron or metal of any kind used in the construction of the ankle-joint, which makes the leg extremely light; furthermore, the nature of the material is such that no oil is ever required. Then, for amputations like mine—below the knee—the curved joints on either side of the knee are a great improvement on the ordinary square or angular joints used by other makers.

When I set down, my pants set perfectly smoooth over the knee, and I am not obliged to put my other leg across the joints to hide them.

Boneventue Gross.

Saratoga Springs, May 11, 1860.

Dr. Bly:—Dear Sir,—I am still wearing your artificial leg, and feel a satisfaction in saying that it more than meets my expectation, for its lightness, adaptation and durability. The ankle-joint, to nature, is all that art can imitate: it is perfect in its action. I can walk with ease, and without a cane, on uneven ground or elsewhere, and am attending to general business about the store.

As to its durability, it needs but a slight mechanical eye to observe that yours is more durable than any other that has been offered to the public.

Hoping that your success may continue, that your improvement may continue to relieve the unfortunate, as it has me.

I remain, yours, &c.,

CLARK W. SALISBURY.

A PALMER LEG REMODELLED AND IMPROVED.

BUFFALO, Sept. 17, 1859.

Dr. BLY:—DEAR SIR,—You ask the privilege of publishing my letters. You can do so if you like.

Yours, &c.,

WILLIAM BUSHNELL.

BUFFALO, March 12, 1859.

Dr. BLY:—DEAR SIR,—I have been wearing the Palmer leg for about four years, during which time I have had two, both made by B. F. Palmer, of Philadelphia. I have had a great deal of trouble and vexation, caused by breaking the instep springs. The instep spring in my second leg has just broken again, which leaves me entirely destitute—my first leg having been completely worthless for some time. I am satisfied that metallic springs cannot be depended upon in an artificial leg; therefore I would like to have you put your patent rubber spring into my second leg. If you will, please inform me by return mail.

Most respectfully yours,

WILLIAM BUSHNELL.

BUFFALO, Sept. 10, 1859.

Dr. BLY:—DEAR SIR,—I am still wearing my Palmer leg with the rubber springs you put in for me. I like them very much. It makes one feel mighty comfortable to know that he has springs that cannot be broken. Besides, they have im-

proved my walking very much, the action of the rubber being so much more natural.

Most respectfully yours,

WILLIAM BUSHNELL.

LORENZO TAYLOR.

ELBRIDGE, ONONDAGA CO., N. Y., Sept. 1, 1859.

DEAR SIR,—I have worn the leg you made me last May every day since; and in justice to you, and those who are suffering as I was, that they may not be imposed upon, I feel it my duty to let it be known how useful and important your invention is. I feel it more on account of a letter I received from Palmer and Co. before I got my leg.

I would not like to repeat what they say about your leg, therefore I send you their letter—you can read for yourself. If I had not been near by, so I could go and see your leg for myself, I should not have bought one after reading their letter, but should have got one of theirs, which has only a single up-and-down motion at the ankle-joint, instead of the one I now have, which admits of every motion of the natural ankle.

If I happen to step on a sidling place, or on a stick or stone, the ankle-joint yields just enough to let the foot accommodate itself to the inequality, and thereby prevents all stumbling or inconvenience.

I work in a saw-mill, where I roll logs, carry lumber, tend the saw, and do all kinds of work. When lifting, I sometimes put a strain on the leg equal to the weight of two or three men, but I find that the leg can stand all I can lift.

The first week that I wore the leg I walked with one crutch; the next week I used one cane, and the next week I lost my cane so often that I concluded to throw it away altogether.

With much gratitude, I subscribe myself,

LORENZO TAYLOR.

BOTH LEGS AMPUTATED.

ROCHESTER, N. Y.

DEAR SIR,—I wish to state a few facts, which I hope you will publish for the benefit of those who have had the misfortune to undergo amputation of one or both legs.

For two long years, after I had my legs amputated, I dragged out a miserable existence, walking on my knees, during which time I was shown a great many artificial legs; and, after seeing and learning all that I could, I determined to procure a pair of Dr. Bly's ball-and-socket jointed legs. And now, after using them, I can assure those wanting artificial legs that their superiority over all others that I have seen is decided and positive.

The great improvement consists in the mobility of the ankle-joint, which bends sideways and diagonally, and every way the natural ankle does. The side motion enables me to keep my balance with the same facility that others do, by allowing the body to sway to one side or the other, as the case requires, particularly when on a steamboat or on the cars. It takes away the stiffness and uncertainty, or feeling as if on stilts, which there is when on two legs which have no lateral motion at the ankle. My motions are so free and easy, and I walk so well, that many are not willing to believe that I walk on two artificial limbs until I show them. I live a little more than a mile and a half from the post-office, and I am in the habit of walking there, and about town, for an hour or two, and then home again, without a cane; and I ask no one to wait for me either. If there is any one who does not believe it, let him try me.

I am now learning a trade, and am comfortable and happy.

HENRY EITT.

ROCHESTER, Dec. 27, 1859.

Some time in September last, Dr. Bly called at my picture gallery and asked me if I could take the likeness of Mr. Eitt, a man who had lost both of his legs, and was wearing two of the Doctor's "patent legs." I said I could in half an hour. A little before the time expired, I went down to the foot of the stairs to see if they were coming, and see how the man walked. In a minute or two a man passed me and went up stairs; near him was the doctor. I asked where the lame man was. "There he is," replied the doctor. Said I, "He does not go lame." "Well, that is the man," said the doctor. And I hereby state that Mr. Eitt, with two artificial legs, could and did, without the aid of a cane, walk in such a manner that no one would notice any lameness. He went up and down stairs without inconvenience.

MATSON OTIS,
Artist, and Proprietor of Gallery, 14, *State St., Rochester.*

STANTON, PORTAGE CO., WIS., May 15, 1860.

DOUGLAS BLY, M.D., Rochester, N.Y.:—DEAR SIR,—It is some time since my last to you. I have been waiting until I had thoroughly tried the leg you made me, which I have done, and become satisfied that it is all you represented it to be. Before I got it, I thought that if one half of its merits were true, which I found set forth in your pamphlet, it would be good enough; and now by using it I find that they were not only all true, but that not more than half were told. The fact is, no one can fully appreciate the merits of the ball-and-socket joint until he uses it. I go wherever I like, no matter whether it is level or hilly, rough or smooth. The foot accommodates itself to the surface the same as the natural one, and enables me to walk with freedom and ease.

Respectfully yours,
W. H. PACKARD.

A PALMER LEG REMODELLED AND IMPROVED.

DETROIT, MICH., Aug. 3, 1859.

Dr. D. BLY:—DEAR SIR,—I this day send you by express one of my artificial legs, manufactured by Mr. Palmer, of Philadelphia. I wish you to insert your patent india-rubber springs and knee-joint. I have worn artificial legs between thirty and forty years—Bartlett's, Palmer's, and Thomas's, and one other, whose name I cannot recollect—all of them having metallic springs, which are a perpetual source of trouble and expense, in consequence of their breaking so often. Another great source of annoyance with all the artificial legs I have seen or worn is the wearing of the bolts and boxes, producing a clanking or rattling noise; the only remedy being to send the limb to the manufacturer or some other mechanic, to have the boxes bushed. I saw a specimen of your artificial legs last spring; gave it a thorough examination, and it seems to me you have found a remedy for both of the difficulties alluded to.

Please make the necessary alteration as soon as convenient, as I am in continual fear when one of my legs is gone for repair that the springs in the other may break at any time, and compel me to take to my crutches.

Yours truly,

E. ROOD.

DETROIT, MICH., Sept. 19, 1859.

Dr. D. BLY:—DEAR SIR,—My Palmer leg into which you put your patent springs and knee-joint came in due season. I am extremely well pleased with the improvement. The action of your springs is remarkably pleasant. There is a life-like elasticity in them, which gives a very fine motion to the leg, far superior to the metallic springs.

Your method of tightening the knee-joint is admirable. It is as much better than bushing with buckskin as the rubber springs are better than the metallic.

I am so well pleased that I shall send you my other artificial leg to have your springs and knee-joint inserted as soon as its instep spring breaks again.

Yours respectfully,

EZRA ROOD.

LOUISVILLE, KY., Dec. 10, 1859.

DEAR DOCTOR,—Again I send you my warmest thanks, for setting me on my feet again. I also feel very thankful to the doctors here for sending me to you. They told me you had constructed a leg on anatomical principles, which I hardly thought possible, but now I am convinced. The ball-and-socket joint at the ankle allows my feet to accommodate themselves to the varying inequalities of the ground so well that not one in a hundred can tell, by seeing me walk, that I walk on anything but my natural legs. This has been tried over and over again. It is a great triumph. I can walk on rough ground, side hills, slanting sidewalks, cobblestone pavements, and up and down stairs without difficulty, not even requiring a cane. In going up and down stairs I use my feet alternately, the same as other people. When I had had my legs only three weeks, I walked a mile and a quarter in twenty two minutes, and went up one flight of stairs in the time. A few days ago I walked over the Oakland race-course—one mile—in fourteen minutes. Dr. Knight, D. S. Benedict, Thomas Brown, Capt. McPherson, and others, saw me do it. I do not know whether you call that good walking or not, but it suits me pretty well.

I and my friends will wager $5000 that I can walk a greater distance in a given time than any man living who walks on two artificial legs of any other patent or construction.

If there is any one in this region wants an artificial leg, send him to me, for I am a better certificate than can be published.

Most sincerely yours,

DR. J. F. MILLER.

☞ Mr. J. F. Miller had the misfortune in California some years ago to have both legs cut off by a threshing machine, and subsequently resided in this city, but was nevertheless able to move about on the remaining joints. During the past year Mr. Miller has procured a pair of artificial legs made by Dr. Bly, of Rochester. We knew Mr. Miller well when he resided here before, and yesterday a friend took us to his office. We found him sitting in a chair on entering, and he immediately arose and coming up to us received us very cordially. Our friend had not informed us who he was, and we did not recognise him. We knew the face, but having been accustomed to look down upon him, we now had to look up in addressing him, and he moved about on his artificial "understandings" with an ease that challenged detection. The change was so great we had to be told who he was.—*Louisville Journal.*

This leg was exhibited at the New York State Fair, at Albany, October 4, 1859, and the following is the Report of the Committee:

Artificial Legs.—History teaches us that now and then an ultimatum will be accomplished in some given direction of scientific research or mechanic art, or both combined. This, it seems to us, is the case in regard to Dr. Bly's artificial leg. Nothing can, possibly, more entirely imitate and replace the natural leg. It is light and strong—it is capable of adjustment to the stump without inconvenience to the wearer—it is symmetrical and elegant in its proportions, and when covered with a stocking would not be detected. But its crowning excellence consists in the flexibility and perfectly natural motion of the joints, and the adaptation of the foot to any position or any uneven surface, operating in all respects like the natural one, and the motion or action of the leg in the act of walking, on account of the rubber springs or muscles with which it is furnished, instead of hitching or dragging as is generally the case, is elastic, buoyant, and natural. And we repeat, it is difficult to surmise what further can be accomplished in this direction. The doctor had a gentleman in company with him who wore two of them, and it was really surprising to see with what ease,

with only a cane, and sometimes without even that aid, he could not only walk about, but could do so easily and gracefully. The doctor has not only proved himself a first-class inventor, but a public benefactor also, and we feel sure that those who have been so unfortunate as to be deprived of either or both of their legs will learn by the use of his artificial ones to so regard him. We award him the first premium.

I certify that the foregoing is a true extract from the report of Committee, No. 72 d, of the N. Y. State Fair, held at Albany, Oct. 4th, 1859.

S. A. Bunce, *Secretary to Com.*

Albany, N. Y., July 30, 1860.

Dr. Bly,—I am very much pleased with my artificial leg you made; it works well, so life-like in all its motions. The superiority of your springs over the metallic ones I have formerly worn is very apparent. I can walk with perfect ease and elasticity. I am on my feet from early dawn till night, both in and out doors, without the least inconvenience, since wearing the one made by you, but I could never do it with either of the former legs, to a much less extent, without wounding me severely: this great difficulty is now done away with.

I have worn legs of several different patents, among which are Selpho's old Anglesea, and Selpho's improved Anglesea. Over all of these I must give yours the decided preference.

Yours, with much respect,

Anna McCrea.

Corning, N. Y., Aug. 15, 1860.

Dr. Douglas Bly:—Dear Sir,—I have worn your leg every day since I got it, and am very much pleased with it. I have worn three different patents before yours—one made in New York, one in Boston, and one in Springfield, Mass., by Palmer and Co., but I never could walk as well, or work with as much

ease with either of them as I can with yonrs. The side motion is the best thing of all. It enables me to lift and carry heavy iron castings without hurting or straining my stump; also to work at a vice, or do anything belonging to my trade—machinist.

Your india-rubber springs enable me to walk very well indeed. I have no limp or halt as I had with my other legs. The india-rubber springs seem to take away the mechanical action always produced by metallic springs. If any wishes to see this demonstrated, let him come and see me at my work, or let him take a walk with me.

Yours, &c.,

HENRY LIPPS.

A PALMER LEG REMODELLED AND IMPROVED.

SCHAGHTICOKE, RENSSELAER CO., N. Y., Aug. 16, 1860.

Dr. BLY :—DEAR SIR,—I am happy to inform you that my Palmer leg, which you remodelled for me with your improved ankle-joint and springs, now works to a charm. I suffered a great deal of inconvenience with the springs of my old leg continually breaking, and with the joints becoming so loose as to make a noise at every step, both of which difficulties are obviated by your improved springs and joints.

The lateral motion of the ankle-joint is a great improvement over the old Palmer ankle. It enables me to walk on any grade, or on rough and uneven places, without prying, cramping or straining my stump. And it gives a greater freedom of motion, and takes away that stiffness that I used to feel in walking.

The natural motion and ease in walking, obtained by your ankle-joint and india-rubber strings, when contrasted with my old Palmer ankle and springs, makes your invention invaluable. You deserve the heartfelt thanks of that portion of community who are obliged to look to art to supply a limb in place of one of which accident has deprived them.

I remain, truly your friend,

J. W. GEDDIS.

BATAVIA, N. Y., August 1, 1858.

DR. BLY :—DEAR SIR,—For the benefit of railroad men, I send you this testimonial in relation to the artificial leg you made for me.

I am an engineer, and run a locomotive on the N. Y. Central R. R. I have tried a number of artificial legs of different construction, and yours enables me to work about my engine with more ease and facility than any other. The mobility of the ankle-joint, which allows the foot to adapt itself to the motions of the engine, also to the unevenness of the ground in jumping off, is of great importance to railway men. I have had it a year, and it has given me no trouble in breaking or getting out of order, though it has had some severe tests in jumping off the engine.

H. BACKUS.

ADDITIONAL TESTIMONY FROM H. BACKUS.

BATAVIA, N. Y., June 1, 1860.

It is now about two years since I obtained one of Dr. Bly's ball-and-socket jointed artificial legs, and I can testify that neither joint, spring, or any part of it, has got out of order in the least.

H. BACKUS.

SHUSHAN, WASHINGTON CO., March 13, 1861.

DOUGLAS BLY, M.D. :—MY DEAR SIR,—I shall send you my Palmer leg on Monday next, by express, for you to put in all your improvements, especially the ankle- and knee-joints.

* * * * * * *

In reading one of your recommendations, the writer speaks of the great annoyance with artificial legs, such as the wearing of the bolts and boxes, producing a *clanking* or *rattling* noise. That

is the case with my limb, so much so that I dread to walk, and do so only when compelled by necessity. Put in your method of tightening the knee-joint.

Yours, affectionately,

PHILANDER PERRY,

Pastor First Salem Bap. Church.

INGERSOLL, C. W., March 6, 1861.

Doct. BLY :—DEAR SIR,— * * * * I have improved very much in walking since I began to wear the leg you made me. I like your leg far better than my old one. I am not afraid of breaking a spring, which gives me confidence in myself when walking. * * *

I remain yours,

JOHN C. LITTLE.

UTICA, July 9, 1861.

To those wishing to procure substitutes for lost legs :

I, Thomas Morgan, having had the experience of several years in walking artificially, and consider myself competent of judging of the merits of artificial legs, and will speak without prejudice, as it is of no interest to me whatever; only if I could, through my advice, help some one in procuring a good and substantial leg. I first got a Palmer leg, and having worn it out, was compelled to get a new one. I had heard a great deal of Dr. Bly's famous ball-and-socket jointed artificial leg. I made up my mind to have one, and see what I could get out of it in the way of walking. I have been walking on it one year, and to my satisfaction. I must give it a decided preference over the Palmer leg; it gives me more ease and comfort, and certainly has greater durability, as I cannot see as it has worn a particle yet. The ball-and-socket joint imparts ease that I cannot get where there is no side motion; and secondly, it never

requires bushing and constant tinkering to keep it in running order.

Yours truly,

THOMAS MORGAN.

Utica, N. Y.

MT. GILEAD, O., January 24, 1861.

Dr. BLY :—DEAR SIR,—It is withpl easure, and from a sense of duty I owe you, I write this. The leg you manufactured for me works to a charm. Those not acquainted with the circumstance can hardly be made to believe that I use an artificial leg, as it is hardly perceptible, as I walk without crutch or cane, although I have only used it about three months. In conclusion, allow me to thank you heartily for what you have done for me, and also to congratulate you on your *great* invention, hoping that prosperity may be yours.

I remain your obedient servant,

E. C. CHASE,

County Recorder, Morrow Co., Ohio.

INDIANAPOLIS, IND., May 12, 1861.

Dr. D. BLY :—DEAR SIR,—My experience in wearing artificial legs previous to wearing yours was such that I had made up my mind that all artificial legs were *necessarily* uncomfortable, and that I must put up with it; but now I am happy to find that I was mistaken. The side motion in yours prevents all the cramping, straining, and hurting the stump when I step on a stick or stone, or on uneven ground, a relief and comfort that no one can well understand unless he has worn a leg without side motion. The curved joints at the knee, with the arrangement for tightening, are admirable. Either the ankle-joint or the rubber springs, or both together, have improved my walking very much. I walk so well that I am looked upon as an able man; so well, that one of our captains, who was getting up a

company, wanted me to join in his ranks, and one of the boys told him that I had an artificial leg, so he examined me, and finding that he was sold, treated the crowd.

Yours truly,

WM. B. JONES.

CINCINNATI, O., April 24, 1861.

Dr. D. BLY, Rochester, N. Y.:—RESPECTED SIR,—I feel that I am fulfilling a duty in returning my sincere thanks for the great benefit I received in procuring one of your "artificial limbs." I can deeply feel for the poor wretch that has to pass through life on a crutch, *with aching arm, benumbed hand, and deformed appearance.* I would, as a fellow-sufferer, urge on all such the necessity of procuring one of Dr. Bly's "artificial limbs." I have been walking for six months on one, and I have more than realised my most sanguine expectations. The ankle joint is *splendid.* May your invention ever continue to be to to others what it has been to me—a revival of life's happiest days. Again thanking you,

Believe me ever your debtor,

A. R. CALLAHAN.

[From the 'Transactions of the Medical Society of the State of New York.']

The Points of Election and Kind of Operation for Amputation of the Lower Extremities, with reference to the Use of Artificial Limbs.

By Douglas Bly, M.D., Rochester, N. Y.

POINTS OF ELECTION.

Since an early period in surgery surgeons have recognised the importance of electing such points for amputation of the lower extremities as were best adapted to the application of artificial limbs. And many of the authors of works on surgery have given such points as were considered best adapted to the artificial limbs made at that time, but the great improvements which have been made in artificial limbs have materially changed the old points of election; therefore this subject demands the attention of surgeons generally.

In accordance with the high state of perfection now attained in the construction of artificial limbs, all amputations performed on the foot should be anterior to the insertion of the flexors of the foot. The operation known as "Chopart's" severs the flexors of the foot, and should never be performed under any circumstances whatever. The moment the flexors are severed, the extensors, having no antagonists, draw the heel upward, extend the foot on the leg, and cause the amputated surface to point almost directly downward. This deprives the patient of all power to use the remaining portion of the foot, and also renders him incapable of wearing a useful substitute. I am aware that, to obviate this difficulty, some surgeons have severed the tendo Achillis, but that has proved ineffectual; it is only a partial relief at best. Therefore amputation at this point renders the patient a hopeless cripple. The wound is slow to heal, always tender, often ulcerating, and the remaining portion

of the foot is generally a curse to the patient as long as he lives, unless he submits to a secondary amputation.*

It is but a short time since the Prof. of Surgery in the Geneva Medical College performed secondary amputation for such a patient. This patient had had the tendo Achillis cut twice, and then made an unsuccessful effort to wear a substitute constructed by a noted firm in New York City, but at last, to better his condition, was obliged to submit to re-amputation. (See fig. 9, which represents a stump after "Chopart's operation.")

Fig. 9.

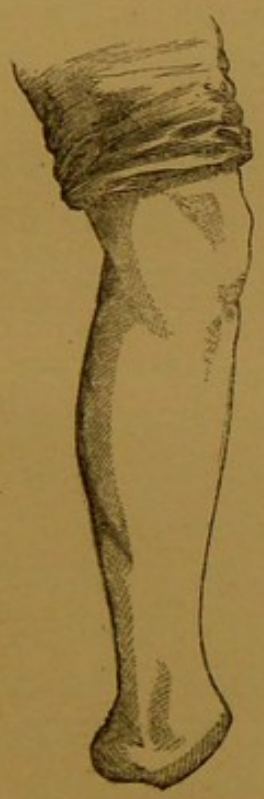
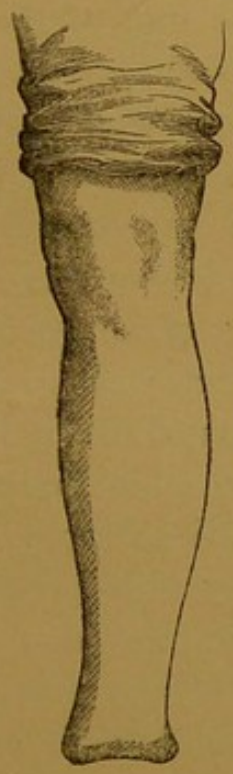


Fig. 10.



Amputation through the ankle-joint, by sawing through the malleoli, known as "Symes' operation," is less objectionable; still, since the artificial leg has been brought to such perfection, there are reasons which weigh heavily against this operation. The ankle-joint in the artificial leg should correspond with the one of the natural leg, but cannot in this case, and be con-

* Since this paper was written, I have (to meet the objection here mentioned) invented an artificial foot expressly for Chopart and Symes' operation, by which the patient who uses it can walk without the slightest pain or difficulty.—H. H. B.

structed after the most approved plan, on account of the length of the tibia and fibula.* To get a good fit with an artificial limb, the stump should be conical, or at least it should not be larger at the end than it is higher up, as it renders a portion of the interior of the artificial too large enough to allow the bulbous extremity to pass through. (See fig. 10, which represents a stump after "Symes' operation.") Or if the leg is made to lace up, even then the ankle is necessarily large and clumsy.

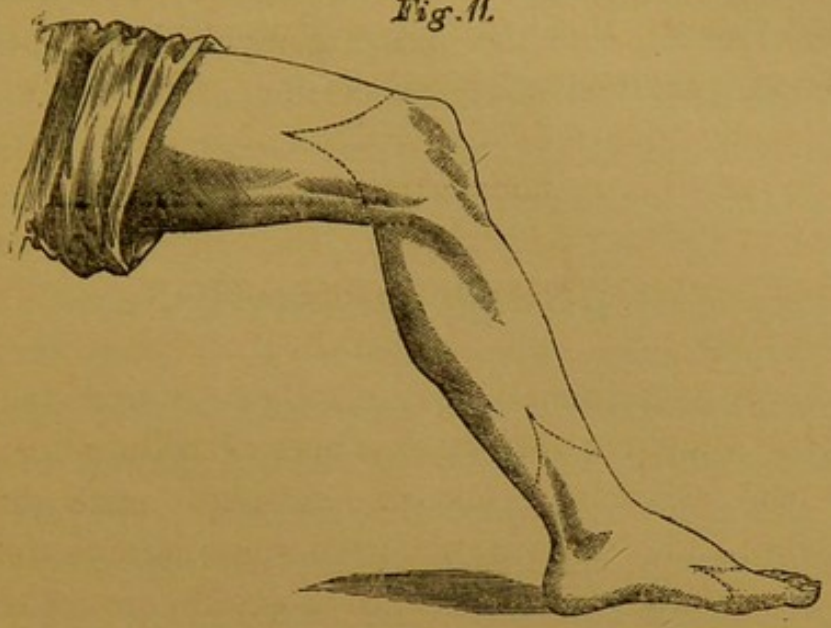
It has been supposed that by this operation the patient would be able to take the most if not all his weight upon the end of the stump, but the cases which I have seen do not sustain the supposition. I have not seen one that could support the whole weight on the end of the stump, though a few could sustain some, not enough, however, to counter-balance the difference in the substitutes, while others could not bear any more than those who are amputated higher up. Therefore, when amputation becomes necessary which would sever the flexors of the foot, it should be performed a sufficient distance above the ankle-joint to admit of an artificial substitute with an ankle-joint of the most perfect construction now attained.

The junction of the middle and lower third of the tibia is the lowest point at which amputation of the leg can be performed, and give sufficient room for the construction of a good, substantial and graceful artificial limb, with an ankle-joint of the most recent improvement. It also gives a stump of as much length as is of any service to the patient, therefore the junction of the middle and lower third of the tibia should be the first point of election whenever the flexors of the foot cannot be saved. (See point indicated on leg, fig. 11.)

An artificial leg, with lateral motion at the ankle-joint, will bear a stump of greater length, with comfort to the patient, than one which has no lateral motion at the ankle. The testi-

* The lower portion of the bones occupy space which is needed for the artificial joint. (See Nos. 1 and 3 on page 12.) For amputations below the knee, the cords (*C*, fig. 1) have to be shortened according to the length of the stump, until the springs (*S*) rest on the plane seen just above the ball (*B*), and cannot conveniently be placed any lower. This illustrates the necessity of removing at least the ends of the tibia and fibula.

Fig. 11.



mony of those who have undergone re-amputation is, that with a very long stump and an artificial leg which had no lateral motion at the ankle, they suffered much more from the cramping and prying of the stump against the sides of the leg when they stepped on any uneven surface than they did after re-amputation with a stump of less length. The fact that the junction of the lower and middle third of the tibia gives a stump of as much length as is of any service to the patient is important in this connection. Then from this point the surgeon should not recede unless compelled by necessity. He should contest every inch until driven to the knee-joint. But he should never operate through the knee-joint, as nothing is gained by it, while much is lost, because the end of the femur will occupy space which is needed for the construction of an artificial knee-joint. True, an artificial joint has and can be made in this case, but not near as durable and comely as when the condyles of the femur are removed. The size of the condyles makes the end of the stump too large, and the same objection arises as in "Symes' operation."

If the femur is sawn through just above the condyles, the stump assumes a conical form, and the end of bone no longer presents any obstacle to the construction of an artifiicial joint of the most modern improvement. Then, for amputation of the thigh, the point of election is just above the condyles of the femur. (See point indicated on thigh, fig. 11.) From this

point upward the surgeon should contest every inch with redoubled vigour. And the higher compelled to go, the greater the value of every item of femur saved.

KIND OF OPERATION.

In the use of artificial legs no weight is ever taken on the end of the stump; in fact, nothing is allowed to touch it. But on the sides it is just the reverse. The artificial leg encases the stump, and more or less pressure is taken on all sides, particularly anteriorly and posteriorly. The stump is used as a lever to operate the artificial leg, and at every step there is considerable pressure on the anterior surface in carrying the leg forward, and then it is transferred to the posterior surface, just as the weight of the body is being carried forward on to the leg. Thus there is a pressure alternately on these two surfaces at every step. Besides this, with a leg in which there is no lateral motion at the ankle-joint, there is more or less cramping and prying of the stump against the sides of the artificial leg whenever the foot is placed on an inclined plane, or one side happens to be placed on any inequality, such as a stick or stone, or uneven ground of any kind. Now, as the cicatrix is always tender and sensitive, it becomes necessary that, in amputating the lower extremities, the surgeon should choose the kind of operation which will best protect the stump on all sides, particularly the anterior and posterior.

The operation which fulfils these indications best is the double flap, the flaps being antero-posterior. (See dotted lines on fig. 11.)

If the flaps are taken from the antero-posterior surfaces, they lap over the end of the bone or bones, and protect the edges by means of sound healthy integument in all cases, and in many by a cushion of muscle. This brings the cicatrix across the end of the stump, where nothing can touch or injure it when wearing an artificial leg. Very small portions of the cicatrix may in some cases pass up on the sides laterally, but not enough to be of any account in the use of an artificial leg with lateral motion

at the ankle-joint, as that prevents all lateral cramping or prying against the sides of the stump.

The single flap operation is decidedly bad, because it often, if not always, brings the cicatrix just across the edge of the bone, where, from its sensitiveness, it seriously interferes with the use of an artificial leg.

The circular operation would, at first sight, appear to fulfil every indication, as it is alike on all sides, but unfortunately, instead of protecting all sides, it is really just the reverse. As soon as the weight of the body is placed upon the stump with a circular operation, the whole muscular covering, with the integument, glides upward in a body; the end of the bone or bones protrude beneath, covered by a thin cicatrix only, and instead of being protected on all sides are really protected on neither. Thus it is seen that the antero-posterior flap operation is the operation to be performed whenever the surgeon has the privilege of choosing.

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