Meyer (H.)

PROCRUSTES ANTE PORTAS.

Why the Shoe Pinches

A CONTRIBUTION TO

APPLIED ANATOMY.

BY HERMANN MEYER, M. D.

Professor of Anatomy in the University of Zürich.

PUBLISHED BY

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239 & 241 Fourth Avenue, New York,

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ALL KINDS OF BOOTS & SHOES

AS RECOMMENDED BY

HERMANN MEYER, M. D.

1876.

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Truly, M. L. HOLBROOK, M. D.

PROCRUSTES ANTE PORTAS.

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DIRECTIONS FOR SELF-MEASUREMENT.

Take the measure at the places marked in the outlines given below, and write it in inches opposite the numbered lines. Also take an impression of the foot, obtained by standing on paper and drawing a line round.

WRITE SIZE IN INCHES.

1.....

2.....

3.....

4.....

PREFACE BY THE AUTHOR.

The greater part of the following pages appeared, in the Spring of 1857, in the second volume of the "Monatschrift des wissenschaftlichen Vereinschrift in Zürich," under the title of "Procrustes ante Portas! Ein Culturgeschichtliches Zeitbild." As its title indicates, this paper was a pretty sharp satire on the many deformities which, through vanity or ignorance, have been thoughtlessly or intentionally inflicted on our bodies. On various occasions I have briefly alluded to evils of this kind, and dwelt more particularly on the errors in the usual form of the coverings of our feet, at the same time giving hints how a more suitable shoe might be obtained without prejudice to the ever primary consideration of elegance. My attention had been directed to the subject in the following manner: On the one hand my experiments on the mechanism of walking, published elsewhere, led me to remark how utterly bad our foot-clothing is; and on the other, my position as a teacher of anatomy gave me abundant opportunities of observing the almost incredible deformities of the human foot, resulting from the pressure of the shoe. Several well-marked cases having come under my notice in rather rapid succession, I wrote the paper above alluded to, to make known, once for all, my opinions on the subject.

The matter excited much attention amongst those who had the opportunity of seeing this paper, and many medical men recognized, with great interest, the importance of the question involved. From the most varied sources I have since been urgently requested to recast this essay in a separate form, so that its contents might become known to a still wider circle of readers.

I confess having hesitated somewhat to comply with these demands. My scruples were overcome, however, by a considera-

tion of the great importance of the subject, and I yielded the more readily that anatomists so distinguished as Peter Camper and Sömmering had preceded me with similar lucubrations,—the former with his paper "On the Best Shoe," and the latter with a treatise "On Stays." Moreover, it especially behoves anatomists to speak out on such subjects, since, from the nature of their studies, they have at hand the proper material for settling such questions.

The subject treated of by Sömmering concerns only one-half of mankind; and of this half, only those who are sufficiently foolish, voluntarily to sacrifice comfort, health and beauty to an absurd fashion.

In the case of the shoe, however, all mankind are equally interested; and the ventilation of the subject is the more important that we submit in ignorance only, and do not voluntarily subject ourselves to those injuries to health, and, it may be added, to temper, directly and indirectly inflicted by badly-shaped shoes.

Camper, writing on this subject in the last century, very truly remarks,—"All horse-doctors and horse-fanciers are interested in the shoeing of their horses, numerous papers appear thereon, and shall we not concern ourselves about the foot-gear of man?

Camper's suggestions attracted considerable attention, but his plans found little or no encouragement, because they were so very impracticable, and, above all, because of the very clumsy form of shoe he recommended.

May my little work be found more practical! I have, at all events, tried to produce a form in unison with the claims of elegance, and various trials have proved that my plans may be carried out with success.

HERMANN MEYER.

ZÜRICH, *December*, 1857.

The Meyer style of shoes has become very popular in England and is known as the "Waukenphast," being named after its manufacturer.

WHY THE SHOE PINCHES.

OBJECT OF A COVERING FOR THE FOOT, AND THE CONDITIONS IT HAS TO FULFIL.

We put on shoes for precisely the same reason that we wear clothes on other parts of our bodies, namely, that we may be protected from injurious external influences.

The influences from which we desire to be protected are, roughness of the ground on the one hand, and cold and wet on the other.

When the roughness of the ground only is to be provided against, the sandal—consisting of a sole of stiff leather or wood, fastened by thongs or bands so as completely to cover the under part of the foot—is sufficient.

But if protection from cold and wet be also desired, the sole has generally added to it a covering for the whole foot, and part of the leg. This covering may be made of various stuffs, but usually consists of soft leather. When thus combined with the sole, the upper leather further serves to keep the sole firmly fixed under the foot, and thus does away with the need of bands and thongs. Such combinations of upper leather and sole are called boots, shoes, etc.

A shoe, then, has to afford protection against unequal and rough ground, as well as against cold and wet. This is the object of a covering for the feet.

A covering for the foot has, however, to fulfil this object in a manner that will give rise to no disadvantage, the existence of which would essentially diminish the benefits of protection. The remedy would in this case be worse than the evil. Here, however, Fashion, so unfortunately mixed up in all our clothing relations, steps in and must even have her say on the shape of the shoe. So long as the influence of fashion is confined to the cut and amplitude of the coat, the form and color of the hat, and the like, the only harm that accrues is the probable production of a somewhat ludicrous effect. It signifies little, so far as health is concerned, whether a man wears a gray coat or a brown one, but it is of some importance whether the shoe he wears be broad

or narrow, rounded or pointed, long or short. The shape of the shoe has too much influence on health and comfort to be left to the dictates of fashion.

The influence of fashion on the shape of the shoe produces the most baneful effects on the mechanism of the foot and on its soundness, and thus materially affects our moving about, and our consequent ability to take a sufficient amount of open air exercise.

It is quite clear that the foot must get into the shoe, and if the shoe differ in shape from the foot, it is no less plain that the foot being the more pliable, must necessarily adapt itself to the shape of the shoe. If, then, fashion prescribes an arbitrary form of shoe, she goes far beyond her province, and in reality arrogates to herself the right of determining the shape of the foot.

But the foot is a part of the body, and must not be changed by fashion; for our body is a gift, and its several parts are beautifully adapted for the purposes for which they were intended.

We do not, indeed, at first sight fully perceive the arrogant absurdity of which fashion is guilty in going so far as to determine the shape of our feet, because we are not alive to the fact that the case is peculiar to the feet. We only see it influencing the shape of the shoe, and come to the conclusion that it may regulate this as well as the cut of the coat. To this prevalent opinion we yield, regardless of the influence on the shape of the shoe, and thereby on the FOOT. As well, indeed, might Fashion one day come to the conclusion that fingers are inelegant, and decree that henceforth the hand be squeezed into a conical leather bag;—as well, indeed, might she in one of her freaks forbid the display of our arms, and bind them firmly to our bodies like those of children in swaddling clothes.

The shoe ought to protect the foot, but it has no business to distort its shape.

A shoe which will really be a help to walking, and not, as is too often the case, a hindrance, should be adapted to the shape of the foot, and this must accordingly first occupy our attention.

ON THE STRUCTURE OF THE FOOT.

The foot consists of six-and-twenty bones, very beautifully arranged, and admitting of more or less motion on one another.

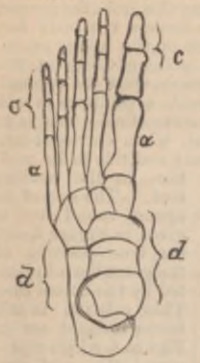

Fig. 1.

Bony framework of a healthy foot, seen from above,—*a a*, metatarsal bones.—*b*, astragalus,—*c c*, phalanges of toes.—*d d*, the tarsus of which the astragalus forms a part.

Fourteen of these bones belong to the toes, the remaining twelve enter into the formation of the tarsus and metatarsus.

The metatarsal bones are the five long bones (*a*). With the forepart of these the toes form the joints. The remaining seven are the tarsal bones, and one of these, the astragalus (*a*), is embraced on each side by a projection (malleolus) from the bones of the leg, thus forming the ankle-joint.

If the inner aspect of the foot is examined, we find that it is an arch, resting in front on the anterior heads of the five metatarsal bones (*a*), but principally on that of the great toe, and on the calcaneum or heel (*b*) behind. The astragalus (*c*) forms the keystone of the arch.

The arch is enabled to retain its form by means of strong ligaments, or bands, passing from one bone to the others, and thus held closely together, sustains the superincumbent weight of the body without giving way.

When we rest on the foot, as in standing, the arch is flattened by the pressure from above, and, consequently, becomes lengthened. When, however, the foot is allowed to hang free, the curvature is increased. At every step in walking, also, when the foot is raised from the ground the curvature immediately becomes greater through the action of the muscles. The toes lie in front of the metatarsus, and are connected with it by joints. Each of the smaller toes has two joints,—the great toe only one.

Fig. 2.

The inner aspect of the foot, showing the arched construction of the whole foot—*a* head of metatarsal bone of great toe.—*b*, calcaneum—*c*, astragalus.

The great toe plays by far the most important part in walking; because, when the foot is raised from the ground, with the intention of throwing it forward, we first raise the heel, then rest for a second on the great toe, and in lifting this from the ground the point of it receives a pressure which impels the body forward. Thus, in raising the foot, the whole of the sole is gradually, as it were, "unrolled" up to the point of the great toe, which again receives an impetus by contact with the ground. The great toe ought, therefore, to have such a position as will admit of its being unrolled in the manner described, that is to say, it must so lie that the line of its axis, when carried backward, will emerge at the centre of the heel; and this is its position in the healthy foot. The sole of an almost sound foot is given in Figure 3, and the true position of the great toe is indicated by the dotted line. This relation is still better brought out in Figure 4, which represents the well-preserved foot of a child, about two years old.

Fig. 3.

Fig. 4.

Figure 3.—View of a sole as yet in its natural state. Figure 4.—Sole of the foot of a child two years old. [In both of these figures (3 and 4) the continuation of the axis of the great toe is seen to pass through the centre of the heel.]

The line drawn through both figures is that in which the line of the foot UNROLLS itself from the ground. The smaller toes, however, are by no means without their uses. In standing, they rest on the ground, and give lateral support to the foot; while, in walking they are bent in a peculiar manner, so that they are firmly pressed against the ground,—and here, too, they support the foot latterly. The first joint is strongly bent upward, while the second is hollow above. This peculiar curvature enables the toes in a measure to lay hold of the ground as with bird's claws.

CONSTRUCTION OF THE SOLE OF THE SHOE IN THE ORDINARY WAY.

In proceeding to make a shoe to order, the shoemaker measure the foot at various points, but of all the measurement he takes, none have a decided influence on the shape of the sole except the length, and perhaps the circumference of the foot at the root of the toes.

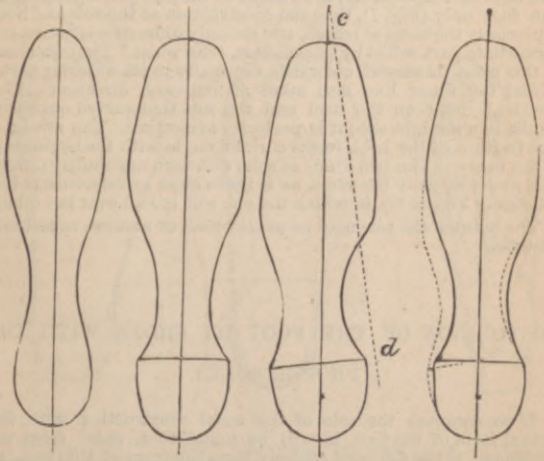

Fig. 5. Fig. 6. Fig. 7. Fig. 8

Figure 5.—A symmetrical (straight) sole, like those usually made for ladies' shoes. Figure 6.—A sole of the same kind for a man's foot. Figure 7.—An unsymmetrical sole [made to fit one foot only] of the ordinary make —*c d*, the line in which the axis of the great toe lies in a sole of this kind. Figure 8.—The two outlines (Figs. 6 and 7] laid on one another, showing that the only difference between these two soles is in the direction of the "*waist*," between the heel and the anterior part of the foot.

The length, however, is in all cases the more important, and in proceeding to plan out the sole, it is laid out in a straight line, a little is added to it, and the sole receives one of two shapes, according as the shoe is intended to fit the right or left foot, or either foot indiscriminately.

If the shoe is intended to be used for either foot, the line alluded to forms the center round which the outline of the sole is symmetrically constructed, as in the accompanying Figures 5 and 6. The straight boundary line in front of the heel forms a right angle with the middle line.

If, however, as is more usual, the shoes are made for the right and left foot respectively, the outline of the sole corresponding to one foot only (Fig. 7), then the construction of the sole and heel is precisely the same as before, and the only difference is in that intermediate part called by shoemakers, "the waist." The outer line of this waist is curved outwards, especially in its anterior part; whilst the inner line also takes an outward direction. The "waist," between the heel and the sole thus curved outward, whilst in a straight shoe it is perfectly symetrical. The straight line in front of the heel, forms a right angle with the beginning of the curve. The two kinds of sole, although apparently different, are essentially the same, as is made clear by reference to the adjoining Figure (8), in which the one sole is laid over the other.

The point of the sole may be made broad or narrow, as fashion dictates.

DISTORTION OF THE FOOT BY SHOES WITH IMPROPER SOLES.

If we compare the sole of the usual construction with the actual form of the foot, it will be found that, apart from its smallness, it has deviated entirely from the form of the foot, as will readily be seen by comparing the soles represented above with Figures 3 and 4.

In making this comparison, we also perceive how the foot is injuriously acted on, since it must be forced, by the upper leather, into a shape corresponding to the outline of the sole. This cannot be avoided, indeed, for the toes are squeezed together from both sides, and the pressure is necessarily greatest where the shoe is narrowest. If we examine more particularly as to

how the position of the toes is in this way affected, we find the following changes take place:

From the outside the four smaller toes receive a pressure which forces them against each other, and also against the root of the great toe, which is thus pushed inward.* The point of the great toe is besides pressed outward, and the middle line, or axis, of the toe thus becomes oblique. The obliquity of the great toe thus results from the inward pressure on the root by means of the smaller toes, and the outward pressure on the point directly inflicted by the upper leather.

Fig. 9.

Fig. 10.

Fig. 11.

Figure 9.—Sole of the foot of a girl twenty-two years old, distorted by the pressure of the shoe, but otherwise healthy. Figure 10.—The same sole with the outline of a *straight* sole laid over it, showing how such distortions are produced by the form of the foot accommodating itself to that of the shoe. Figure 11.—View of the skeleton of a foot so deformed, from above. The joints of the toes look shorter here than in the healthy foot (Fig. 1), because, on account of the toes being curved, they are apparently diminished in length.

* The terms *outward* and *inward*, here and throughout, when used in reference to the foot, have relation to the middle line of the *body*, and not to that of the foot.

The distortion which thus arises in the foot is very important, for the almost rectangular-triangle in which the toes naturally lie, is converted into an isosceles acute-angled triangle, and in this the toes are expected to find place. It is well if they can do so side by side, but this treatment is constantly giving rise to the most mischievous distortions, at first only manifested while the shoe is worn, but eventually becoming permanent. The accompanying outline (Fig. 9) represents a foot disfigured in this way; it was drawn from nature, and with the exception of this distortion, is perfectly sound; it is the foot of a comparatively young woman. Figure 10 exhibits the outline of this sole laid over the sole of a corresponding shoe; while Figure 11 represents the skeleton of a foot reduced to this condition.

Very frequently, however, the toes cannot find place side by side, but, cramped for room, are pushed over one another, and this position gradually becomes habitual. The adjoining Fig-

Fig. 12.

Fig. 13.

Fig. 14.

Figure 12.—Sole of a woman about twenty; the second toe is pressed upward and is therefore not visible. Figure 13.—Sole of the foot of a girl somewhat younger; the second toe is not seen here either, and the rest of the toes are also pressed into an opposite and wrong direction. Figure 14.—Apparently healthty sole of a young man nineteen years of age, in which, however, a false direction of the great toe may be observed.

ures, 12 and 13, taken from otherwise perfectly sound feet, are examples of this. The second toe is here pressed upward above the great toe, and is thus partially seen in looking at the sole of the foot. But we also occasionally find one of the other toes displaced, and I frequently observed the small toe lying transversely across the backs of the others.

In both cases it very constantly happens that in addition, one or more of the smaller toes are compelled to lie bent up, so that the first joint resembles a knob. This defect also becomes permanent.

It is clear that all these evils must become much greater, if, in addition to its otherwise unsuitable shape, the shoe is made to short, since in this case the point of the great toe receives an additional backward pressure, which forces it still more against the smaller toes, and displaces its root still further inward. Such very marked distortions as are represented in the figures above are certainly not very frequent, yet they occur much oftener than we should expect. That even apparently healthy feet are not quite free from traces of these deformities is exemplified by Fig. 14, which at the first glance, seems to be perfectly sound; on trying to draw on it the line seen in Figs. 3 and 4, we shall discover, however, that even here the great toe is directed obliquely outward.*

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* "As we are not writing an historical essay upon fashion, we divert our desultory observations to the foot-notes—a literal fact and a contrast supplied by Paris and Pekin. In China, ladies' feet are contracted in the length, in Europe, in the width, both being thrust into coverings too small for them. In China the whole foot is reduced to a hoof, the ankle and calf being lost

in the process, and the joints stiffened; in both countries it is fashionable to walk upon the toes, the Celestials doubling them under the foot, the Europeans stilting themselves upon elongated toes and heels, to the injury of the tendon Achilles, and a graceful carriage."—(*Madre Natura.*)

THE INJURY OF THE FOOT BY IMPROPER FORM OF SOLE.

The consequences resulting to the foot itself from an improper form of sole are not limited to the fact that the deformity becomes permanent, but are of a still more serious and important nature.

These more important evils are caused partly by the pressure to which the toes are exposed, and partly by the bad usage to which the distorted foot is necessarily subjected in walking.

The pressure of the upper leather first effects the small toe, and pushes it from before backward, bending it upon itself, and in this position it has not only to sustain the pressure of the upper leather generally, but also the pressure of the great transverse wrinkle which forms on it at the roots of the toes. Besides, as joints are exceedingly sensitive to external forces, it naturally happens that the joints of this toe frequently become subject to inflammation, giving rise to much pain and difficulty in making use of the foot, and at last leading to anchylosis (union of the bones forming the joint). The damage thus done to the efficiency of the foot is, indeed, not only important, but before this point is reached, much suffering must be endured, and we ought not, unnecessarily, to bring on ourselves any mutilation, be it ever so slight.

It is on the great toe, however, that by far the greatest and most serious evil is produced by an improper form of shoe, and the influence is first felt on those two points which primarily received the pressure, or its inmediate consequences, i. e., on the point and root.

At the point of the great toe the pressure falls in the first instance on the nail, and on it therefore its greatest effects are experienced. This pressure principally affects the anterior part of the inner edge of the nail, and must, since it forces this part outward (towards the smaller toes), displace the whole nail from its natural position. It first becomes oblique in its direction, and is then forced over the margin of the skin which ought to cover it on the side next the small toes and thus slight inflamma tions (Fig. 16, *a*) are constantly excited in the displaced fold of the skin, giving rise to more or less pain.

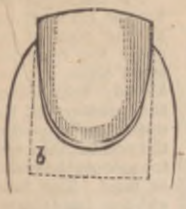

Fig. 15.

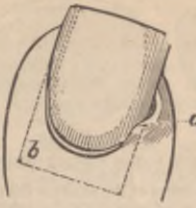

Fig. 16.

Figure 15.—The nail of the great toe in its healthy state. The doted line shows the extent to which the nail is connected under the skin. Figure 16.—The nail of the great toe pushes obliquely on one side,—*a*, inflamed margin of the fold of the skin pressed outward,—*b*, in this and the immediately preceeding Figure is explained in the text.

At the same time the matrix of the nail, fixed under the skin (Figs. 15 and 16 *b*) is forced more firmly into the skin, while exactly on the point into which it is so pressed, there is so constant pressure of the upper leather from above, and the nail can thus only be disposed of by being rolled up on itself. This pressure, moreover, acts on the whole inner margin of the nail, which must, therefore, also be rolled up on itself. The whole inner margin is in this way bent downward, and in consequence of such distortion, the skin, in standing and walking, is continually pressing against the sharp edge of the nail, and is thus kept in a state of constant irritation. As the evil proceeds, the margin of the nail passes more and more round, and presses more sharply into the skin, until it reaches that state in which it becomes painful whenever a shoe is put on, because not only is the nail now driven into the skin by the pressure from under, in walking and standing, but precisely the same effect is brought about by the pressure of the upper leather, even when the foot is hanging quite free.

In this manner the skin which is contiguous to the bent-up margin of the nail is always irritated and painful, especially after prolonged walking; by degrees it gets into a state of chronic inflammation and may eventually become ulcerated, producing what is popularly known as "proud flesh." We have here the figure of a "growing-in-nail," an ailment which not only interferes greatly with the use of the foot, but too often requires for its relief medical and even operative interference.

Fig. 17.

Fig. 18.

Figure 17.—Transverse section through the distal phalanx of the great toe with a healthy nail. Figure 18.—Transverse section of the anterior joint of the great toe with the outer edge of the nail bent up —"growing-in-nail."

Not less important are the evils arising at the root of the great toe from the same cause. It has already been stated the pressure of the upper leather pushes the point of the great toe against the smaller toes. The joint at the metatarsal bone thus becomes bent aside (Fig. 11) so that it forms a protuberance on the inner side of the foot. If the point of the toe is now pressed against the ground in walking this protuberance must be made still greater, and so pressed more forcibly against the upper leather. At the same time, moreover, the great transverse wrinkle in the upper leather —the result of the bending of the toes –presses directly on the same point; and the protuberance at the root of the toe is thus constantly subjected to a two-fold and very injurious pressure. In these circumstances it is by no means wonderful that this joint becomes subject to continual inflammation, which, by extending to the bones, must, in this situation, produce permanent and painful swellings, which become in their turn, and even from slight causes, the source of inflammations and new growths of bone.

In this manner arise those unseemly and painful swellings at the root of the great toe, which either from mistaking their true nature or from wilful deception, are called "chilblains" or "gout," just as the one or the other term appears the more interesting. In many cases, moreover, this kind of inflammation of the bones, and their investing membrane, may lead to the formation of matter, and eventually to the disease known as "caries" or ulceration of the bone.*

* In connection with this I wish to explain, that I by no means desire to question the existence of such inflammations of this joint as are commonly attributed to gout; in by far the greater number of cases, however, inflammation of the metatarso-phalangeal joint of the great toe is traumatic, as above described; and even with regard to the occurrence of *gouty inflammations*, the causes above alluded to give an obvious reason for the formation, at the points indicated, of a *locus minoris resistentiae*.

Such are the principal injuries to the foot resulting from the pressure of ill-constructed shoes, and they are of sufficient importance to induce me to confine my remarks to them alone. I shall therefore only very briefly allude to the constant irritation which the pressure of such a shoe occasions to the skin, giving rise to the proverbially sensitive corns, and to those painful thickenings of the skin usually known as bunions.

Fig. 19.

Bones of a foot in which the joint at the root of the great toe is very much distorted inward, inflammatory exudations forming bony prominences are also apparent: seen from above.

I must, however, explain at somewhat greater length, how the improper form of the shoe becomes one of the chief causes of flat-foot.

Flat-foot is ocasioned by the loosening of the ligaments that knit the foot firmly together, and by the consequent sinking of the arch, the inner aspect of the foot no longer presents the natural hollow in the sole. The causes of such loosening of the ligaments are numerous; but by far the most frequent, and one readily induced by the ordinary shoe, is weight improperly directed on the arch. If, for example, a shoe happens to be trodden on one side, and especially, as is most commonly the case, if it be so at the heel, then the heel has no support except from the inner margin of the sole, which is thus worn away, and the heel-piece becomes oblique, or, in other words, lower at one side than the other. In walking and standing on such a heel-piece, the whole external margin of the foot is raised, and the inner, which naturally supports the arch, is so depressed as gradually to lose its convexity, and thus flat-foot is induced.

Growing-in-nails, unseemly protuberances at the base of the great toe, (gout, chilblains,) corns, bunions, and flat-foot, are thus the immediate consequences of that unsuitable form of the shoe in established use.

ERRORS OF SHOEMAKERS IN REGARD TO THE CONDITION OF THE DISFIGURED FOOT.

When about to make a shoe for a foot already crippled, the shoemaker believes that he succeeds perfectly if he makes it exactly to fit the foot. This, however, is a gross fallacy; by so doing he renders the existing evils still greater.

A foot with its great toe lying obliquely, is necessarily shorter than it would be with the toe in its proper position, and if the shoemaker calculates the length of the sole by that of the measured length of the foot, he makes the shoe too short. In such a shoe there is no possibility of the great toe ever attaining its true position; on the contrary, it is still more firmly fixed in its false direction, and all the consequent evils are thus intensified.

In order that the shoe may not pinch, the shoemaker is also in the habit, with the very best intentions, of making the upper leather very roomy toward the inside opposite the projecting ball of the great toe. This expedient, however, as will readily be perceived, has the great disadvantage of affording still greater facility for the further displacement of the root of the great toe.

Thus when the shoemaker flatters himself that he has made a very comfortable and particularly good fit, it turns out that he has actually increased the distorting pressure on the great toe, and thus favored the exciting cause of the whole mischief.

BROAD SHOES, AND TAKING MEASURES BY MEANS OF AN OUTLINE OF THE FOOT.

Numerous examples have already shown us that the ordinary covering of the foot has many disadvantages; many attempts have accordingly been made to overcome these evils in one of these two ways:

1. By making the shoe very broad.

2. By taking measure by means of drawing the outline of the foot on a sheet of paper.

Both methods are quite insufficient, as may readily be proved.

Fig. 20.

Sole of a shoe unusually broad in the fore part, showing that in a sole of this kind also, the great toe has a false position, that is to say, in *c d* instead of *a b*.

The results arising from a very broad shoe, in which, in addition to a correspondingly wide upper leather, the sole is made unusually broad in front, can only be clearly understood by reference to the adjoining wood-cut. In this we have a straight sole without any pointing before; but even with a sole of this kind the great toe cannot find a place in its true position, that is to say, in the line *a. b.* It still remains pressed obliquely outward, passing indeed in the line *c. d.* Shoes of such a breadth of sole, which according to the current belief are faultless, are doubtless better, but are scarcely more suited to their purpose than shoes of the ordinary make. (Compare Figure 7, in which the line *c. d.* is likewise drawn, showing the position given to the great toe in the shoe.)

The second method, that of measuring the foot by drawing its outline on a sheet of paper, is especially clear to the shoemaker's mind, because his employer, by instructions given beforehand, has completely cut himself off from all grounds of complaint. "The shoe is made exactly to the foot," says the shoemaker, and his victim also readily consoles himself with this reflection, and attributes his long-endured infirmity of feet to every cause but the right one. In this expedient there is also, however, much deception, the very foundation on which it rests being untenable. It proceeds on the principle that there are primary difference in the structure of feet. That is an error. All feet are perfectly alike in the principles of their mechanical construction and the only differences in our healthy feet are those arising from varying length and breadth. In the original form of the foot we never meet with those essential differences, designated by shoemakers straight or bent feet, and still less with such variations as arise from the position in which the great toe lies, or from the thickness of the ball at its root. Variations of the latter description only indicate how far the form of the foot has passed toward the shape of the shoe; in other words, to what extent the foot has become deformed by shoes worn at a former period.

For healthy feet, therefore, a drawing is superfluous; it is sufficient to have the length and breadth, and—most important of all—a knowledge of the structure of the healthy foot. To the management of the feet already distorted, I shall return hereafter.

The true form of the foot, moreover, is never attained by such a drawing. It is usually taken from a foot enveloped in a tightly fitting stocking, and in this case the direction of the great toe is always oblique, because, from the constant pressure of the shoe, this obliquity comes to be assumed so readily, that the very moderate force exerted by a stocking is quite sufficient to bring it about. The foot is consequently drawn with the toes unnaturally pressed together. A drawing taken from the nude, with a knowledge of the anatomy of the foot, is the only one that will give the correct form of the sole of any foot.

But while a drawing of the naked foot is unnecessary, it might still be of some advantage, and might be used to some purpose by a shoemaker who knows and is willing to apply the true principles on which a sole ought to be constructed, for it would do away with the necessity of sundry individual measurements, and give him exact copies of minor defect which must always be taken into consideration in the construction of the shoe. Most shoemakers, however, use such drawings in order to find out how they will be able most conveniently to squeeze the foot into the smallest possible compass; and as long as the shoemaker persists in this endeavor, as long as he recognizes as his chief aim the symmetrical squeezing of a foot round the axis of its sole, so long will the most exact copy of a sole afford no guarantee to the employer, that he will get a more comfortable or even a better fitting shoe than that in ordinary use.

The supposed advantages of these drawings rest, then, in a great measure, on a delusion; and no less deceptive is the idea that a shoe with a broad sole must fit, simply because the sole is broad.

HOW A PROPER SOLE MAY BE DESIGNED FOR EITHER FOOT.

After what has been stated concerning the structure of the foot, and the evils arising from an improperly-shaped sole, the principles on which a proper one ought to be constructed may be arrived at without difficulty.

The main point to be attended to is, that the great toe shall have its normal position, so that those functions which are proper to it may be called into play in walking. It must, therefore, as has already been pointed out, lie in such a position as that its axis, when carried backward, shall pass through the centre of the heel. In a straight line, therefore, in which the centre of the heel and the axis of the great toe are included, we have the primary lines necessary to designing the entire sole, and a proper sole may now be formed in the folllowing manner:

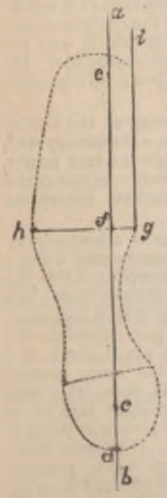

FIG. 21.

Design for the construction of a proper sole. Explanation in text.

The length of the foot from the back of the heel to the point of the great toe is laid down in a straight line, *a. b.* The half of the breadth of the heel, *c. d*, should then be marked off on this line, and the centre of the heel is thus ascertained. The length from the point of the great toe to the point where the hollow of the foot commences, that is to say, to the posterior margin of the ball of the great toe (*e. f.*), about two-fifths of the whole length of the foot, is now to be measured and marked off in its proper place on the primary straight line, and thus the broadest part of the foot is found. At this place a line should be drawn cutting the longitudinal straight line at right angles, and on this transverse line the greatest breadth of the foot is to be marked, so that so much of the foot lies on one side of the long line as corresponds to half the breadth of the great toe (*f. g.*), the rest of the whole breadth of foot falling on the other side (*f. h.*) The longitudinal line is now carried a little little farther forward, and then paralled to it the inner margin (*g. i.*) of the anterior sole is to be drawn, and we thus begin at the inner termination of the transverse line which indicates the greatest breadth of the foot.

All the points essential to the construction of a proper sole have thus been obtained, namely, the inner margin of the anterior sole, the posterior boundary of the heel, and the greatest projection of the little toe. Around these points a sole may readily be constructed, as may be seen from the annexed drawing (Fig. 21), in which the outlines of the sole are filled up—with dotted lines. To a shoemaker of good taste it will not be at all difficult to infuse into the design a certain amount of elegance.

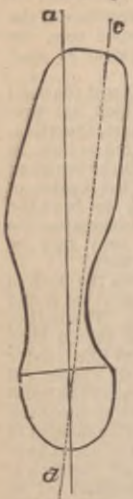

FIG. 22.

The proper sole for a shoe, indicating the line in which the great toe lies—*c d*. The line marked *a b* is that round which the shoe is constructed in the usual method. Compare Figures 5, 6, and 7.

By way of example I submit the adjoining Figure (22), the outline of a sole designed from the points just indicated by Mr. Weber, a shoemaker in Zurich; and in order to show the difference between a sole of this kind and one of the usual construction, I add the outline of one of latter description (Fig. 23), which was cut out by the same ARTISTE for the same foot the deviations of the proper sole being distinguished by dotted lines.

In designing a sole, a drawing of the sole of the foot may be very useful to a shoemaker who knows and is willing to apply the true principles of his art, as he will thereby be saved the the trouble of making numerous individual measurements.

To recapitulate what we have already said A sole is of the proper construction when a line (see Fig. 22, *c. d.*), drawn at half the breadth of the great toe distant from, and parallel to, the inner margin of that toe, shall, when carried backward, pass through the centre of the heel. In the usual form of a sole this line passes out of the inner margin of the heel (see Fig. 7.) If, then, the preservation of the primary straight line is, as has been already shown, the principal point in the formation of a proper sole, it follows, that, if it be thought desirable to have pointed shoes, the pointing must be effected from the outer side, as indicated in the annexed Figure 24.

In a pair of shoes made on these principles, placed side by side with the heels in contact, the inner margins of the front part of the foot are also brought close together, (Fig. 25.)

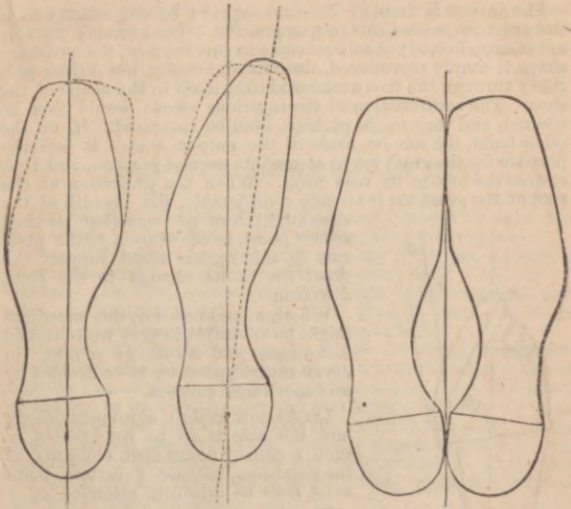

Fig. 23. Fig. 24. Fig. 25.

Figure 23.—The proper sole [Fig. 22] laid for the sake of comparison, on the symmetrical sole of the ordinary shape. [Fig. 7.] Figure 24.—The proper sole pointed at the toes. Figure 25.—Right and left soles of the proper construction placed side by side.

ON THE CONSTRUCTION OF SOLES FOR DISTORTED GREAT TOE.

We have just seen how the sole should be constructed for feet not very decidedly distorted by the ordinary form of sole, that is, in those cases in which in the naked foot the great toe still readily assumes its proper direction. The question now arises, how is this to be done for feet in which, when naked, the toe retains a false direction?

The answer is simple: The sole ought to be cut exactly as if the great toe were in its proper position. The grounds for this are clear. For, if the sole be made to suit the foot, the ordinary shape is simply reproduced, since the deformity has arisen precisely through the foot accommodating itself to the shape of the shoe. The continuation of the injurious effects would thus be insured, and they might perhaps even be increased. If, on the other hand, the sole be made of the proper shape, it becomes possible for the great toe to assume its normal position, and thus restore the foot to its true form. When the projection at the root of the great toe is already considerable, the breadth of the shoe might even be somewhat lessened at this point, in oder that a gentle pressure on this region might support the great toe in its change to the right direction.

FIG. 26.

Whether, and how far, this expedient might be advisable in very well-marked distortions and swellings ought, in every individual case, to be decided by an experienced surgeon.

I must now explain more particularly how the sole is to be constructed in such a case of permanent obliquity of the great toe, because a certain point must here be carefully attended to.

That is to say, the length of the foot is not to be taken in one measurement, for if so taken, the sole will be inevitably too short, but it must be taken in two parts, the first being the length from the heel to the joint at the root of the great toe, and the second the length from this joint to the point of the great toe. These two measurements must then be added to each other and laid down in a straight line, and the result will be the primary longitudinal line of the foot, which is employed in the further modelling of the sole exactly as directed in the previous section. Suppose, for example, that the sole of the foot for which a shoe is to be made, has the form of the adjoining Figure (26), the length

Method of constructing the proper kind of soles in cases where the great toe has been pressed obliquely out of its true position. Description in text.

b. a.; is to be measured first and then that of *a. c.*; the latter should then be carried out in continuation (*a.d.*) of the line *b. a.* which will now extend to *e.* and *b. e.* will then represent the true length of the foot in question.

ARE H IGH HEELS OF ANY USE?

It is usual in all shoes of even moderate strength to make the heel a little higher, by means of what is called a heel-piece.

These heel-pieces are generally of some little use, especially in dirty weather, and we cannot wholly deny their right to existence. But, at the same time, they ought to be as low as pos sible, and heels an inch thick, as is at present very commonly the case, have very serious disadvatages indeed.

The weigh of the body is by this means thrown in a disproportionate ratio on the toes, the joints of which which are consequently overstrained. Moreover, with a high heel the sole is so oblique in its direction that the foot must constantly be gliding forward and forcibly pressing the toes into the point of the shoe. The toes, therefore, even when the shoe is sufficiently long, are subject to the same injuries and disfigurations as if it were too short, and the effects are doubly hurtful, when the form of the sole is also incorrect.

High heels, especially if they are very small, are peculiarly liable to wear obliquely, and so the shoe gets trodden on one side; they must therefore be peculiarly favorable to the origin of flat-foot.

High and small heels are therefore quite unsuitable. The heel-piece ought to be as low and broad as possible.

THE UPPER LEATHER—BOOTS OR SHOES!

With regard to the upper leather, there is on the whole little to be said, since its shape is in a great measure determined by that of the sole, so that with a properly constructed sole the upper leather must also be essentially correct. It need only be observed, that the material should be as pliant as possible, and that it is well adapted to its purpose, when sufficient width is

allowed over the toes to enable them to move freely in walking and without constant pressure being exerted on the first joints.

[Especial care must therefore be taken to have the upper leather so wide at the inner margin of the foot as to admit of the great toe resuming its natural position, which is now made possible by the shape of the sole.*]

We now come to another important question, namely, where and how is the fastening of the shoe, or boot, to be affected?

Very light, low shoes, such as dancing shoes and slippers, the upper leather of which are alone sufficient to keep them firmly on the foot, do no harm by the mode of their fastenings, but it is insufficient, and a more efficient contrivance is required for the ordinary boot or shoe.

The boot is fastened by firmly encircling the foot at the instep. The whole foot is so wedged in between the upper leather and sole, that, as is well known, the pulling off of the boot very frequently necessitates the use of a bootjack.

It is impossible that the foot can be thus tightly clasped without producing a constant pressure on the instep. What, then, are the consequences of this?

We have already seen that the foot forms an arch, the efficiency of which in a special manner depends on the tensity of its ligaments being maintained. If, then, an unnatural and flattening-pressure be constantly exercised on this arch, the binding ligaments get slackened and the arch falls down; a broken-down arch, as we have already seen, causes flat-foot. The pressure of the upper leather on the instep must, therefore, and particularly in the case of narrow boots, favor the origin of this deformity; the same cause must further interfere with locomotion, for at every step the increased arching of the instep, which takes place at the moment the foot is set to the ground, is resisted by the upper leather, and an injurious influence is thus exercised on the action of some of the muscles used in walking, and which run from the anterior aspect of the lower leg to the back of the foot.

A boot is thus by the nature of its fastenings rendered a very unsuitable covering for the foot. When we consider, then, how very generally boots are worn, and worn, as a rule, with very high, small heels, and badly shaped soles, we need feel no surprise that flat-foot, bent-up toes, "chilblains," grown-in-nails, corns, bunions etc., are so common.

* This sentence is not in the original, and is here inserted by desire of the author.

Notwithstanding this fault on the part of boots, we must bear in mind that this kind of covering is almost indespensable for wading through water and walking in snow. Only let care be always taken that boots made for such purpose be not too closely fitting over the instep.

Shoes or half-boots, in which the fastening is effected by means of laces, are better than boots, inasmuch as a lace can never be pulled so tight as the upper leather may be, for it often takes the whole strength and weight of a man's body to enable him to squeese his foot into a boot.

The best kind of fastening, however, is that which is carried somewhat above the ankles, especially if it be possessed of a certain amount of elasticity. The fastenings of half boots, by means of pieces of elastic let into them, are therefore very suitable, when not to tight. With such a fastening the arch of the foot is in no way impeded in its action, and the movements of walking are thus effected in the easiest and most unconstrained manner possible.

[It must, however, by no means be inferred, that the upper leather should not fit the foot with accuracy. It is absolutely necessary, indeed, that it should do so for the protection of the toes in going down hill. And what has just been said must only be considered as a warning against the too tight, and consequently hurtful, closing so common in boots.*]

* This paragraph is also added in this translation by the request of the author.

ANSWERS TO OBJECTIONS.

Various objections will doubtless be made to the kind of sole proposed in these pages, and the curved form will be especially found fault with, for it will be said that one cannot be elegantly CHAUSSE in such shoes.

Objections of this kind have been already suggested.

To such remarks I have to reply, that the objector must first define his notion of the word elegant.

One set of people consider elegant and fashionable as equivalents. I need only remind these that FASHION has already had many changes, and that she brings about new ones every day. It is perfectly possible, then, that she may one day take up the proposed form, and from that moment it will become elegant. A shape may come into fashion—and be thought elegant too—provided only a considerable number of persons approve of and adopt it.

Others say such a shoe cannot be elegant, because the feet appear to be too much turned inward. This idea is a pure hallucination: the proposed form of shoes admits of the foot having its own proper shape, while in reality the ordinary form frequently renders the actual turning in of the foot quite necessary for the relief of pain experienced at the root of the great toe.

Others again, taking their stand on a sense of the beautiful, declare the curved sole anything but beautiful, and, therefore, inelegant. I would only ask such people if they consider a naturally-formed foot less beautiful than a crippled one, and if they consider a shoe that always sits well, less agreeable to look at than one trodden to one side.

Another set object to it as being too conspicuous. To these I can only say, that anything will cease to be conspicuous when it comes into general use. The proposed form, however, is not after all so very remarkable in appearance, several persons hav-

ing already adopted it without attracting undue attention. On the other hand, a crippled foot is conspicuous, and very unpleasantly conspicuous, too.

But even if the proposed form of shoe be somewhat peculiar, as a set-off it has the advantage of always setting well, of affording the greatest possible comfort in walking, of keeping the foot in good shape and condition, and even of giving a chance of recovery to an already injured foot. And in deciding for or against it, these advantages must, among other things, be taken into account.

Specimens of Ancient Foot Covering.

Specimens of Ancient Foot Covering.

Specimens of Ancient Foot Covering.

The following from the pen of R. T. TRALL, editor of the *Herald of Health*, in reference to Boots made on the Meyer system, speaks for itself :

"An experience of a few weeks in having our boots and shoes fitted to our feet, instead of having the feet pinched, cramped, cabined, cribbed, and confined to suit the fancy of the shoemaker, or the edict of the fashion, has demonstrated several advantages, among which may be named : 1. A feeling of easiness, instead of uneasiness all over and through the lower extremities. 2. A feeling of comfort in walking or standing hitherto unknown. 3. No inclination to run down or bear uneavenly in the boots or shoes themselves. 4. No liability to corns or bunions on the feet or toes."

Quite recently S. Cantrell has introduced Meyers' method into New York. A visit to his store cannot fail to prove instructive, for there you may see a variety of shoes sufficient for a small exhibition. There is the sandal of the California Indian, the Chinaman's shoe, the Chinawoman's slipper—in which she tortures and dwarfs her feet—English shoes of almost all kinds and, best of all, his own physiological shoe, in which the foot may enjoy plenty of room and flourish. We hope Mr. Cantrell will realize his expectations regarding reform in boots and shoes, and extend his labors to all parts of the land.—*Dr. Holbrook in the Herald of Health.*

OPINIONS OF THE PRESS.

"The English Translation of Dr. Meyer's Essay—exact in detail, and clearly illustrated by drawings—is enough to enable any man to lay the law down clearly to his bootmaker. It is sixpenny worth of knowledge, that will, we hope, be the ruin of a fashion that has put thousands of people into actual torment of pain, and denies to most of us the full and free use of our legs."—*Dickens' All the Year Round*, August 24, 1861.

"This useful pamphlet is no pretentious puff of some *soi disant* anatomical bootmaker, but the learned though compendious *brochure* of a physiologist of great professional acquirements, and considerable literary experience in this special department of anatomy. It has, moreover, every appearance of having been translated with great fidelity and knowledge, and is furnished with a preface which at once elucidates it, and adds if possible to its value."—*London Review*, September 15, 1860.

"The Professor gives us an account of the normal anatomy of the foot; of the changes which boots and shoes, as ordinarily constructed, almost invariably produce; and also patterns of his own proposed foot clothings, which are formed upon scientific and anatomical principles, adapting themselves to the natural shape and proper action of the foot. The reputation of Dr. Meyer and the importance of the subject, will insure attention to this little work, which has been faithfully rendered from the German by Mr. Craig of Stratford-on-Avon. To very many, comfort in the feet would be an immense boon."—*Cheltenham Chronicle*, November 20, 1860.

"A sixpenny pamphlet, which will be profoundly studied by all people who suffer in the toes."—*Examiner*, August 18, 1860.

"The working man, the pedestrian, the farmer, the sportsman yea, all who value the comfort of a properly fitting shoe, will do well to read and act upon the rules laid down and exemplified in Professor Meyer's little work."—*North British Agriculturist*, April 3, 1861.