PATTERN-CUTTING MADE EASY:

AN

Exhaustive Treatise on Scientific Designing,

GIVING DETAILED INSTRUCTIONS FOR THE AUTOMATIC CONSTRUCTION OF PATTERNS AND THE MECHANICAL GRADING OF SAME INTO COMPLETE SETS, EITHER IN STRICT PROPORTION, OR TO ANY REQUIRED SCALE OF FITTINGS.

BY

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ENTERED AT STATIONERS' HALL.

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PREFACE.

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"They gave me advice and counsel in store,
Praised me and honoured me more and more;
Said that I only should 'wait awhile,
Offered their patronage, too, with a smile.
But, with all their honour and approbation,
I should, long ago, have died of starvation,
Had there not come an excellent man,
Who bravely to help me at once began.
Good fellow! He got me the food I ate,
His kindness and care I shall never forget
I cannot embrace him, though other folks can,
For I, myself, am this excellent man."

HEINE.

At the request of many influential friends, who lament the absence of a reliable and practical work on this paramount branch of boot and shoe manufacturing, I have been prompted to offer my ideas, which I hope will be acceptable, to the numerous followers of the "gentle craft," considering that I hope to enable them to master, with insignificant study on their part, that which cost me years of experience and pecuniary expense, together with a diligent investigation of all available literature and scientific truths which I thought could be applied with profit to this important but neglected subject, the issue of which is now condensed into small compass, combined with the successful results of my earlier experiments.

Having made designing my special study, and being conversant with its general application, I expect, with the aid of a few carefully constructed diagrams, and more important still, with the confidence and attention of my readers, to explain not only the principles of pattern-cutting and geometric grading, &c., as they are practised by a limited number of individuals, but also to

thoroughly elucidate a new and mechanical substitute for obtaining better results with the greatest simplicity and mathematical accuracy, consequently with the greatest economy of time. The theories advanced in the following pages are mostly original ; yet it is not on that account they are advocated, but for their usefulness in advancing towards, if not attaining, perfection ; for it is hardly necessary to remark that novelty of itself would be of little value if not supported by decided improvement.

A word to students may not be out of place here by advising them to carefully read my instructions before trying their practical application. Begin at the beginning, and learn the principles before practising the details, and the understanding of one chapter will be greatly facilitated by an exact knowledge of the previous. It may require a little extra mental industry; but after that you can pride yourself with the consciousness that you have acquired something that was worth studying for by grasping not only what this treatise may teach but also what —to the thoughtful mind—it may suggest, *i.e.*, a fair idea of the application of science to boot and shoe manufacturing. The value of teaching by principles has been justly recognised by preparing the pupils to grapple with contingent irregularities. The draught of this work has been founded with this view ; yet though it will be essential for me to explain in detail the construction or modification peculiar to any particular design, still it will now be understood that the example was mostly given for the sake of the principles which underline it, and to cause the result to be fruitful. I, as far as possible, consistent with brevity, give a reason for every statement or rule I may happen to make, thereby enabling the possessor of same to gain an intelligent idea of his work, whilst he constructs with the greatest facility, rapidity, and utmost perfection any possible pattern he may wish to realise, for no person can *do* anything well until he knows *why* it is done.

Technical literature, as a rule, is not very attractive with regard to *belles lettres*, eloquent composition being *erased* for the benefit of practical knowledge. My own effort, I am sure, is no exception to this. But though it may lack literary effusion, and many faults appear visible to the eye of the critic, yet I trust such will be generously overlooked, as I claim no approbation for it but credit—if that be merited—for the sense and gravity of the matter. This indulgence is likely to be granted by those interested in the propagation of truth and excellence when I state that I write this work under many disadvantages, sacrificing a slight leisure for its accomplishment—in a hurried still, I trust, a clear manner while advocating nothing only what I have proved by practice to be productive of the best results. Having had to correct my own proof sheets, many errors may have escaped my notice for want of a more careful and less anxious revision.

Before closing those few prefatory remarks, I wish, while acknowledging the kindness of the numerous and disinterested friends who have offered me their assistance, to tender my sincere thanks to Mr. B. Doyle (*Irish Leather Trades' Journal*), to whose sympathetic encouragement the publication of this maiden effort may be justly said to be due.

Yours very truly,

THOS. BROPHY, JUNR.

Chapter I.

INTRODUCTION.

Pattern-cutting as it was, as it is, and as it will be.—The neglect of this most attractive and profitable subject.—The benefits derived from a thorough knowledge of the same.—Its proper divisions.—Simplicity and accuracy, the elements of perfection.—Theory and practice.

"*The workman unacquainted with the advantages of scientific education frequently undervalues it, when he sees so much time devoted to studies that appear incapable of practical application.*"—Edward Swaysland.

Pattern-cutting has been universally acknowledged to be the highest manipulative branch of boot and shoe manufacturing, requiring more thought and judgment than any other division of the trade. In short, it has been classified as an art, depending for its efficiency to a large extent upon the natural taste and cultivated skill of the designer. While admitting to a great extent the truth of this prevailing idea, yet the object of this work is to show how this department can be brought to a science—that is, by a collection of uniform principles, easy of application, and founded upon normal or average proportions, constituting a methodical system which will enable any two or more pattern-cutters to obtain exactly the same results. But those results having been first proved by experience to be most correct, such will, I am sure, be fully appreciated not only by those who laboured under the guess-work of the old school, but also the many others who, while quite willing, yet never had the opportunity of realizing their laudable intention of using every facility and advice which would enable them to rise in their calling.

The cutting of patterns some years back was a very rude operation indeed, and it does not require any extra strain on our memory to recall to our mind the fact that many — very many — uppers for boots and shoes were constructed without the aid of any patterns at all. Strange as it may appear, I have known it to be a usual practice—even in these days of technical instruction and literature—for many makers and manufacturers to have the vamps and

backs of strong work chopped roughly out from kip and shoe butts, and afterwards cut to the vague measure required, while others, who were the happy possessors of one or two heir-looms in the shape of a few ragged cardboard patterns, utilized this wonderful economy of plant to act for all sizes. Somehow or other, the demand for the few varieties these gentlemen condescended to supply, seems to be somewhat limited—a fact which the "born artists" attribute to unappreciated merit. Patterns, they say, "would be only in their way, they can cut a vamp or quarter to a hair's breadth without bothering themselves with such trash—aye! and not leave as much waste as would cover a sixpenny bit." Should you happen to be a little communicative, you are likely to be told for your benefit, that "there is no power in heaven or hell that could make me believe that there lives a specimen of humanity who could never teach me nothing" (no one can teach them, I suppose they mean), and very likely the truth, when we consider that there are always some people who never learn anything.

Up to the present day it is frequently remarked and taken for granted that no two pattern-cutters cut alike. This statement, without doubt, is hardly exaggerated, so it stands to reason if one is right the other must be wrong. In all probability both are in error, and considering the systems in vogue, we cannot expect anything else. This is not as it ought to be. Pattern-cutting, if brought to its highest development, must be uniform and faultless. This, no doubt, can be attained after repeated efforts by art; but the loss of time and labour, the confusion, and the risk of disappointment appear to be too dear a price to pay for perfection, when inferiority can be made to apparently pass as a sufficient substitute.

In the future, this attractive and profitable study is bound to show the result of that thought which is beginning to be devoted to it by the enthusiasm of modern intellect, and propagated through the useful medium of our trade journals and technical schools. There is good reason to believe the grading of the primary patterns will in time be performed by machinery, and something in this direction has engaged attention of our inventive and ingenious American cousins, with a very fair degree of success. Many must think this innovation almost superfluous, for when the application of that branch of geometrical science called graphic proportion is fully understood, it will be seen that this operation is simply mechanical in itself.

It is singular as it is regrettable, considering the importance of this branch of the trade, that until lately insignificant attention has been given to solving some of the most difficult problems necessary to be overcome before any headway can be made with certainty and facility. "Pattern-cutting," says the *Irish Leather Trades' Journal*, "seems to be absolutely neglected by the vast majority of makers of custom and shop-

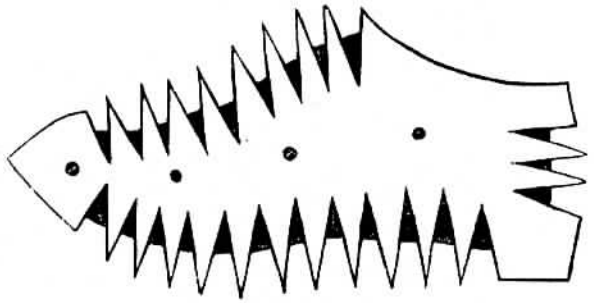

FIG. 1.

work. The want of a uniform scientific principle, based on the formation of the human foot, and capable of general application, is at present felt in no small degree. Ordinary rules of measurement are of no use when a boot must be made to fit an individual peculiarity; even the most experienced men frequently misfit in cases where slight technical knowledge, properly applied, would enable a good fit with satisfaction to be produced. As the pattern is, so will the boot be turned out; and he who shall invent or introduce a uniform and practical system of pattern-cutting and grading, will deserve well of mankind, whether makers or wearers of boots."

I lately had the opportunity to examine two sets of patterns cut for the same last and to act for the same style of boot, by two designers at present commanding a large salary in the

employment of two well-known factories, and the formation of each set presented such a characteristic distinction that I could tell ever afterwards the patterns that were constructed by either of these cutters. The primary patterns were right as regards measurement; but the standard of one was excessively "sprung" at the toe, while the other was cut extremely "dead." One was bounded by bold, round curves, the other was hard and angular. They differed in "spring," they differed in "draft;" in "pitch," inclination, and design there was the greatest disparity, and, as if this was not enough to complete the contrast, they were scaled on such different principles that the slight resemblance which existed in the standards at the beginning was hopelessly lost when graduated. The only conclusion I could come to from this was that they were very well cut, considering the unscientific methods under which they were constructed. There appears to be no fixed rules, standard measurements, or regular systems in being. Nearly all work by vague and haphazard methods of their own invention—the outcome of their necessity and well-paid for experience. Pattern-cutting undoubtedly has languished, while every other branch of boot manufacturing has made rapid and progressive strides towards improvement. Every department has advanced; but the pattern-cutting of to-day is almost the same pattern-cutting it was half a century ago—nothing new. "Place your last upon a sheet of paper, *carefully* mark round, and depend upon a trained eye and a steady hand to complete the rest—remember practice makes perfect." This is the teaching—put in a nut-shell—that we only have been favoured with as yet, what we have been told over and over again, only by different persons, by way of novelty.

Surely the "gentle craft" has not degenerated. Has not pattern-cutting as great a claim upon its characteristic intelligence as clicking, finishing, making, or any other division of boot-making? What we want is more thought, more science, in short, more light. In detail, a collection of principles, measurements, rules or proportions—the issue of theory combined with practice. No one, if capable, seems willing to help in

supplying this want. No doubt, motives of prejudice and narrow-minded jealousy, so common in all trades, influence this refusal to give more information.

The benefits derived from a thorough knowledge of pattern-cutting can hardly be over-estimated. Many is the idea that has been lost to the trade for want of the means to realise it. Many has been the blessing lost to the world for want of that power, synonymous with knowledge, to produce it. The study must be equally advantageous to the employer as to the employed. For designing plays by far too important a part in the success of shoe manufacturing to be indifferently placed in the hands of second-rate ability. The most expensive material may be used in a boot, the best workmanship may be employed in its production; but should the patterns be ill-fitting or ugly, I have no hesitation in saying the work is spoiled. The most creditable efforts are wasted, for the fault is irreparable.

Pattern-cutting may be properly divided under three headings—First: Standard construction; secondly, designing; and thirdly, grading. If those three general divisions be mastered with any fair degree of success, pattern-cutting, in the abstract, will present little or no difficulty. Standard construction justly claims our first attention; not because it is exactly the primary operation, but because it is the most important, and at the same time appears to be the most difficult; so my best attention will be given to this in the following chapter. By designing we will understand the correct dissection of the standard in the best possible manner, on the *modus operandi* necessary to obtain any particular style, consistent with beauty and utility. The principles of grading, though last in division, are by no means least in value, for no branch of pattern-cutting has attained greater mathematical perfection than the subject I intend to fully deal with in the later chapters of this treatise.

Although it will be my business to show, as much as I possibly can, how this subject of pattern-cutting can be brought to scientific accuracy, yet it would be idle and absurd for me to ignore the value which art can and does lend to beautify and enhance our productions. I do not, by any means, wish

to disparage art or rule-of-thumb workers. No; quite the reverse. I think they certainly deserve the highest tribute we can pay to their skill who can achieve the "ideal" with any moderate proportion. I believe that anyone who can attain perfection with only the guidance of an educated eye and a practised hand, is nothing short of an artiste, a genius worthy of admiration, and deserving of every praise for the ability of his natural talent. But we all know by experience that the majority of mankind is seldom gifted with such intellectual endowments; therefore it has no other choice but to accept the unerring principles and valuable laws so bounteously offered to us by science. The question is this. One man may, after great practice, or with mental faculty, draw a perfect circle freehand, but is liable to be *wrong*: another man, not at all so

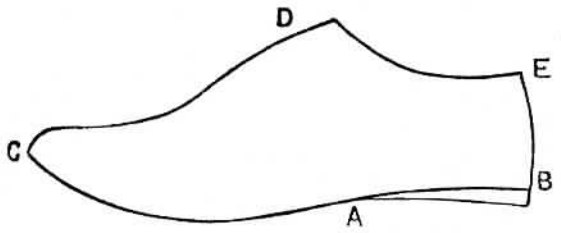

FIG. 2.

gifted, makes the mechanical use of a pair of compasses, and accomplishes the same object, but is always *right*—which is the best? The actions of men are always measured, not by what they can do, but by what they really do. The former may dazzle and please us, but the latter is more accurate and wise—therefore the most useful in the end. The goal of all human operations is perfection, the elements of which are simplicity and accuracy. These combined constitute our glorious ideal. One without the other is like capital minus labour—when separated, of little use, but in conjunction, forming the end and aim for which they were fully intended. The accuracy of an operation is its utility, and the simplicity its beauty. Many a rule, though accurate, has been so complicated as to be utterly impracticable; and very many so simple as to be absolutely worthless. But I credit myself with having taken care that the rules I will endeavour to explain in the following chapters shall contain both of those desirable qualities. No pains were spared, in the first place, to prove them accurate, and in the second place, every effort was devoted to render them simple.

It is an unfortunate quality in a great many artisans of modern times, who, when they have not sufficient intellect to grasp at once a clear and valuable theory, or lack perseverance, the best substitute for that intellect, should use all their eloquence to injure and condemn that which they were too blind to see and too prejudiced to give a fair trial. Stupidity, when natural, can only be pitied; but stupidity and insolence combined is, to say the least, unpardonable. It has become fashionable with bigots to lavish, with no spare hand, the utmost abuse on theoretical teaching. But though I fully recognise benefits which arise from theory, coupled with practice, yet I have not the slightest hesitation in placing theory far above practice. Let us examine this: Theory may be said to be the science, and practice the art. What makes one pattern-cutter of equal intelligence better than another? Simply because he is master of the science or theory which enables him to cut his patterns with accuracy, beauty, and rapidity. Whereas, his less fortunate rival is weary cutting patterns repeatedly before he can bring them to his liking (which is generally very poor), and after half a dozen attempts, waste of time and paper, even then doubts if his productions will fit; and if by any chance he obtains something unusually good, the probability is he could not do the same thing again. Ask him to divide a line eight inches long into three parts and he will not be able to do it, only after several trials. Apply to the scientific cutter and he will divide it if you want him into twenty parts, exactly, in less than half a minute, and at the first offer, by aid of his geometrical *theory*. What makes one clicker work at seventeen shillings a week while another can command more than double that? Is it not the theory and education that causes the difference? Why does one laster get a better class

of work than another? Is it not because he *knows how to* make it better? and for that reason does it better. What makes a finisher turn out more creditable work than another? Is it not his *knowledge* of his material, his recipes, and the use of his tools? In short, what has caused the steam engine, the printing press, the telephone, our chemistry, our geometry, our mechanics, our electricity, our astronomy, and all the other scientific wonders? Who dares dispute? *It was the human theoretical mind.*

Though the above may help to erase the erroneous idea that art is supreme, yet it is somewhat difficult, for want of more universal definition, to draw a strict line between science and art, since in many branches of human knowledge the two are so blended together, that their complete separation is actually an impossibility. Suffice to say, that it is absurd to run away with the notion that pattern cutting is an art alone; and while I admit, with moderation, the subject is both a science and an art, I feel it incumbent upon me to say that it comes more under the domain of theory than practice, though one is issue of the other, if they are genuine.

CHAPTER II.

THE PRIMARY PATTERN.

Geometrical preliminaries.—Standard construction.—Various systems. The usual practice.—The proper method.—Spring and draft.—Pitch and inclination.—Average measurements and observations.

"*One thing is made very plain in the decisiveness of the vote this week on our technological competition. The boot trade is tired of rules which are merely rules-of-thumb. At least half-a-dozen competitors efficiently and carefully described the usual method of cutting a pattern to the last, but the 'usual method' is obviously suitable only for men who have worked at the board for years, and who have had considerable training both of wrist and eye. The new plan described by 'Eclectic' (T. Brophy, jun.) is purely automatic, like the geometric system of grading, or Jones' patent method of pattern marking; consequently it is approved by the general good sense of the trade, as typified in the vote we publish in another column.*" —SHOE AND LEATHER RECORD.

The first and most practical step in pattern-cutting is the formation of the primary or standard—sometimes miscalled the lining pattern. To demonstrate the necessity of having this absolutely correct, would perhaps be somewhat superfluous, and considered almost an insult to the intelligence of my readers, who, very likely, are fully sensible of its importance. Yet how many thousands of standards have there been constructed which fall very, very short of what they ought to be, or intended to be. Many imagine themselves pattern-cutters who can no more claim to be such than a scissors editor can affect to be an original composer. For they think because they alter the measure of some other pattern that they have designed a new one, and done all that was wanted. But the folly of cutting from other patterns, to say the least, shows a want of self-reliance, without forgetting the truth that it is generally the faults and not the virtues that are copied by such lethargic designers. As an example, it is related that a young lawyer aspiring to oratory, went to hear John B. Gough, and ever after tried to imitate him; but the only similarity between the two was their habit of placing their hands upon their hips and fluttering their coat tails while speaking.

Before proceeding any further, it is necessary for me to state that, before any proper headway can be made in pattern-cutting, a knowledge of geometry will be essential, at least the elements of the practical portion. To obtain this is certainly far from difficult, for the facilities existing are very great and extensive. The subject is no less attractive than valuable, as geometry was always a popular and practical science which no artisan—no matter what trade or branch of trade he follows—could afford to neglect, the utility of which is realised in everyday life. And even outside the pecuniary advantages derived from such a knowledge, it has a great influence upon the mind, developes the brain, and the best exercise for constituting that enviable attribute—correct judgment. Besides, geometrical terms have become so universal of late, that it is utterly impossible to understand descriptive language without understanding their meaning.

It was my intention to give here the problems upon which the teachings of this work is based, and explain the preliminaries necessary for a proper understanding of same, but I find after consideration that it would be a great deal better to ask my readers to purchase a little book, price twopence, entitled "Gill's First Grade Practical Geometry," published by Simpkin, Marshall, and Co., London. This concise work covers the ground sufficiently for our purposes, and contains much information of a valuable character for beginners, more than I could possibly afford to insert in the limited space at my disposal. Suffice to say—the student, to grasp my theories intelligibly, must learn, first of all, the definitions, and secondly, practise the elementary problems, especially the construction of angles, dividing of lines, and the conformation of similar figures. Though it is useful to draw perpendiculars and parallel lines geometrically, yet for convenience sake it is more practical to do so mechanically, by aid of a pair of set squares. Still it is always well, when using a new pair of set squares, to first of all test them geometrically, as the slightest inaccuracy will often cause serious trouble.

We fully appreciate the necessity of having a perfect standard pattern, when we see that upon it the whole set unquestionably depends, the remainder being merely repetitions, but on a slightly different scale, while the standard –so to speak—is the original parent of all. Our faith in this necessity is even more accelerated when we consider that from this set may be cut hundreds, aye, thousands of uppers, to be made into boots for thousands of human feet; and when we see what inconvenience a grievous fault in this precious standard must cause to these thousands of wearers. The inexperienced hand has no idea of the unlimited errors that are likely to happen in this particular operation, and, unfortunately, only too frequently do happen, as witnessed by the unsightly specimens periodically offered for auction by most of our extensive retail shoe dealers. Faults too numerous to mention or to cure. But in Chapter IV. I expect to warn the young tyro against many pit-falls by first explaining their cause, and then giving the antidote for their prevention.

There have been several methods for constructing this primary pattern. The explanation of a few, though necessarily brief, may be suggestive to those who have time and talent to explore the virgin fields which have yet to be discovered, in the interest of boot and shoe manufacturing. One system, based upon a kind of mechanical algebra, was, by the aid of paper measures taken from the foot, to work out a standard, by applying the measures, first doubled in two, minus width of sole, plus lasting over, to a rectangular sheet of cartridge paper. A second method was by elementary principles of solid geometry, to project a last pattern from a sole shape. The same *modus operandi* can be used with equal value for the upper pattern. A German system was, by the use of a proportional scale and two cross lines, to create a complete standard, the data being only one measurement of the foot, either the heel or joint, the other measurements being found by referring to a concise scale made from average statistics. The cross lines, serving the purpose of a foundation, regulated the shape, the measurements found being applied in certain proportions around them. To

see this system worked out rapidly is really very astonishing. But, after all, the accomplishment is more ornamental than useful. There is an American mode, from which it is said very good results have been obtained. It is this: A last is placed upright, resting upon the back of the heel, then, by either sliding or rolling it in known directions, the shape and dimensions of the last were supposed to be obtained without any other help. Of course, during the rolling process a pencil was continually marking points at stated intervals. The usual practice, as taught by those who profess to enable students to cut a standard to a last from a plain sheet of paper, without the aid of other patterns, is simply this: "You are first to have the correct form in the mind," then place the last upon a sheet of paper, and mark round it with a pencil, and lastly depend upon an educated eye and a practised hand to finish the remainder (very artistic, no doubt). A slight improvement upon this last method was the addition of a pair of horizontal parallel lines, and a perpendicular erected at their extremity. It is claimed for this, that the novice is materially benefitted. The use of the instruments called French curves has proved to be most advantageous to those who were not a good hand in the free use of the pencil. I have known many clickers who could describe almost any curve with their knife, but put a pencil in hand, and they are like a fish out of water. Many pattern-cutters who make a very poor show in regard to freehand drawing, receive the greatest help from the French curves; or, as I often done myself, cut a small piece of zinc, containing the approximate curves of the patterns, which I utilised in forming the outline of standard, and designing it into covering patterns.

But perhaps the most common of all modes of cutting standards at the present day is for the cutter to take a pattern which he has learned by experience fairly fits a certain sized last; and by altering its dimensions or shape make it do for another last. He then cuts out pair of uppers by this pattern; has one closed, and then tries it on the last, and should it not fit, he cuts another pattern, and goes through the same performance, until, after many repeated efforts, he chances to make out

what he thinks is correct. The pattern-cutter, if he is one in the full sense of the term, should know how his pattern is going to fit with as great a certainty as if he saw it actually upon the last or foot, and not be depending upon comparison with approved designs, or testing its accuracy by many trials upon the last—a roundabout, and to say the least, unscientific proceeding. There are a few other methods for working out the standard, more or less similar to the above, such as pasting a roughly-cut half-pair of linings around the last, using a sheet of paper of convenient size and rectangular in shape, &c. But it does not require any lengthened experience to learn that there must be a great amount of speculation, uncertainty, and confusion connected with them. The standard, to be correctly produced, must be taken from the last (which we suppose is perfected as much as possible beforehand). We must commence at the fountain-head. The great variety of last at present in use present such a large difference in shape and fitting, that it is absurd to think for a moment that the pattern that suits one could be utilised with safety to do for another. I have been told as a great secret, that if I obtained the outline or profile of the last by a kind of shadow process, that to complete the rest of the standard would present no difficulty. The fit was ensured, and the upper so produced could be lasted with the finger. A sheet of paper was to be placed upon one side of a glass door, and the last suspended by a piece of thread upon the other. A light was to be thrown upon the last outside, while a tracing of its shadow was then taken with a pencil inside. But although the outline of the last is, no doubt, of great service, yet it is not enough. A little thought will convince us that it is really the circumference, or what would *cover* the last, as a peel covers an orange, or the epidermis our flesh, that we want to obtain.

So we will sub-divide the construction of the standard into two operations—the first producing what covers the last, the next the leg, and under the title of pitch and inclination discuss the proper connection of the two. It is hardly necessary for

me to remark, that the standard means the shape of what would cover one half or side of the foot and leg, minus width of soles, plus lasting allowance.

The following essay, which I contributed to the technological competition instituted by *The Shoe and Leather Record*, under the *nom-de-plume* of "Eclectic," explains what, in my opinion, is the best method for cutting standard patterns, and which I found only required to be known in order to be appreciated. In the voting of the readers which followed the publication of the contributed articles, my effort was accorded 308 votes, while the second essay scored only 31. In the notice which

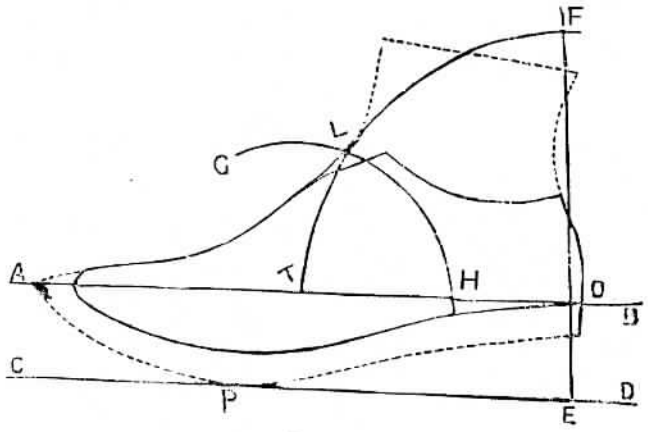

FIG. 3.

accompanied the result of the poll, the following comment appeared :—"The writer of the successful essay is Mr. T. Brophy, jun., 15, Francis Street, Dublin, to whom a cheque for two guineas has been forwarded, in accordance with the terms of the competition. Mr. Brophy deserves every praise ; and although exception has been taken to his method of treatment, which to some extent hardly complied with the conditions, yet the sense of our readers has unmistakably proved that his departure has been forgiven in consideration of the very novel and ingenious method of pattern-cutting he described. We are sure his fellow-competitors will not grudge him his victory."

Likely it is necessary to state that following is very slightly abbreviated or changed from the original.

Many of us know that the geometrical rules for grading a primary pattern into complete sets have reached perfection. But the difficulty at present existing is *how* to obtain this primary pattern. It is upon this pattern, usually called the standard, that the whole set will depend. If this be wrong, the set will be wrong ; if this be accurate, the whole set will be accurate. Hence the necessity of obtaining a faultless standard pattern. To construct this has been the aim of many laudable experts, who have recognised its importance ; but so far their efforts have not proved practical, consistent with simplicity and accuracy. The following system, which has cost me years of tedious study and practical experiment, I have the greatest confidence in recommending. This system, which is simplicity itself, requires no art or genius upon the part of the pattern-cutter. It is purely mechanical. A person having no experience in pattern cutting can, by this system (which can be learnt in a very short time), design a perfect standard pattern, without it being incumbent upon him to train his eye and practise curves—in fact, to be an artist in the full sense of the word, which he must be if he attains any considerable success by the systems at present in use. Or, let a professed pattern-cutter work with this system, and he will arrive at the very same results. That is, let a skilful pattern-cutter and an amateur work by the same rules, and compare their productions, and they will be both the same exactly. This proves that it depends very little upon the taste of the designer to produce a correct and well-fitting pattern, which at present is only obtained by one out of a hundred, and even that worked out by the greatest possible amount of skill and judgment, and at the risk of being wrong in many points, if not all.

Given the last, the height of heel, the problem is to construct a standard pattern, perfect in form, fitting, spring, draft, and pitch of leg.

You first select the left-foot last, and place it upon a sheet of drawing-paper, with the toe towards the left hand. You then block out two rough outlines about an inch or two larger than the last; then mitre the edges, as in Fig. 1. This done, take up the last, find a point in centre of the last upon the top of instep and joints, also at end of toe find the centre—that is, the points D and C, Fig. 2. Then join those points in a straight line with a flexible rule—a piece of spring brass. Now we have a line upon the top of the last, which divides it in two parts. We now fasten one of the papers upon the outside of the last with tacks or drawing-pins, as shown in Fig. 1. I should have said that the back of the last, from top to the seat, should have been divided in two by a straight line from the point E. to B, Fig. 2. The paper fasten to one side of last. We bend each mitre, one by one, over the line in centre, from instep to end of toe; and where the mitre crosses the line, cut it off, so that the remainder only just touch the line. Proceed in like manner with the mitres at the back of heel, and all along the bottom; that is, where the mitres cross the edge of sole of last cut-off. This will then give us the shape of outside of last. Now, to get the shape of the inside, we proceed in like manner as we got the first. It will be found that the outside shape will be larger in many points than the inside shape. To get a mean shape, we place the outside shape upon a sheet of paper, and the inside one over it; and, with a fine-pointed pencil, we strike an average between the two. Cut this out, and this gives us Fig. 2, which we will call, technically, the form. This form gives the correct covering of the last, the correct spring, the exact measurement of every part round the last, which is nigh impossible to get by any other means. It also gives a truer curve for any part than we could obtain by the guess of the most experienced craftsman.

In order to give it a proper draft we cut about $\frac{3}{8}$ of an inch from the corner of the heel, and taper it to nothing at the waist, as shown in Fig. 2 by the points A and B. The reason we give it this draft is that it is found necessary, so that the boot should stand up well, that it has a tendency to incline forward;

for if we did not put in this draft the top would lie in its place too easily, whereas it should require a little straining or lasting to bring it down at the heel. To complete the standard I refer you to Fig. 3. Do not be frightened at this diagram; it is by no means complicated. You place the form upon a sheet of paper, and mark round it with the pencil; you then add $\frac{7}{16}$ in. along the bottom for lasting, as shown by the dotted lines. This is for machine-sewn work, with an average lightness of top. If for hand-sewn $\frac{4}{16}$ in. will do, and if the top be strong or light we have to adapt allowances to the quality. After adding the $\frac{7}{16}$ in. for lasting we measure from the corner of the heel of the pattern, the height of heel itself, minus the substance of the edge of the sole. To make it clear. Suppose the height of heel the boot designed for is 1¾ in. and the edge of the sole is ¼ in. in thickness, we measure off 1½ in., this gives us the point E. From the point E we draw the line E C, touching the bottom of the pattern at point P. Now from the point O at right angles to the line E C, draw the line E F. Now, I need hardly remark, at this time of day, that the leg is not perpendicular to foot when elevated by the heel, but to ground upon which the heel and toes rest. Now the line C D represents the ground, and if the leg is at right angles to the ground, it must be parallel to the line E F, and so it is; and if we draw a line parallel to E F, in the centre of the leg, it would give us the line by which the inclination of the pattern is regulated; so we see it depends upon the height of heel what inclination we give the leg. But not only does it depend exactly on the right inclination we give the leg, but we must find also what position would be the right point from which to start the front of leg at throat of pattern. For if we begin the leg too far back, we would make the back seam almost straight, and then we would be compelled to choke the pattern at the throat; so we want to find a starting-point. To find this, we draw a line from the point O parallel to C D, and from the point O, with a radius of half the heel measure, we describe the arc T L F, and from the centre T, with a radius of half the line T O, that is, quarter the heel measure, describe the arc H L G. And where the arcs

cross each other is the correct point or middle of the throat. Now, with a starting-point found, and the inclination to guide us, it is not very hard to draw the front of leg by the curve from the point L; then, with the leg measure to serve as a help, the remainder of the back seam is easily completed.

Since writing the above, I have had an opportunity of hearing many criticisms, both favourable and otherwise, upon the system I described; and amongst many comments, I was unanimously told by a few, whose opinions I have reason to appreciate, that my method for obtaining what I technically called the form, together with some other details, was everything that could be desired; but that, when I came to the construction of the upper part of the pattern, I seemed to be somewhat astray, or at least was rather obscure. In fact, the vagueness of my elucidation required more minute definition to show that my rule for regulating the pitch and inclination was capable of general application.

Acting upon this wholesome and generous criticism of my weakness—and seeing that many others, who could by no means claim to be juniors in pattern-cutting, were stuck in the mud, so to speak, on the same subject—I set to work to remedy these defects, my experiments resulting in the following issue, which, with a few other improvements, will, I am sure, leave nothing to be asked for. In the first place, it will be a saving of time not to mitre the form papers, but to simply nick or slit them. The right place to do this is where the last or form would present a very decided curve. It is not advisable to make too many notches. Say about five cuts in front, one at the back, and four along the bottom. This will be sufficiently accurate and more workable. The next step is to place the outside form (the largest) upon a piece of cartridge paper, and trace rounds it outline with a fine-pointed pencil, or, better still, with a dull knife; then over this place the inside form (the smallest) and likewise mark round. It only remains now to split the difference of the two outlines by cutting evenly with a sharp knife and a steady hand in order to obtain the average form. It is well when placing the inside form over the other to fix it, so that the

bottom lines may coincide or touch one another at the points C and B, Fig. 2. The reason it is essential to get the two forms is because one side of the last is different in shape and measurement from the other.

The pattern obtained has now to be drafted in the manner previously explained, if not the after-work will cause some trouble both to the laster and the pattern-cutter—to the laster because his skill is wasted, and to the pattern cutter because the rule I will give presently for deciding what is called "position," or the construction and connection of the leg portion of pattern with the form, otherwise more generally known as "pitch and inclination," will be entirely upset. The laster may go through the formula of "hoisting" his upper as high as he possibly can upon the back of his last, but if draft is not in the upper beforehand, it all amounts to very little. The sit of the completed boot depends practically upon this draft. It is the life of the boot, so to speak, and if not correctly done the work is doomed to be unsightly, and hang dead ever afterwards. It has been taught in some of the technical schools to draft the form by allowing $\frac{1}{16}$ in. in the waist, and whatever disparity there appeared along the bottom when averaging the forms to let it remain there. This, if a smaller allowance was made for lasting purposes, would about equal the cutting off the $\frac{3}{8}$ in. from the heel. It seems to be a universal practice to draft patterns by springing the toe. But a little thinking would very soon show that such is most reprehensible. Should the toe of standard be unduly sprung—and it is so when it deviates from the natural spring of the last—it will generate the most exasperating evils. The laster cannot get the quail pipes out of the toe, and the designer, in his innocence, tries to remedy the super-abundance of fore stuff by cutting the vamps narrower. This, he finds to his horror, only augments the difficulties. It is not the vamp that is generally too wide, but the outer edge that is far too long. Springing does not come into pattern-cutting at all. It is the property of the last-maker, and let him keep it. It is better for most, if not all of us, to have nothing to do with it.

By "spring" is meant the elevation of the toe of last above a horizontal plain, catching the tripod bearings (heel and joints). Suppose a last was raised at the heel one inch, and just bring the whole fore part of sole perfectly level with ground or horizontal plain. It stands to reason that if we raised the heel any more, the joints must come off the ground, the only point touching being the extreme toe end. We learn from this, that the higher the heel the last is intended to carry, the more it

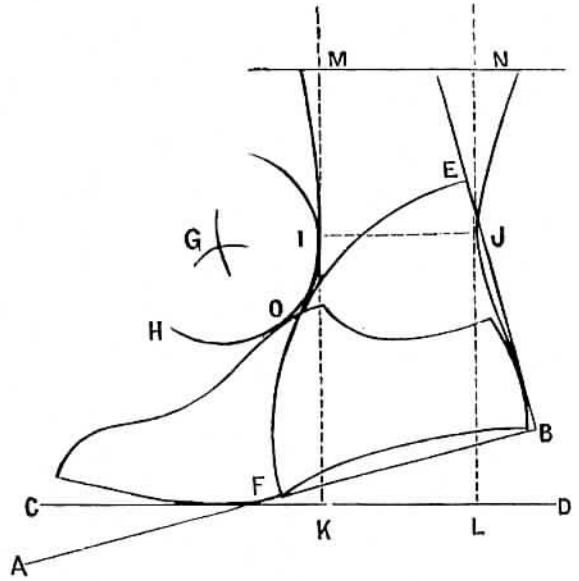

FIG. 4.

must be sprung at toe. How much it should be sprung for a given heel depends upon the class of work as well as upon the situation of the joints upon the sole of last. It is often supposed that the toe of last should be sprung half the height of heel the last is to carry. This would be right if the joints of the last were located one-third from the toe of last, and the whole fore-part was wanted to be exactly level with the ground. It is a simple sum in proportion. As the distance from the toe to the joints is to the distance of the joints to the seat, so will be

spring of toe to the height of heel. The data is that the distance from the toe to joints is one-half of the distance from joints to seat (because the first is ⅓ and the other ⅔), therefore the spring should be half of height of heel. But if the joints chanced to be situated in any other part of the sole of last—for demonstration sake, say one-half—of course, different figures will be the result. In this case the spring of toe will equal the height of the heel.

This is what we call the natural spring; but then there is also an artificial spring which facilitates locomotion in strong work. It was one of the points in prize work that the fore-part of the sole should touch the ground everywhere. In light, handsewn work, this might be feasible to a certain degree; but practical men agree that, in the ordinary walking boot, a certain amount of artificial spring is essential over and above our calculation of the natural spring for height of heel. In strong work, in shoes, and in the Albert or blocked military, this artificial spring is all the more necessary. It keeps the shoes from gaping at the quarters. It prevents unsightly wrinkles in the front of the Albert. And without it progression in strong, unyielding boots would be almost an impossibility. The stronger and stiffer the boot, the more this spring is necessary, till we come to the climax—the clog, which must correspond to the fellow of a wheel. If clogs were not turned up at the toe, as they are, locomotion in them would be almost impeded. In strong work of this extreme type, what we understand as correct walking is entirely out of the question. The labouring man does not make use of the admirable functions of his feet. He slings his legs from the hips with a jerky gait, making progress only by practically rolling along.

It must be understood that in taking ⅜ in. away for draft, it is not really taken from the heel measure, as will be seen later on. We only cause a twist, which, when slightly strained to get into position, ever afterwards acts as a sort of spring or tension, In some cases it is necessary to reduce the actual measurement, such as drafting a light calf or dress Wellington, in the small of the

legs. But in drafting a standard or a button piece, we simply cause a twist by altering the regular shape of curve. This draft can be given to the form in this way without cutting any portion away. Place the form upon a sheet of paper, and mark round all along the bottom from B to C, Fig. 2, then continue up the front as far as where the cone of instep begins. Next place the fore-finger at the waist A, and tilt the form on this pivot until the heel is raised three-eighths of an inch, the line already drawn. By marking round the remainder of the form we obtain a new one perfectly drafted.

With regard to pitch and inclination we will have to discuss one or two things, *re* the formation of the leg and its connection with the foot or its position, and then see how to fix the same geometrically. In the first place, I contend that there is no such thing as a perpendicular centre when the human leg is in its normal and upright position. Ocular demonstration will convince the most sceptical as to the truth of this statement, if they will take the trouble to observe the living form. Suppose we have an approximate covering for the pedal extremity, and we bisect the profile of the calf and ankle line, then join these points, the resulting line must be the centre, but it is certainly not perpendicular. This and a few other things it will be necessary for us to understand before we can proceed with technical details. The two terms, pitch and inclination, seem lately to be classified as one and the same thing, and, perhaps, were always so. But, in order that we may understand each other, it is absolutely essential to settle the meaning of one and the other. By pitch we will denote the spot where the leg is connected with the foot—what some call the throat—the angular place where the leg begins to rise; and by inclination the angle which the leg makes with the ground, deviating backwards or forward from the upright position to the foot.

The pitch, I have no hesitation in saying, even in opposition to recognised authority, is not at all influenced by any artificial elevation; no matter what variation may be made in the height of heel, this point is still unchangeable. There is another fact

that remains to be noticed, which observation will prove to be correct as a general rule. That is, the front of the leg in its natural and erect position is not inclined backward, neither is it at right angles to the ground, but it has a forward tendency. At the ankle this is not so evident, but the higher we examine upwards the faster the forward inclination increases. This is not much, it is true, as seen in the natural form, but in the pattern it must be proportionally more so; for the leg only shows the diameter, or shortest distance, whereas the pattern represents the circumference of the flesh outside. It is surprising all the little details that have to be weighed and taken into consideration in this one subject alone, acting and counteracting the influence of each other. For example, in lasting an upper, the two sides of it are separated more at the forward part than at the heel, because the last is wider at the ball than at the hinder part. This greater separation allows the vamp to sink somewhat downwards, which pinches the leg slightly forward. Then, again, it it is found necessary, in order to throw a looseness into the leather at the shank, that it may last easily there, to pull it well down at the heel, which draws the leg back again. The two operations thus counterbalance each other, and maintain the original position. These apparently little things, though tedious to consider, yet help to give us an intelligent understanding of the subject.

In giving my rule for regulating the pitch and inclination, I will also combine another for finding the relation which the calf measure bears to the ankle in the average proportions, and the formation of leg curves. Fig. 4 being our diagram, which, though not over accurately drawn, will illustrate the problem.

The form being obtained as described, place it upon a sheet of paper, and mark round with a fine-pointed pencil; draw the line B E from the corner of heel and passing through the back of the form, as shown in the diagram. From B draw at right angles the line B F, then from B, as centre at a radius of half the heel-measure, describe quadrant F O E. From the extremities of this arc F and E, for centres using the same radius, describe arcs, cutting each other at G; now, from G as

centre, and radius G O, make the arc H O I. This will connect the form of the leg (yet to be constructed) in a circular curve, thereby making a correct pitch, which, as I said before, is not changed by any variation in the height of heel, for it is the stationary hinge upon which the leg is rotated, either backwards or forwards, being entirely governed by the heel-measure, and the angle it makes with the bottom of the foot.

To get the correct inclination from a given height of heel, we proceed thus:—Measure from the corner of heel, point B, the height of heel the pattern is to be designed for, minus the thickness of sole, and at that distance from B draw the line C D, passing through the ball F. This is the ground-line. Now from this draw a perpendicular K M tangent to (touching) the arc H O I; from K set off half the ankle measure along C D to L, and from L erect another perpendicular, L N. Now we have the main structure for the leg, as seen by the dotted parallel lines K M and N L being the foundation upon which the inclination and leg-curves depend. The rule for calf measure, after making up statistics compiled from average measurements and examination of the best models, I find is this: that if the calf measure be located at a distance of half the ankle from the ankle-line itself (I J), its increase over the ankle measure is one-fourth of that ankle-measure. Now, to apply this rule, based upon normal proportions. Join I J, which is the ankle measurement, because I J is equal to K L. From I set off along K M the distance I J. This will be as far as M. From M draw the horizontal line M N. Now, according to our rule, we have to add one-fourth of I J to M N. The question arises, where shall we add this increase? Is it to be placed at the side M, or N, or half-and-half—perhaps some would say all at the side N. This will depend upon the particular idea of the pattern-cutter. If he wants the leg to hang back, he would apply, not only all the addition at N, but also take some from M and add it to N. If the front line is required to be perpendicular, the increase is simply added at N. But in reality there is only one way to apply this addition, and that is the right way. It will be remembered I said the front of the

natural leg was not at right angles to the ground, but slightly inclined forward, and that the pattern required to be more so. So what we do is this: Divide the increase in four parts, add three at N, and one at M. This is about the proper proportion and right inclination. The formation of the curves will present no difficulty. Join the points thus found to I and J in a graceful outline, and connect the back of the form in a continuous curve to J. Add $\frac{5}{8}$in. lasting in light work, machine-sewn, and $\frac{7}{16}$in. for strong work, along the bottom. Complete by cutting out in a graceful form a correct standard through the fixed points obtained. I may remark that in some scales of fittings, especially if the heel or ankle measure is above or below the average proportion, that the arc H O I may not catch the top of the form. Should such be the case this slight irregularity must be finished freehand, keeping outside the larger ones to prevent any radical mistake. This system may appear complex and roundabout, but in practice it is nothing of the sort. Once it is understood it is sure to be easy, automatic, and correct. Geometry is sometimes a very dry subject, and is a little hard to learn. But this should be always overlooked in consideration of its utility and accuracy.

There are one or two other useful methods of obtaining the exact pitch and inclination. One is by drawing a line parallel to A B at a proportionate distance for different sizes, and cutting the same with an arc, using a radius in the same proportion, with B as centre. Then, by drawing a perpendicular line to C D, passing through the intersection of the arc with the horizontal line. The remainder is completed by adding one-third of the ankle measure in front and two-thirds behind the perpendicular. The other is to draw the line B F, passing from the corner of heel B through the ball F. At right angles to this is erected the line B E; at 3½in. up this line make a point ¼in. inwards towards the toe. At 5in. higher up make another point on B E. These three points now render the drawing of the back-seam curve comparatively easy, which is done by drawing a line from the top of form to the point ¼in. from perpendicular, and from that continue the curve outward to

the point 5in. up perpendicular. That is, the back-seam crosses the line 5in. from B, and under those conditions only. The allowances for lasting must be on the form. It is only for a size fives, and for a heel 1¼in. in height. If the pattern is intended for a higher heel than 1¼ in., the back curve should cross the perpendicular line somewhat lower than the specified 5in. Suppose the elevation at heel is 1½ inches, then the back-seam should cross at 4¾in. up perpendicular, so that the higher the heel the lower the back-seam should cross the perpendicular, and *vice versa ;* an eighth for an eighth above or below the specified data given.

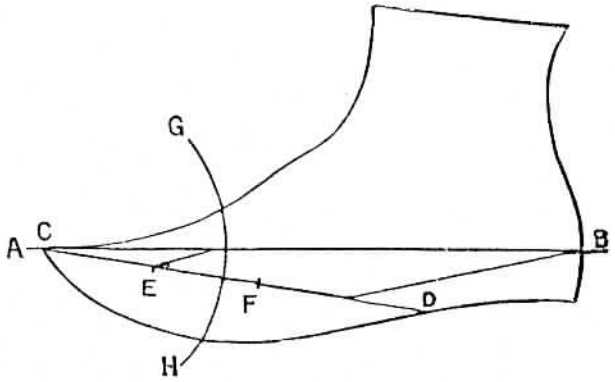

FIG. 5.

One system is to get the front-seam, the last one is to obtain the back-seam. If we have either one or the other in conjunction with the bottom curve, the remainder is found by the ankle measure. The first method described is based upon the mechanical construction of the foot. The part where the arc cuts the horizontal line adequately represents the ankle joints, and the perpendicular the *tebia* or shin-bone. It will be seen that the method illustrated by Fig. 4 depends the shape of the back of the last or form. This small portion of the back seam, if the last is properly made, will be always in the same position, and of the same shape. For though the profile of a shoe last will throw nearly a straight line, yet if it were flattened out,

it would cast a different curve. Some of my pupils in the City of Dublin Technical Schools, thinking I was making them build upon too shallow a foundation, have very ingeniously worked a system of pitch and inclination by a combination of Figs. 3 and 4, with great success. Some used the method explained by Fig. 3 to obtain the pitch, and that described by Fig. 4 to get the exact position and curves of the leg. It is self-evident that the pitch must be somewhere in the larger arcs, as described in both figures. But we must find out what part of the arc it is. In Fig. 3 I have fixed the pitch at an angle of thirty degrees with the line A O. Some have said that they would like this should not be so forward. If so, let them describe a larger angle, which will cause the pitch to go back as much as they like. The construction is there, and only requires a little thought or modification to make it subservient to the taste—if it goes by that—of any designer.

Every pattern-cutter should possess a graduated scale of fittings, which he finds by experience corresponds with the class of trade catered for. The proportional scale seems to be the most universal, and is admirably adapted to the normal growth of the human foot in most cases. The following set of measurements, which I have published before, has been averaged and arranged after a tedious study of the character of the human foot and an investigation of the numerous statistics. It will be found to be sufficiently simple and accurate for all practical purposes, being fully reliable for general application to the Irish boot and shoe trade. It will require a slight modification to meet the irregularities peculiar to a few localities. Still a word in explanation will be absolutely essential for a proper understanding, and will, I am sure, be appreciated by those who have the development of the Irish leather trade at heart, whether stimulated by patriotic philanthropy or the more general motive of self-interest.

In the first place, it is needless to remark, that there is not at present existing any recognised table of measurements or universal scale of fittings. Most manufacturers appear to be working to most diverse ideas in this respect. Perhaps at first

sight this is not to be wondered at, when we consider that, for instance, the measurement I give here for a 3's or medium fitting would be looked upon as a 5's, or full-fitting in the south of England, and designated as 1's or slim-fitting in the West of Ireland. But it may be asked (as it has been) what is the use of issuing a set of measurements, or preparing a system of pattern-cutting, when you cannot bring within its compass all dimensions in general use? To answer this question let me ask another. Why do wholesale manufacturers make thousands and thousands of pairs of boots, when they know that the same will not fit everybody? Simply because it is absurd to think of fitting every foot with readymade goods. But there is an average, and that is also in the majority. He who can work on fair lines for that majority evidently must come near the "Bull's-eye." It is useless to talk about exceptions, that is fully understood, and exceptions only help to prove the rule. It is imperative to understand that the figures I give herewith are for the normal and average foot (nett) and must not be confused with the last or pattern measure.

MEN'S FOOT MEASUREMENTS.

Length.	Joints.	Instep.	Heel.	Ankle.
5 sizes	9⅛ in.	9⅞ in.	13¼ in.	9 in.

WOMEN'S FOOT MEASUREMENTS.

Length.	Joints.	Instep.	Heel.	Ankle.
2½ sizes	8¼ in.	8⅞ in.	11⅞ in.	8¼ in.

BOYS' FOOT MEASUREMENTS.

Length.	Joints.	Instep.	Heel.	Ankle.
11 sizes	7¼ in.	7⅞ in.	10¼ in.	7 in.

Applied to lasts these sizes would be men's 8's, women's 5's, and 13's boys'.

To make those dimensions applicable to lasts, three sizes must be added to the length for men's, 2½ sizes for women's, and from 2 to 2½ for boys', ⅛ may be deducted from the instep and toes, and ½in. added to the heel measure. Why this modification is necessary is a subject too extensive for me to deal with in this chapter. I can, however, guarantee them to be accurate, and have found by practice that these leave nothing to be desired.

A complete table of measurements can be very easily made from the above foundation by adding ¼in. to joint and instep, and ⅜in. to heel measure. The smaller the fitting to be obtained from the medium or standard set, the greater the difference there should be between the joint and instep—⅛ of an inch for each fitting—and the larger the fitting, the less this disparity. This simple rule constitutes the principle upon which the most recognised method for fitting is founded. The situation of the girth dimension upon the last is—

Men's 8's last, foot drawing 5's. Joints from toe 3½, instep from toe 5½in.

Women's 5's last, foot drawing 2½in. Joints from toe of last 3, instep from toe 5in.

Boys' 13's last, foot drawings 11's. Joints from toe 2½, instep 4¼in.

Three English sizes go to an inch. But an inch contains three-and-a-half French sizes. A 5's last should measure 10in. in length. The width of tread for an 8's last is 3½in. for medium fitting, and the width of heel is always three-fourths of the tread.

The graduation, to be right, should be ninths of an inch, instead of eighths; but as the ordinary standard is divided into eighths and quarters, the above increase will be the most popular.

In chapters V. and VII., we will consider this important subject again.

Before concluding our contemplation on the primary pattern, it would be entirely out of place if I did not call the reader's attention to a very useful instrument, invented by the patentee,

Mr. F. A. Jones, of London. This ingenious apparatus is bound to be valuable to the inexperienced hand in pattern, for, by its aid, and the pamphlet of instructions given gratis to the purchaser, any pattern, from a child's shoe to a man's thigh

boot, can be marked out, with a great saving of time and skill. To explain how it is worked would, perhaps, deprive the inventor of some of the merit and profit to which he alone is entitled. For further particulars see advertisement in this work.

Chapter III.

PRINCIPLES OF DESIGN.

Insignificant cost of design, compared with the commercial value of the beautiful.—Art and Nature.—Fashion and novelty *v.* comfort and utility.—The attributes of style.—Combination of the useful with the beautiful.

"*Let them cast aside old patterns if they are ugly, and in their place use patterns that will not only fit, but adorn the foot. If this be done the lesson of Wedgwood's life will not be thrown away on shoemakers.*"—Boot and Shoe Trades Journal.

I now come to the consideration of a subject which is bound to play a most important *role* in the welfare of the boot and shoe trade—a subject upon which depends not only the reputation for the development of our artistic productions, but also the success of our trade from a pecuniary as well as from a national or patriotic point of view. I mean the combination of fine art with boot and shoe making. Although the application of science has of late years been somewhat developed, yet the application of the beautiful has been sadly neglected, if not most shamefully rejected, by the majority of British boot manufacturers, as too speculative and abstruse to be of any intrinsic value. And I am sorry to say, not only left the study of the æsthetic and the beautiful to the fame and profit of continental rivals, but to the idle dreams of imaginative poets, whereas it is through the manual skill of the practical artisan that the advantages derived from science and art are more productive, and not in their being the mere discussion and amusement of æsthetic enthusiasts. Shoemakers are accused, and I think upon very good grounds, of being too stereotyped in their ideas. This is an imputation which, if not refuted, must prove most detrimental to our reputation. An imputation which it is incumbent upon the intelligence (which has always been the characteristic of the "gentle craft") to erase, and save our trade from degenerating into that inferior rank, which otherwise it is bound to occupy in the estimation of the general public. Continental manufacturers have not been slow to realise the fact that appearance is something with

everybody, and everything with some people; or that the future of their success would lie more in the artistic than the mechanical. Still, it is encouraging to know that the few of our own manufacturers who have recognised the commercial value of the combination of the useful with the beautiful, their efforts have been crowned with the most astonishing success. The feature which stands prominently forward as the pre-eminent characteristic of British work is its thorough practicability. But we are beginning to find out that something else is wanted. It is acknowledged that when British manufacturers set their minds upon doing a thing they are seldom known to fail. And perhaps it is our continued success which has made us over-confident of our powers to excel. We have acted with a little too much pedantry, and, by a little too much negligence, the best and most profitable class of work has slipped through our fingers. If our manufacturers would only turn their attention from that degrading and suicidal practice of what is known as cutting prices, or the convulsive effort to undersell each other, to that field of progress, at present almost shunned by British competitors, we would not hear those helpless appeals to rescue from the tyranny of a cruel and keen competition—a field in which competition changes its garb of despotism for that of a guardian spirit, to encourage and stimulate a healthy rivalry after excellence and improvement; and where thoroughness and talent will inevitably gain their merit. Competition is a foster-parent given to man for his guidance and protection, and, like nature, cannot be violated with impunity without paying the penalty of their folly, as many have had the sad experience of during this last few years back.

Design costs little; therefore, if manufacturers wish to gain a maximum of profit at a minimum of outlay, or, to put it plainer, "want to make money," I would tell them that "the philosopher's stone" is the combination of comfort, attractiveness, and utility. These three, or properly speaking two elements (for comfort comes under the head of usefulness), concentrated together, and we have the secret of success. Minus one, and we are as far away as ever.

And to the honest artisan, who yearns to "be something," I would say, as has been said before "many a time," that I know of no other means of his so readily attaining his object as "by his acquaintance with the laws of the beautiful, and study until he has learned to perceive between the beautiful and the ugly, the graceful and the deformed, the refined and the coarse."

"*It was always possible for a nation, by artistic power, to give the commonest material vastly increased value.*"—OSCAR WILDE.

The eloquent Burke apparently proves to us pretty clearly by the sophistry contained in his "Philosophical Consideration of the Sublime and the Beautiful," that proportion, utility, symmetry, and, strangest of all, perfection, are not the cause of beauty. But in opposition to this we have the statement of the greatest living critic on the occult art, Oscar Wilde, who says: "Nature was beautiful in its exquisite details and in the pageantry of its changing moods. Nature is an ideal in itself, but as regarded Art it is not an ideal at all."

But the great Wieland, in his criticism on the "Beautiful and Useful," says: "To allow no value for beauty, except where it is useful, is a confusion of ideas," and that "man would be immeasurably below the height to which he had ascended in Europe if he had been confined within the narrow boundaries of the necessary and the useful." Yet Socrates, "the prince of philosophers," exhorts the painter and the sculptor to unite the beautiful and the agreeable with the useful. Byron and Bowles were also herculean opponents on the same subject. But it is not for me to enter into a pedantic discussion, or support the advocate of any particular statement. For although such might be both interesting and instructive, yet it would be outside the limits for which this work was intended, my object being to deal with more technical and less general details.

It is a pity that Art and Nature should be at such a great variance with each other. The shocking bad condition of the human foot of the present generation must be attributed to the shoemaker's art, whether he himself is to blame or not. Civilization has done nothing for the pedal extremity except to

cause its distortion. Better for people to go barefooted than have their muscles wasted, their bones distorted, and the joints perverted in their action by the wearing of tight boots. "Shoes of that pattern," says Dr. MacKenzie, "must make the wearer suffer for want of muscular exertion, and in addition to the certainty of in time bringing on disease of the bones of the foot and ankle, they lay the foundation of indigestion and dyspepsia." A correct fitting boot at present is a luxury. The shoemaker's art is misapplied for want of technical information based upon true science. "Every artist," says Mrs. Haweis, in "the Art of Beauty," "knows that any foot that has worn a shoe is deformed. If he wishes to make studies of a beautiful foot, does he choose the smallest-footed lady of his acquaintance, and copy those 'little mice' of hers? No, he ignores the whole race of English and French women. He goes off to the East, or to the fish-women on the shores of Italy, who have never worn a shoe; there he studies the free-practised muscles, the firm steps, the ineffably graceful movements." Still, let us not go to the other extreme, and cast aside the beauty and utility of Art altogether. We have been told to take Nature as our guide, and follow her faithfully. But if we held the glass to Nature, we should all go naked accordingly. No; Nature itself is not in the full sense perfect. Therefore, let us make good the deficiency by Art.

"*Nature has perfections in order to show that she is the image of God, and defects in order to show that she is only His image.*"—PASCAL.

Many shoemakers are not guilty of the serious charges which are continually levelled at them. Some may have the best intentions, but their hands are tied, either by Fashion, Taste, Novelty, or false notions of beauty.

If a fair and fashionable lady customer tells her shoemaker that she wants a nice stylish pair of boots, high-heeled ("I wear a 5½in. elevation," writes a lady correspondent to *The Family Doctor*, "a 3½in. heel, and a 2in. Spanish sock"), narrow-toed, and threatens, if she "can get them on," she "won't have them for the world." The shoemaker, with the courage of a lion, inspired by the justice of his cause, conscientiously answers

that the law of hygiene absolutely prevents him from making such unsanitary coverings for her large and malformed pedal extremities. "From an artificial elevation," says he, "will infallibly emanate an excruciating dislocation of the articulation of the tibia and fibula with the astragulus. As for intermittent pressure, it is bound to generate a super-development of the epidermis, and the unnatural position of the phalanges evidently must result in some of the evils that the flesh is heir to, especially the injurious accumulation of that obnoxious and corrupt matter, anatomically termed synovial fluid, issuing from

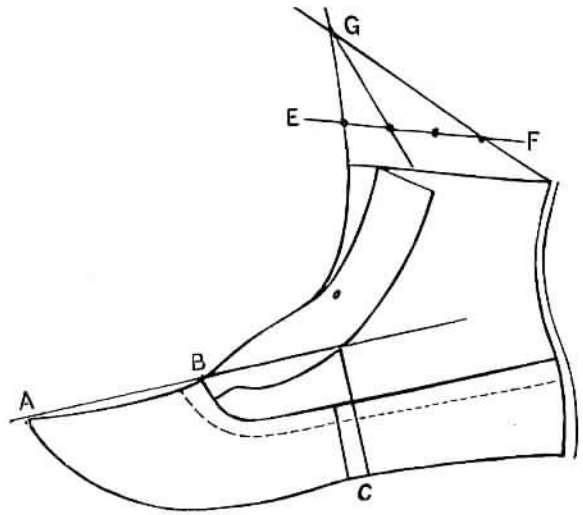

FIG. 6.

the *bursæ mucosæ* into the vacuum which nature abhors, and, my dear sister, which nothing can obliterate, except mother-earth—the grave."

An oration like this may display the shoemaker's knowledge, but I am sure very little of his wisdom. If the climax of his sincere eloquence does not bring a parasol into rather close proximity with his cranium, I can only say he must lose a customer, for the *lapsus linguæ re* the largeness of the pedal extremity tells "a tale untold." Never speak about anything big

in the presence of the fair sex, or you may make an enemy for life. They might think you alluded to their feet—a most unpardonable calamity.

Nothing is more ridiculous than to fix faulty ideas of beauty to any species of malformation. Neither is a small foot beautiful when not corresponding with the proportions of the human frame. I am prepared to admit, according to the growth our taste has taken, that there is something striking in a high Wurtemburg heel; a dashing appearance in a backward inclination, and a certain amount of neatness about a pointed toe. But, remember, I am not prepared to admit that any indulgence in this idea will compensate for the stifled cries, the agonizing pain, and the utter distortion of the most neglected and hard-working member of the human body, requiring the treatment of the chiropodist, who by right is an unnecessary member of society, his art being simply to restore nature. But if the foot, in the first place, was properly provided for, nature would require no restorer.

"*This is an art which does mend nature—change it, rather—but the art itself is nature.*"—SHAKESPEARE.

Nothing can succeed like a perfect fit; it combines ease, elegance, and increased durability, which sooner or later will be sure to be appreciated by the wearer.

The great dangers to which the wearers of those obnoxious things—ill-made boots—are open to, can never be too often repeated. It is our duty to teach the people to believe in sensible boots, that they cannot violate the laws of anatomy without paying the penalty. I mean by this that when a customer seems incapable of judging for himself, and at the same time is open to honest persuasion, the shoemaker should then come to the front with the truth, though for the time it may be a little unpalatable. This is the duty that is cast upon us; let us perform it with the same ardour as a missioner of Christ would work for his Saviour, and not with Machiavelian policy cringe to the weakness of your effeminate customer with one phrase, while you may cripple him for life by another. If this we do, the sneer would lose its sting—that "the community is bound

hand and foot and delivered over to the tender mercies of the shoemaker." "In the shoemaker's stocks," was also a proverbial saying, not very long ago very popular. "We," writes Carlyle, "have a public suffering much in its feet; but few shoemakers possess the actual art of making shoes which are easy to the wearer." Let us trust, with Mr. Herbert Hill, that the rising generation of shoemakers, sensible of its responsibility, and possessed of the only reliable and available armour—viz., scientific education—will resolve firmly to render this, "like some other sayings of the 'sage of Chelsea, no longer true." Still, we cannot reasonably be expected to overcome impossibilities. If the demands of fashion are so headstrong that its torrents cannot be checked, in other words, the orders of your customer are so imperative that it would be utterly useless to argue any modification, then by all means put the heels on the toes of his boots if he wants them.

As extreme measures in political life are bound to cause a revolution against the motives which they were employed to protect, so sure will a reaction embarrass the over advocacy of a too sudden and singular hygienic reform. Although Goldsmith tells us to plead for more than we expect to get, yet I always found it far more practical in general life to always insert the thin end of the wedge first. Never try to overshoot the mark, rather convey the idea that you are not shooting at all; then you are likely not to be assailed with derision if you fail, but gain all the more praise if you succeed. "How I made my money," said a millionaire, "was by the practical application of a little affectation. When I was poor I let on I was rich, and when I was rich I pretended I was poor." I have learned by observation, and proved by experience, that there is one great law above all others that will greatly facilitate the gratification of anyone's wishes—that is, if you want anything never evince the least anxiety to obtain it. If health reformers had to have shown more practical ideas and less anxious sentiment, the good cause which they advocated with fanatical enthusiasm would have made more headway to-day than it has. Their arguments were more commanding than convincing.

They inserted the thick end of the wedge first. They were unfortunate in their mode of procedure and prejudiced in the eyes of their audience, for they not only overshot the mark, but they stood in the arena before spectators who were only too willing to pick them up before they fell.

Since the movement in favour of natural foot-wear has come into vogue, various objections have been made to hygienic boots. "They are far from elegant," says one; "large, crooked, ugly," say many others. "They are not the shape of my foot at all," says the nice young man with the high collar. "Abominable," cries the young lady who suffers to be beautiful (fashionable, I mean).

"To such remarks," writes Professor Meyer, "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 already has 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 and adopt it."

The hygienic boot is really a beautiful foot-covering, looked at through the spectacles of general appearances as well as from an artistic point of view. It may be a form to which the eye is not accustomed. But once association is made, the strange look not only disappears, but a great liking is fully entertained for that article of dress ever afterwards, as witnessed by those who have worn them for a short time, when they eventually look on all other forms with pain and disgust.

In these days of all potent fashion, no portion of the human body seems to be so awfully neglected as the foot. And this is all the more reprehensible considering the great duty this member has to perform. We bestow the greatest attention upon the feet of the horse, the ox, and other animals of burthen. Why not upon the greatest specimen of our Creator's art? We laugh, or perhaps cry at the absurdities of the Chinese custom,

which actually pulverised the feet of its young and beautiful women. We become horrified at the recital of the barbarous practices of uncivilised nations in their tamperings with the human figure, yet if we could "see ourselves as others see us," we would be likely to acknowledge that we are no less blameable. More so, for we cannot plead ignorance. The consequences of stupidity have been continually whispered, aye, perpetually roared, into our ears; yet we—the models of civilisation and intelligence—have ignored the warnings of Camper, Dowie, Meyer, Hannibal, and the unquestionable teachings of which our medical literature and trades journals actually teems.

The feet having to support the weight of the whole body, and the demand upon their functions being almost for ever exercised, at the same time their situation being located so far from the motive power of circulation—the heart—they unquestionably require our constant and best attention. More people have died by unsanitary boots than people are aware of, or care to inquire about. Battles have been lost by ill-made boots; thousands of our fellow-beings have gone to a premature grave of consumption caused indirectly through cold, and directly by unscientific foot-gear; and thousands, I might say millions, of living human beings are at the present day suffering a most painful existence through the tortures of an afflicting shoe.

I have myself, with indignation, beheld the distortion of the mechanism and functions of which the human foot is so admirably constructed and so well adapted. The beautiful arch, of which Sir C. Bell speaks with the greatest estimation, completely ruined—bunions on one side, a crop of corns on the other, callosities on the bottom, in-growing toe-nails on the top. Altogether a most lamentable case. The fault in many instances, I firmly believe, can be equally divided between the bungling shoemaker and the vain customer.

We were terrified the other day when reading of the human sacrifices which an atrocious community of savages continually make to their pagan deity; but we ourselves are also paying our tributes to our popular idol, Fashion, only, being more selfish, we perform our religious duties with less faith or enthusiasm.

Instead of offering up ourselves at once we only sacrifice ourselves in pieces, beginning by punching holes in the ears, next destroying the feet, and lastly by tight-lacing the body, &c.

But how are we to answer for the fact that people who are neither followers of novelty or fashion, but firm believers in comfort and utility, are still "a-suffering in their feet?" The disgraceful ignorance of the embryo shoemaker gives us the solution. The "kissing Judas," who tells his unfortunate

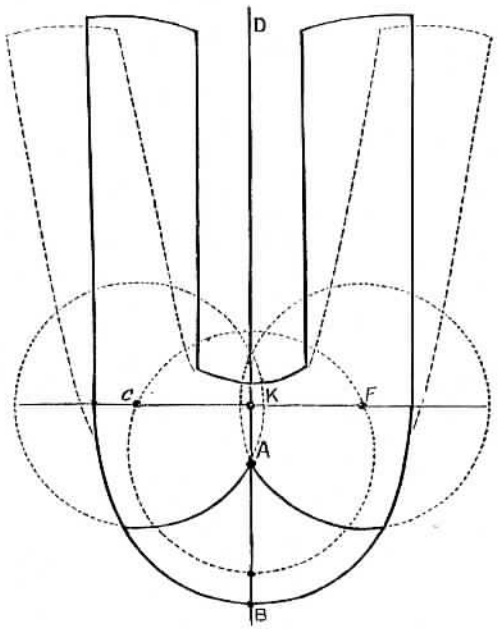

FIG. 7.

victim, writhing in a pair of new and crippling boots, that "they will be most easy and comfortable when they bedden to your foot. After a short time they will be only too large. But I will give you a pair of socks, so that *when* you find them too easy you can slip these in and fill up the superfluous vacancy." The lying traitor! and the boots he tries to palm off are composed of such material and shape as would never give ease, but, on the contrary, every possibility of getting worse. To put it mild,

over his door should be nailed: "*No comfort guaranteed here until our boots are worn out.*" Yet this miserable wretch, while he solicits with contemptible servility an undeserved custom, can afford to sneer at scientific methods, call geometry "bosh," and trade literature "trash." The issue is a simple one. "Then how do you stand *now*, where will you be *then*." It means this, that when we "hoist the geometrical flag, and beat the anatomical drum," the inexorable law of nature—"the survival of the fittest"—will compel this bugbear of society, and the discredit of his brethren, to be for ever afterwards "a thing of the past."

Although Dame Fashion is arbitrary and absolute in all her decrees, and commands us to do this or that—orders which the slaves of this fickle goddess must obey, and nobody but the sensible social-science matter-of-fact sort of woman dares to defy—still her history shows us that she moves in a circle, and any change she makes is merely a revival or modification of old styles. A glance at a series of pictures of costume at various periods in English history will show how fashion has changed at different times with respect to boots and shoes. The excessively pointed toes of the time of Richard II., for instance, were superseded by the extreme broad wide toe during the reign of Henry VIII. One time the toes of boots were prolonged to such an extent as to absolutely impede locomotion, only an ingenious inventor conceived the idea of curling them up in spiral fashion. Another improved upon this, as usual, by attaching the toe to the knee by a chain. This went to such an extent as to cause the intervention and prohibition of the clergy. And the succession of broad toes increased with such equal absurdity as to necessitate an Act of Parliament limiting their width to no more than six inches. I suppose they were worn the length of the foot, allowing them to be as broad as they were long. This shows that there was nothing essential to the gratification of the æsthetic instincts of mankind. Each form was doubtless equally admired in the time of its prevalence.

Devlin speaks of right and left sole shapes as an old idea,

implying the notion that in his time "straights" were in vogue. But now we are after having a spell of rights and lefts, and likely, after all our talk, they may be ousted again by the straights, the adored fashion at present in France, which will likely be soon handed over to us.

That the shoes we wear are seldom made of the proper shape has been often pointed out by scientific writers. The poor suffer more from this cause than the well-to-do. This matter was the subject of an able and interesting paper, read by Colonel Zeigler, Chief Surgeon of the Swiss army, at the Geneva Hygienic Congress. He stated that every year 800 recruits are rejected for malformation of the feet, resulting from badly-fitting shoes. A test of a perfect pair of shoes is that, when placed together, they should touch only at the toes and heels; the soles should follow the sinuosities of the feet, and give room for their expansion.

As prevention is better than cure, give your customer boots to fit his feet, and not entice him to make his feet fit your boots. Few people are born with deformed feet. Yet a perfect foot to-day is a very rare thing. It is often thought that a boot made large must be easy. This is a mistake; the cure is as bad as the disease. It is only an exchange of corns and bunions for blisters and inflammation of the feet, because the vamp will in time fall into a hard inverted fold, and press upon a very tender and sensitive part of the foot, the top of the phalanges. It is only when there is sufficient material, and that in its right place, that a proper fit is secured. He who wears over-large boots evidently must have been "burned at the fire," or a little gone in the upper storey. And he who wears his boots too tight, undoubtedly has a *narrow understanding*, both literally and metaphorically speaking.

Many shoemakers seem positive that the study of the osteology of the foot and leg, combined with a knowledge of general physiology of the human body, is beyond their sphere. They say that it is neither fair nor advantageous to impose this extra duty upon them; it is all very well for technical teachers, who can impart a scientific and ambiguous tone in their lectures in

order to recoup for their lack of practical knowledge, but to "the real shoemaker" it is useless. I will not argue against this stupid notion—it carries its own condemnation. The foot it seems unnecessary to say, is intended for walking, yet many shoemakers ignore the fact altogether. They satisfy themselves with a superficial observation of the external form, while the mechanical actions of the internal portion never cost them a single thought.

Notwithstanding that there are few who would be more pleased to see a proper hygienic boot widely adopted, yet I have no wish to be misunderstood or thought inconsistent. I am not one who can change too suddenly from one habit to another, and I think I am a type of a great many others. As it is harder to unlearn than to learn, it is likewise more difficult to break a person off a bad habit than it is to teach him a new one. This tells us that it is unwise at first to place an extreme or unusual shaped boot on the market. A very saleable boot can be constructed as near as possible to the shape of the normal foot, while at the same time made in such a manner as to be pleasing to the eye of a fair and reasonable public. It is not necessary to have very broad toes, angular corners, or too extreme a twist, an over-wide welt, a heavy and awkward waist, or the many other points which are considered essential in hygienic foot gear. In fact, Dr. Rhys says: "The shape of the toe is a matter of indifference, and may take any form that pleases the fancy of the wearer. The fact is, these boots are made too narrow across the points of the toes, hence they are crowded together." By simply thinking we can do many a thing to beautify the boot without infringing upon its utility. "What we want to do," says Mr. Gladstone, "is to make our people think." Quite so. By giving the subject our earnest thought, much natural ingenuity, guided by scientific teaching, can be used to form a boot "that will not only fit, but adorn the foot;" and as the beautiful is such an important factor in the commercial success of our productions, it will be most beneficial for us to now consider what in general are the attributes of style as applicable to boot and shoe manufacturing.

Even in opposition to so great an authority and genius as our Edmund Burke, I am sure, with regard to boot and shoe making anyhow, that proportion, symmetry, utility, perfection, and decorative art or ornamentation actually constitutes the beautiful. I also hold that the useful and the beautiful can and must be combined together, entailing profit and refinement in the manufacture of ideal and natural foot-gear. Taking up the first of these constituents in a practical manner, we find by scientific experience, that the increase and decrease of the average foot, and consequently the patterns, are governed almost entirely by the law of true proportion. The division of the standard into the parts which constitute any particular design, if properly dissected, will invariably bear a certain proportion to the whole or the minor parts themselves, which relation we will consider more definitely in our next chapter. Every student in the art of painting or of sculpture knows that the foot, to be in harmony with the full figure, must equal that relation which the average members bear to the human frame.

That statue of undistorted beauty—*Venus de Medicis*—which has enraptured the world by its grace of outline, stands to-day as the pattern of perfection in natural form and accurate proportion. The height of this model sculpture is five feet two inches, with a foot nine inches long. That is, the foot is about one-seventh of the height. Jean de Witt and Albert Durer have published works upon the human proportions, which go to show that such was one of their chief studies. A little consideration, then, proves to us that proportion—one of nature's laws—is one of the attributes of the beautiful. Symmetry and utility must be the same likewise, for if they were not, a wooden leg, as a fellow for a natural or flesh one, could be classed as a "thing of beauty," if not "a joy for ever." Symmetry and proportion are often confused as the same thing, but although a symmetrical figure is always proportional, yet a proportional figure is not always symmetrical. To put it plain, proportion is often odd, whereas symmetry is always even. You can have all sorts of proportions, but symmetry must always have equal quantities each side of an imaginary or centre line.

The external form of the human figure is symmetrical. If a centre line was imagined to run from the middle of the forehead downwards, terminating between the two ankle joints, we would see then that our form was equally divided. If there is one arm one side, there is another arm at the other. "An eye for an eye." Half a nose or head on one side, well, only half a nose or head is at the other. Should a man possess only one leg, one eye, he would not be symmetrical, for he lacks the even balance; but if he had his nose cut off he would be symmetrical, provided it was done *evenly*. A pair of boots, the left exactly a *fac-simile* of the right, would be symmetrical; but they would not be so if one had a toe-cap and the other had not. The French sole shape is symmetrical in itself; but the hygienic form is not, because the outside is different from the inside. A pair of hygienic sole shapes placed beside each other would be symmetrical. Then utility must also be an element of beauty, for if a boot did not fit properly or wear evenly, it must be very unsightly, and consequently cease to be comfortable and nice—in short, displaying a most distorted form. That perfection is not beauty, very few of us would ask to say, seeing that this is the end and aim we are striving to attain. And if there is one thing more than another that will realise it, concentration of attention to minute details is the surest. A friend called on Michael Angelo, who was finishing a statue; some time afterwards he called again, the sculptor was still at work. His friend, looking at the figure, exclaimed: "You have been idle since I saw you last." "You mistake," said the artist, "I have re-touched this part, and polished that; I have softened this feature and brought out this muscle, given more expression to the lip and more energy to limbs." "Well, well," said his friend, "but all these are trifles." "It may be so," replied Angelo, "but recollect that trifles make perfection, and that perfection is no trifle."

Harmony and taste likewise require our consideration. Harmony of colour and arrangement in boot and shoe designing, means a proper and judicious contrast of material, and the delicate combination of the various parts into a beautiful

whole. This element teaches us that grace of outline, to be pleasing to the sight, must be connected or continued in a gradual blend, while, at the same time, it is not disturbed internally by hard or irregular curves, but formed with equal balance and suitability.

The component parts of a design, to be in harmony, must correspond with the lightness and individual style of the completed article. To determine this quality, to a great extent, depends upon taste—a faculty man cannot unanimously impart unto man. "Thus we see," says Goldsmith, "that taste is composed of nature, improved by art—of feeling tutored by instruction." This divine quality, it is encouraging to know, can be cultivated and brought to perfection by an intimate acquaintance with model specimens of art—and a minute examination of natural forms and curves—by educating the mind's eye to perceive true elegance, and training the hand to operate with a firm practice. And lastly, by developing the inventive faculty in conjunction with correct judgment. This constant study will bring into play your talent, and by a little perseverance original ideas will present themselves, and endow you with that enviable acquirement of pure taste, so necessary to constitute a first-class designer of boots and shoes.

Decorative art has been one of the greatest implements—so to speak—generally and successfully used to beautify and enhance all articles of dress and furniture, more particularly with almost every description of wearing apparel, except boots and shoes. This is a truth that is worthy of our best investigation. A state of things that continues, I am sure, only through the culpable indifference of the shoemaker.

A fabulous amount of money is turned over in other trades on the strength of the attractions which ornamented attire has for the feminine sex especially. Coloured ribbons, fancy feathers, decorated garments, are the enticements with which the draper allures the susceptible pocket of the public, and very commendable, too, seeing that the purchaser is pleased to pay somewhat more than the intrinsic value when the taste is gratified. Why not make boots an article of dress or show, an article of entice-

ment, and thereby turn a stream of circulating wealth into a channel that is well deserving of support from both sides? This channel is the boot and shoe trade, and the support ought to come from the consumer on one side, and the producer on the other. Or, as "Heaven helps those who help themselves," let the shoemaker himself start the racket, and the support that *ought* to come, will and *must* come. We are too much content with supplying the demand: why not *cause* an extra demand by beginning a supply? The practice of decorative art ennobles labour, and contains within itself an enormous store of economic wealth, owing to the extent our productions can be enhanced by artistic effort. A spadeful of clay that has cost less than a threepenny bit, has been made into a beautiful form of vase, that a three thousand pound note was insufficient to purchase it. Materials—as an instance, say canvas and paint—may not cost six shillings, yet the magic touch of the artist has transformed this raw material into such a painting that six thousand pounds could not tempt the present owner to part with it. By giving this our consideration, the enthusiastic workman will be enabled to bring his occupation more up to the level of his genius, while speculating capitalists are at the same time more likely to satisfy their greed.

Care must be taken not to confuse ornamentation and beauty as the same thing. Many things may be elaborately decorated and lack elegance. Again, some of the most beautiful things in the world were entirely without ornament.

Inferior designers usually fall back upon decoration to pull up or recoup for the indifferent results of their work. Wrinkling, scolloping, and perforations are clumsily used to hide defective patterns. But such an abuse of art seldom fails to offend the eye. Ornamentation at this rate becomes a decided enemy of beauty. Some of the best specimens of work I have witnessed were absolutely plain. Yet, in opposition to this, we see every day gaudy colours, patent straps with meaningless curves, cumbrous bows and slides, unsightly machine flowering, and heavy embroidery. Ornament to some, no doubt, but in reality only a very bad cloak to cover a multitude of sins.

But as the taste, or shadow of it, is different in people according to their education and refinement, we must remember that what might please the "upper ten" is often contemptible with the "lower orders," and *vice versa*. And as taste is very unreasonable in its demands, those who cater for the general trade successfully, know that they must put many ideas of their own in their pocket, to favour the wishes of these classes of customers. It is well, therefore, to notice that there is a difference between ornament for high-class goods and ornament for cheap or inferior goods, which is principally this—Low-priced work is usually set off by making it showy and conspicuous, whereas, in the best-class trade only simplicity and delicacy has any attractions. All attempts at elaboration in this style of work is seldom permissible. Or should it be so at any time, it must be carefully toned down. Any residue of the "tinsel age" should be erased. What Mr. C. W. B. Burdett, head master of the London Leather Trades School, remarked, when writing on Spanish lasts, is very appropriate here :—"It should not be forgotten that these boots require great care and correct taste in combining and making. They are for the foot-gear of highly civilised and intelligent people, whose happy climate permits a bright display for many months in the year, and not for a set of ignorant savages amused by the glitter of a bead, or enraptured at the sight of a spangle."

Decorative art depends upon laws—laws of alternation, symmetry or equality, and harmony of colour. Repetition and confusion also "have their finger in the pie," the former conspicuously more so than the latter. An example of alternation is frequently seen in most fancy trimmings, especially the variegated straps which often decorate the front of ladies' seam-to-toe spring boots, or the patent mock lace front on elastic boots. Symmetry is fully recognised in a pair of well-matched boots themselves, and harmony of colour directly appeals to the eye. This law regulates the numerous combinations of materials. It tells us that to show bright and trying colours to the best advantage, we must relieve them by neutral shades, and, as a rule, that red will incline to violet, orange to yellow, and blue

to green. Always put a lighter colour in the legs of your upper than in the vamps or foxings, if you want your contrast to prove effective. With black materials place the dull colour also in the leg, while glazed enamelled or polished stuff surrounds the remainder. To name some well-adapted combinations, such as glacé goat, enamelled calf, or Strasbourg moroccos with glove kid, flat calf, or textile fabrics, or the suitability of the different leathers for any particular purpose would not be so advantageous, as I want my readers to design or combine for themselves, as originality is one of the most valuable accomplishments any pattern-cutter could have. For the field for designing is "practically unlimited," confusion only awaiting the artistic touch to start in gorgeous array. The examples of repetition are so abundant in boot patterns as to need no special illustration. The perforation of toecaps and goloshes

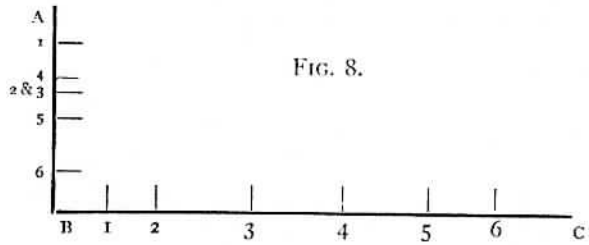

FIG. 8.

afford us a simple instance of repetition, and the familiar design performed through the aid of the punch, having four small holes, with one large one, working simultaneously, is likewise an illustration of both repetition and alternation.

In cutting fancy straps, patent toecaps, or any other sort of variegated curved work, keep in mind that a great number of twisted curves or too many sudden turns should be avoided. A repetition of form generally gives a better effect than a diversity of such. An ornamental or elaborated part should be gradually contrasted with a plain portion. Variegated forms should be kept together as much as possible, and not spread over too large a surface. White silk flowering is a cheap and effective mode of ornamentation. Sometimes it is anything but artistic, still some specimens of this work evince a great amount of taste.

A good rule for flowering is to make it prove attractive and no more, overloading always being a failure. The appliances offered in the way of patterns and machines by the engineers to the boot and shoe trade, for the production of this class of work, as well as other modes of ornamentation and neatness of finish, should prove a great boon to the manufacturers who make fancy goods a speciality.

Grace of outline, the arrangement and construction of curves, requires the study of the pattern-designer, in all probability, more than anything else. As a rule, straight lines, or a combination of straight lines, are thought not to form beautiful forms (yet some very ornamental designs can be made by straight lines alone). Still, with us this cannot be a stringent law, as regards the internal design of some patterns, though, practically speaking, there is not a straight line in the human figure.

Hogarth, when he painted his own portrait, etched on the palette a waving line, underneath which was written: "Line of beauty and grace." No one knew what this meant, though everyone wondered. But the mystery was solved in 1753 by the appearance of a work from the pen of the artist entitled "An Analysis of Beauty," in which he points to the leaves on the trees, the flowers and the buds and blossoms, as formed of waving lines. The line of grace is found in the varied outline of the hills, in the grandeur of the mountains; in everything both minute and magnificent. The beast, the birds, the fishes, and the shells that strew the shore, are cited as examples of the truth of the theory, and the top-stone of the argument is found in the rounded lines of womanly beauty. He thus proclaims himself the discoverer of a great and universal principle, which the great artists of Italy and Greece wrought, most probably more through instinct than science. In all their works is found this line of beauty, as he described it, and nowhere stiff, rigid, or angular forms. The grace of outline which pervades many of the works of antiquity, has been the cause of many attempts to discover if there was any fundamental principle to which this peculiar beauty was to be ascribed. All parties seem to agree that it depends on various

modifications of a curved line. Mr. Reinagle, the Royal Academician, endeavoured to show in an illustrated lecture that ovals of various sizes would mechanically produce numerous elegant and symmetrical outlines. And his audience appeared to be convinced that a line formed by an elliptic curve was beautiful even in an abstract point of view, free from all association. To illustrate his views he employed many diagrams of straight parallel lines arranged horizontally and vertically. These were shown to produce no principle of beauty; though a series of straight lines drawn to radiate from a centre made the simplest beautiful arrangement of lines. This was greatly improved by the addition of curved ones, and the beauty of the arrangement was increased and most elegant when all curved lines were substituted.

There is a very pleasing and instructive toy-instrument sold at present in most novelty shops, called the Polygraph, which, by shifting about in different directions round a fixed centre, and alternately marking round certain curved portions with a pencil—somewhat like Mr. F. A. Jones' patent pattern-marker—very pleasing concentric designs are obtained in foliage or ornament with the least possible amount of skill. We can make some beautiful figures mechanically with the ordinary compass, such as the Egyptian trefoil, the Turk's cap, the spiral or the elaborated quartrefoil, &c. But few attractive forms can be obtained with ruler or set squares.

The vessel called the *patera* and the Greek vase are composed of nothing else but elliptical curves. We can see by this in what manner many splendid forms can be produced. Some, however, contend that the line of grace is formed of what is called a hexagonal curve, that is an arc of a circle equal in length to one-sixth part of its diameter. The outline of the human face is said to be formed of hexagonal curves. But as often abstruse speculations, whatever they may have at the bottom of truth and solidity, suit not the capacities of all, we will have to now turn our attention to more practical work. Anyway, look at everything for yourselves; find out *truth*. Many a man made of good stuff lost his mark through lack of obser-

vation. "The wise man's eyes are in his head," says Solomon, "but the fool walketh in darkness." "And, sir," said Johnson on one occasion to a fine gentleman just returned from Italy, "some men learn more in the Hampstead stage than others in the tour of Europe;" and I know some people myself who could see more in an eggshell than others could learn in the Paris Exhibition. Bring your mind to bear upon your work, and you will make money whether the sun shines or not. Let your productions carry the impression of your brain. "Pray, Mr. Opie, may I ask what you mix your colours with?" said a brisk fine art student to the great painter. "With *brains*, sir," was the gruff reply and the right one.

Gain confidence in yourself, but shun conceit as you would poison. Let pedants take a wrinkle from the last words of Laplace, one of the most skilful geometricians of modern times: "The things which we know are few; those of which we are ignorant are unbounded." Let egotism and false pride learn humility from the words of our Christian philosopher, Sir Isaac Newton, which he exclaimed before his death: "I know not how others may regard me, but to myself I appeared as a little child playing on the seashore, whilst the great ocean of truth lay all undiscovered before me." Although many a rich man has made half his fortune by minding his own business, and the other half by leaving other people's alone, yet, I think, we must occasionally "look over the hedge." I mean by this, that to be a good pattern-cutter, we must not depend altogether upon our own natural abilities, but take minute notice of the points in artistic work, and examine the best samples and models, and you may see, while at the same time we study, the depth and drift of the prevailing fashion. This, together with an eye to novelty, is the best and most concise advice I can give with regard to original design, the application of which must necessarily assist in the formation of that taste so essential for its complete attainment. Above all, keep in mind that we can and must combine the useful and the beautiful in boot and shoemaking. In other words, that our attention is to be directed to impart style and elegance to the boot while we give comfort and convenience to the wearer.

Chapter IV.

PRACTICAL DESIGNING.

Economical hints.—Modifications peculiar to the usual patterns.—The whole and its part.—Novel and useful designs.—How to obtain blocking patterns.—Scientific designing of bottom-stuff patterns.—Laced, buttoned, and elastic designs.—Common blunders.

"*Facts, like sunbeams, the more they are condensed the fiercer they burn.*"—Southey.

"*Economy is of itself a great revenue.*"—Cicero.

"*Give me a standing place and I will move the world.*"—Archimedes.

"*I would rather be beaten in right than succeed in wrong.*"—Garfield.

"A pattern-cutter," says Mr. John Tyrrell, in *The Scottish Leather Trader*, "should not be content to be that only. There is little to commend if the ability of the workman is confined to being able to cut a pattern. If his soul is in his work as it ought to be, he should be ambitious of being something more than this. He should aim to be a designer of patterns; to succeed in this he must possess artistic taste. This may exist naturally, or, on the other hand, it may be acquired." A very sensible advice, surely. Still, what the ordinary pattern-cutter will have to do with, is to learn how to cut the designs at present in vogue, and bear in mind the modifications necessary for the usual patterns.

To begin, suppose the standard is all right, and from it we want to get the lining, the fittings or trimmings, and the outsides, generally termed covering patterns—say for a man's golosh button boot.

The first thing to do is to mark upon the standard the height of vamp. Although a good height of vamp, say for a man's 7's is 4¼-in. Yet, instead of having to carry a lot of individual measurements in the mind, it is far better to give a simple rule for all average work. I might give the measurements of all the various parts in our numerous sizes and designs. But such would be neither scientific nor simple, but entail too great an effort upon the memory. The general rule for height of vamp is "low enough to go on easily, and high

enough to look well." This is rather indefinite. The best definite average I can find is to cut the vamp one-third the length of standard. To work out this, it will be most instructive for us to employ a very useful problem in practical geometry, viz., how to divide a line into any number of equal parts. Referring to Fig. 5 as our illustration, we want to divide the line A B into three equal parts, and utilise the first part for our height of vamp. At any angle to A B draw the line C D. Upon this set off any three equal divisions E F D (the letter D in diagram should be nearer to F). Join D B in a straight line, and from E draw a parallel to D B; where this parallel from E crosses the line A B, is the exact one-third of the whole line. From C as centre, and radius the one-third, describe the arc G H. Where this arc crosses the standard is the correct position for height of vamp to a hair's-breadth.

Although I hold that one-third is the average for vamps, yet I admit there must be exceptions, such as making it shorter for ladies' patterns that are intended for high Wurtemburg heels, or to suit the taste and convenience of many people. Still it is most beneficial to decide upon an average. One-eighth inch or one-fourth inch above or below this makes very little difference, but if by depending upon eye we make the vamp too low, it is not only unsightly, but likely to slip in lasting, and if too high, it will be hard to get on or off the foot, if it is not broken or bursted in lasting or treeing. The height of vamp being decided upon, say at B in Fig. 6, draw the line A B touching the toe and cue of vamp; let it be produced as shown. Now we have to settle the length of vamp, *i.e.*, from A to C. This is usually double the length A B; the wing of vamp is usually the same length as height of vamp. It must be noticed that, though joined, gol vamps are often interlaced in clicking, still a large quantity of this sort of vamp is cut from ready rounded German crup. This being the case, it will be seen that the location of the point C has a lot to do with economy of cutting. If C was situated nearer the toe of standard, it would naturally make a shorter vamp, which is a great consideration in a cheap class of boot, for the piece of

waste between the wings is greatly reduced when vamps are taken from German crup, or placed against a straight line, for instance, the back bone, in clicking from many skins; besides a smaller size ready rounded crup vamp can be utilized than could otherwise be. But when beauty of pattern is placed above economy, the point C might be located more towards the back seam. This nearly adds as much to the style of the boot as if it were a whole gol vamp. Now from C we draw a perpendicular to A B produced, which causes the wings of the vamp to be perfectly square, so that when the vamp is complete (doubled) its extremities will evenly coincide with a straight edge placed against the ends of the wings. The depth or width of wing is one-third the width of vamp, *i.e.*, each wing is one-third, and the space between them another one-third. Therefore, to fix the height of gol quarter or width of wing, divide the perpendicular from C into three parts, and give two of them to the range on height of gol, sometimes called the foxing. If the vamp is intended for the system of clicking termed interlacing, *i.e.*, locking the wings into each other, as is usual with long Balmoral vamps, then barely give two-thirds for width of wing, so that they may easily fit into each other.

We have now to arrange the button tab. Our one-third rule (a very universal one in pattern-cutting) comes in well here. Some button pieces are cut so wide as to look very slovenly, spreading over more than half the quarters. Others are cut so narrow as to look awfully mean. Draw E F parallel to the top of standard, and upon it make any three equal divisions, join the marks of the first and last divisions with the front and back of standard as shown, produce these until they meet at G, and from G draw a line passing through the second mark on E F; where this line cuts top of standard is the correct width for button piece for any size pattern. This construction is simply another geometrical method of dividing a line, which I give for variation sake. Of course the method applied in Fig. 5 can be used instead. A pencil line can continue this width down from front of leg until about ½ in. from cue of vamp, where it should be curved in to no less than ⅜ in.

The button piece may be slightly tapered from the top of leg down to bottom of instep. All the points being connected with a graceful drawing, completes the pencil marking of our design on standard. I may say it is always well to have gol quarter never lower at back than front, for if otherwise an awkward seam comes upon a very tender part of the heel, besides it looks far from stylish.

Before we put a knife to the pencilled design we must cut another standard from this one, in order to make the lining pattern, or place this standard upon a sheet of paper and mark completely around it. To this outline add ¼ in. up front seam and the back seam, and cut ½ in. off from top of leg. For a lace boot we should add the ¼ in. only up the front seam as far as B; but in buttoned work we let it run up the whole way, because the outside quarter linings require turning in, so as to leave no jagged threads at the raw edge. The allowance from A to B and down back seam is for seaming purposes. The reason we cut ½ in. from top is because this part is to be covered by a top band of at least one inch in depth; besides, it prevents the frayed edge of lining appearing at top. A leather lining requires only $\frac{1}{16}$ in. from A to B, and down back nothing is to be cut off from top; but if the edge of lining is intended to be piped (turned in from B upwards and across top) then barely ¼ in. must be added there. Some utilise the standard for a lining pattern, but it is a mistake. The covering patterns are obtained by cutting the original standard along our pencilled design. That is, separate the vamp and gol quarter from the leg. Then get a piece of paper, double it, and place the half vamp to the folded edge in the same way as it is seen placed against the line A B. Score round with knife, and the vamp is complete—requiring no springing at all. Get gol quarter and add ⅜ in. at front for overlapping seam, and ⅛ in. is allowed at back for closing seam. Although it is not generally done, yet it is absolutely necessary for the good fit of the upper that extra provision be made for stiffening or click. The leg requires two patterns—one for inside and another for outside (the one that the buttons are attached to). It is a very universal practice to

make a laced gol leg do for the button ones, but such only requires a little thought to show that this is utterly wrong, being neither useful nor economical, for there is a superfluity of seam where it is not wanted—which a good fitter will cut away—and there is a deficiency where it is required. The inside leg of a button boot must have a ⅛ in. seam, to be attached to buttoned piece, and on the other hand the outside leg, to fit well and lie evenly on the instep, must have ⅛ in. cut away. This makes a ¼ in. difference between outside and inside leg quarters of all button boots. By keeping this in view, and adding the usual allowances at back for closing seam, and along bottom for overlaying or underlaying, the legs are completed.

The usual allowance for seams is this—light material $\frac{1}{16}$ in., stout ⅛ in., woven fabrics ¼ in., overlaying ⅜ in. If vamps or goloshes are perforated or scolloped more will be necessary. The front of all quarters or legs (at B, Fig. 6) should contain a little extra allowance for contraction in maching. For lasting ¼ in. is sufficient for hand-sewn, and ⅝ in. for all other sorts of work. These figures are correct in general; still, judgment must be used in their application to the different sorts of work, or the substance and elasticity of materials used.

We have now to get the button tab drafted, having completed the covering patterns for your legs. You may then cut off the button-tab as pencilled out on standard or leg-quarter. Place this upon a piece of paper, and draw a line up the front of it. Now place your finger or a drawing pin at the edge of throat, as seen in diagram; then pull back the top of tab until there is a difference of ⅜ in. between the front of button piece and the line already drawn. Now, from where the drawing pin is, mark up front and top, and come down the other side as far as opposite drawing-pin, shift the tab back to its original place, and continue to mark the remainder. The marked figure upon the paper now is the button piece properly drafted, and by adding ½in. at bottom for overlay of vamp, and ⅛ for closing seam up front, it is completed. Some cutters draft by cutting ⅜in. away from either bottom or top of button piece, and tapering it to the throat; but this is likely to spoil shape

of tab, especially if cut away at the bottom. The late Mr. Hanibal held that a button tab should be drafted by cutting a small piece abruptly from the bottom. But this is bound to cause a very decided pucker. The reason we draft this tab at all is because, when it is attached to the inside quarter, it will not clip snugly to the outside one, unless the outer edge of tab is subjected to a little strain, which causes it to retain an inward tendency. We having made the curve more obtuse, it necessitates a twist from the machinist to get it into its place, thereby causing the self-closing action of a well-cut button piece.

In high leg button boots, from ½in. to ⅝in. of draft is requisite if it be done at the top, but the ⅜in. or ¼in. will do if done at the bottom. The lining for button tab is made by having it $\frac{1}{16}$in. larger all round than button piece itself. A narrow strip about one inch deep, and the length and shape of top of quarter for top band, completes all our patterns for button boots.

The designer must always keep three things in view when cutting any style of pattern—first, its utility, second, its beauty, and third, its economy. These considerations I estimate exactly in the order they now appear. Utility must not be sacrificed for beauty, nor beauty for economy. Still, we have seen that a boot can be made beautiful without disturbing its usefulness. Equally so a pattern can be made economical without interfering with its beauty. For instance, the extreme bottom corners of all vamps can be cut off, because this part is lasted away in the making. Few cutters calculate what a great saving in clicking this would make. The gol quarters can have the front angles rounded off at the overlaying seam, for the vamp covers that part ; and the stitching not only has sufficient hold, but the probability of any unsightly projection protruding above the range is thereby prevented. Vamps that are intended to have straight toe-caps can have the part under the cap cut off, which makes the vamp most economical in clicking, and also enables a pointed last to throw off a better shaped toe, as there is not so much bulky stuff at this spot. If the joined parts be

well skived and stayed with a strip of linen cut on the diagonal, no seam will ever cause any inconvenience. Some bespoke masters have a piece of inferior stuff whipped to the vamp in place of the portion cut off. Every clicker knows that it is the peak of the toe and the projecting corners of lining patterns that cause all the waste in cutting. The angles in linings especially can well be dispensed with, thereby enabling the cutter to fit his patterns very snugly together. Again, button tab linings can, and

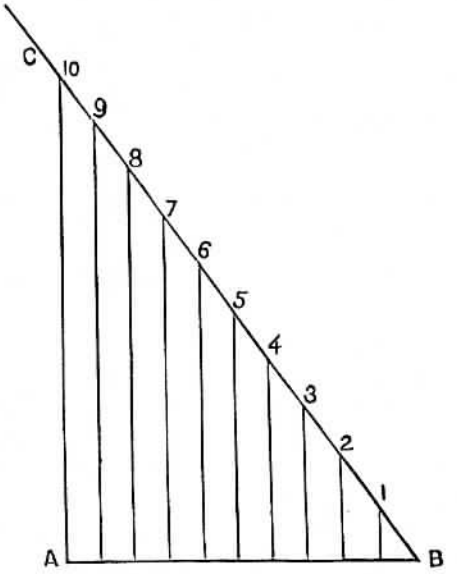

FIG. 9.

should be cut in two parts, provided the seam does not come opposite the button-hole. In the cheaper classes of work the button-piece itself is often cut in two parts as well as facings for high laced boots. The most comfortable and economical counters are those which are joined at each side of the upper, two or three inches from the back of heel, the objectionable seam at back of heel, which usually inflames and cuts the sensitive skin which covers the tendon Achilles, is by this inex-

pensive method entirely obviated, not only is the back of boot inside perfectly smooth, but the wear is materially helped, for the closing seam being strengthened, the leg will seldom break at the back. Shoe linings should be divided in like manner, and not have the seam at the usual and very bad spot in a shoe —the back of heel. The seam of the quarters is there, and that is more than enough. Top bands should be always divided at the back seam. They look equally as well as when whole, and are most economical in clicking.

"It is well known," says Mr. Hill, or Yeoman, "that there is a greater probability of economically fitting a number of *small* patterns into a specified surface, than there is of fitting a smaller number of larger patterns." Yes, in clicking, two halves are better adapted for utilising more material than one whole. So the smaller and more varied we can make the patterns consistent with the equal beauty, the most useful they are bound to prove. These are only little things, you may say. But without attempting a paradoxical figure of speech, I may answer that little things are very often great things. As Young would say—

> "Think naught a trifle, though small it appear,
> Small sands the mountain, moments make the year,
> And trifles life."

One of the best helps in designing the usual patterns at present in the greatest demand is to "take stock," or pay minute attention to every detail in all the popular specimens of work that comes under your view, and fully criticise with untiring examination the points in boots and shoes at present on the market. We read in our school book the instructive story of the dervish and "the lost camel," as told in the *Rambler*, under the head of observation. The moral is this. "Use your eyes," and you cannot fail. A North American Indian on the trail could give us a lesson in this respect. An original designer, metaphorically putting it, is a fountain, whereas you are to be a reservoir. His business is to invent, yours to discover. He is to create ideas, you are to store them. The necessary modifications in the usual designs to keep in mind are briefly

these—after marking the principal points upon your standard as before described, you have to make several little alterations, which you will easily see are necessary for the different styles of boots. For instance, you have first to mark off the height of leg the design is intended to be. If for a side-spring, we must cut ¼ in. off ankle or leg of standard, so as to have it fasten snugly round ankle, and prevent any tendency of its being loose or gaping there. To do this right, ⅛ in. should be taken from front and ⅛ in. from the back. This altogether is ½ in. under full ankle circumference, so we see an elastic boot may be slightly hung back; but a laced in this position would be unwearable.

A very common blunder I see in a vast amount of work is that side-springs are inclined forward, and laced boots backward. This is decidedly wrong. Neither style nor utility is gained by such. The very extreme opposite of this would be better. An elastic design should be a little under the measure at ankle, a lace boot never. A buttoned boot should have the vamp shorter than the corresponding Balmoral, because the button piece, being half an inch wide where the vamp crosses, it does not let the foot in as readily as the lace boot. When I say that a lace boot should be up to the measure at ankle, still, in reality, I make a slight allowance under, which is best seen when we consider that the lace upper covers the outside of leg, and also encloses the tongue, besides being encumbered by a heavy lace. This is the more marked when the material is strong and non-elastic. It is necessary that a little allowance should be made all along the front of a Derby quarter, or it will not meet in lacing. A Lorne shoe should be cut on the same principle. The tabs of a Derby pattern should be situated two-thirds the length of the whole from the back seam. If the quarters of a Blucher boot be too short, and the vamp too long, no matter how wide the vent may be, there will always be the greatest difficulty in getting it on. The tabs of Bluchers, Derbys, and Lorne shoes should be seldom rounded in an obtuse curve at the peak, a very usual practice with some cutters. These parts should be cut rather square, otherwise the

eyelet holes having to be punched too high up, gaping is sure to result, and the vamp falls down and puckers through the looseness on top. Bluchers, though generally cut low in the leg, yet should come up fully one inch over ankle bone. Side lace boots should have the opening slip on the inside cut about as low as one inch from the edge of the sole, and pitched obliquely forward. If not, the boot will be difficult in getting on.

The majority of the usual designs can be changed into different patterns by a few slight alterations. Derbys can be made into Navvys by making the quarters whole back, straight top and tabs elongated into peaks almost coming to the toe, with the addition of a whole water-tight tongue. To cut a full bellows tongue a vertical line should be drawn the length of front of quarter. A horizontal line is drawn at right angles to this. Upon this horizontal line is measured off half the width. The tongue should be at top, which is the heel measure *minus* the ankle. At the other end of the vertical line mark off at right angles ½ in. Now connect this with part marked off on horizontal line. To make the proper curve utilise the front of quarter in joining the points. We have now depicted on paper one side of whole bellows tongue ; now, to complete, double a piece of paper, and place vertical line level with fold, allow for seams or facings, "easy exit," and cut out. The half or small tongue is cut from the whole one, by rounding the upper portion away until made a little larger than an ordinary tongue from the top of instep, being only fastened to the quarter from the throat down. When the tabs are rounded in Derby fashion the bottom of tongue must be made to correspond. But instead of making it double the width of the tabs at this point, as is usually done, it is a great improvement to draft it, which we do in this manner: The bottom of tongue is made about one inch narrower than apparently necessary, and the semi-circular bit usually taken out is left there. A vertical slit is cut in the centre, 1½ in. deep. The machinist in attaching the quarter and tongue to vamp has to pull this slit very open to make it fit on the vamp, which action throws a permanent spring into the tongue,

and causes it to stand up well. No blocking is necessary, and the pattern is rendered very economical in cutting. All water-tight tongues should be closed on top of vamp and not under. Bellows tongues are often used for goloshed and plain lace boots, because the ordinary straight tongue causes much annoyance to the wearer to keep in its place. To obviate this, the straight tongue is sometimes stitched to one side of theb oot at top of facing. A more simple and substantial method is to fasten it to the quarter when putting the second last eyelet on hook in the upper, and clinch altogether. All inside counters should be drafted if a smooth fit is desired. This is done by making them a little shorter than the quarters and deeper at the ends. This will cause a nice space for insertion of stiffener.

In pitching whole back boots forward so as to make them sit in well at back, don't overdo it, for, as the material used in this style of work is generally very heavy and hard, it would be likely to chafe and inflame the leg of the wearer. Blucher boots can be made into "army rejects," by having the backs joined, and outside counters cut to cover all the back seam. This style is made somewhat higher in the leg, and contains seven eyelet-holes, and, if well cut, would be one of the most useful and stylish of boots for the workingman.

To cut shoe patterns, it is sometimes very handy to take them from modified boot patterns. But the surest and best way is to work them from the last. It is related that the greatest multitude of shoemakers ever known to have assembled together was in 1832, when Henley, the Orator Emmons of London, being puzzled for want of an attractive novelty, issued an advertisement expressly addressed to journeymen *shoemakers*, wherein he promised to demonstrate the practicability of any member of the craft making *six* pairs of shoes in a day if he had *sufficient materials*. The house was crowded almost to suffocation. Henley ascended the rostrum and began:— "Gentlemen, although the communication which I am about to make only specifies the practicability of making *six* pairs of shoes in a day, yet, with sufficient stock of materials, the same

person might facilitate sixty, nay, a hundred (thunders of applause). This grand and valuable secret, gentlemen, consists in simply *cutting the legs off of boots.*"

This was the joke of a clown, but "fools often say wise things." Well, to cut a shoe, I will ask you to get out a boot pattern from a shoe last by the Eclectic system, and afterwards cut away the leg. Of course you can get the form and make it into a standard shoe pattern without putting the leg to it, but when you have the boot pattern, you see most clearly what you are doing. As it is easier to pull down than to build up, it is likewise more practical to cut away than to add on, in pattern-cutting especially. And as the fit in a shoe is of more importance than in any other style of foot gear, we must use every facility that would help to lessen the chance of spoilage.

Get out your boot standard pattern from the shoe last (no other is permissible), for provided you cut your pattern as I say it should be, and the fitter and laster, to use a sporting phraseology, "give it a fair hunt," then the whole fitting propensities depend upon the last. A mark is now made at top of instep about 1 in. below throat, and another is made on the back-seam. The height of a seven shoe at back ought to be 3⅜ in.; but as a general rule is always preferable, make this point the same height as the full joint measure of standard, that is, half the real measure of vamp. These two points are connected by an elliptical curve to form a good outline for top of quarter. By cutting at this curve, the leg portion is separated, and leaves us our shoe standard. But it has to be drafted in this manner:—Cut ⅛ in. from top of instep, and gradually taper it to nothing at joint. Make good this deficiency at the waist. Also cut another ⅛ in. away at top of back-seam, and graduated to nothing as you come half way to bottom. This draft absolutely eradicates any tendency to gape, for any elasticity in the material of the quarters is brought to a tension in lasting that will make the shoe clip round the ankles like a fiddle-string. Don't overdo it in your anxiety to make upper as tight as a drum-head, or you may cause much inconvenience to the laster and the

wearer. If the top of back is hooked too much, a dangerous space is left between the back of upper and seat of last, and if too much alteration is made at instep, the sit of pattern is entirely changed; the toe will be raised out of its proper position, being unduly sprung, and the fit be spoiled. Elastic shoes may be a little more drafted than laced ones, but this is modified by the truth that this style of shoe should never come up as high over the instep as a button or laced shoe. The fault in shoes at the present time is that they are too high in the quarters at side. All shoes should pass under the ankle bones. I like a shoe fairly high at the back, but they are unsightly to the eye and painful to the wearer if made so at the sides. Theoretically speaking, all shoes should have inside and outside quarters, so as to fit the ankles properly. Laced shoes have the top of the quarters neatly rounded. The elastic design requires the top to be straight. By following the instruction for marking the points of design and the usual allowance for seams as before given, the shoe standard pattern can be easily converted into the coverings for any required design. Some cutters draft the tabs of button shoes by making the seam-side slightly convex. And when Bluchers are to have joined vamps, the tongue is drafted in lieu of blocking by making the seam part of tongue, and vamp a little hollowed out. The two concave parts being drawn together in closing cause the tongue to stick upright. Men's button-pieces are cut plain, ladies' are usually scolloped. Although the tabs are very often scolloped with only one size gouge, yet in all good work the scollops, to be harmonious, should be graduated from the bottom to the top. To do this proportionally is rather difficult without a special geometrical construction. Get the diameter of the average or middle scollop in your compasses and run up the outer edge of your button-piece with compass to see how many scollops it would contain, say nine. Draw a straight line and place the diameter of average scollop in the centre of this line and at right angles. Now mark off any four equal distances along this line each side of diameter of scollop; this will make nine points on the line. At these nine points erect perpendiculars, then by

drawing a straight oblique line at a moderate inclination, and catching the top of the average diameter we get the properly graduated width of all the scollops. The more the oblique line is inclined, he more pronounced the graduation will be. If this line was not inclined at all, but made parallel to the bottom one, the scollops would be all of a common diameter—equal to each other. The oblique line acts in the manner of a see-saw, the diameter at centre scollop being the pivot. When this line is inclined down at one side it rises at the other. Therefore, whatever is taken from the width of scollop at one end is added to that of the scollop at the other end. If you wish to fix the graduation well, place the diameter of smallest scollop at one end of line, and draw the inclined link passing the top of the centre and smallest width of scollop. All the holes or scollops of a button shoe should be directed towards the back-seam as much as possible, so as to cause the pull or tightness to be round the quarter and not over the instep.

A very useful question appeared in the City and Guilds of London Institute Examination Paper of 1888 No. 6 in the Honours grade—"How would you cut a whole golosh pattern?" Some candidates thought this a very simple operation; others a very difficult one. This is usually done in three ways. One method was to manipulate the whole golosh in the same manner as we did with joined gol vamp in Fig. 6. The next is to slightly spring the whole range or gol wings. And the last is to spring the pattern to such an extent as to cause the inside edges of gol quarters or wings to touch each other at the back. The first method is supposed to be the best for a fit, being the natural shape. The vamp got out in this way in seen in Fig. 7, the dotted lines showing the position of gol wings, and the disparity that would exist between them. But it requires very little experience in clicking to find out that this is an extremely wasteful pattern. It is usual with many cutters to cure this by springing the vamp, so that the quarters would meet at D, which certainly makes the shape very compact. The piece of waste which falls out in the centre is utilised for a boy's tongue. But unduly springing the vamp is a very dangerous practice to

resort to. The best thing to do is to choose "the happy mean" which goes between these two extremes as follows—Get your standard (Fig. 6) and separate the whole golosh from the leg. Get a large piece of paper, double it in two, and place the gol against the folded edge in the same manner as vamp is placed against the line A B in Fig 6; now mark round front of pattern as far as swell of joint, then place a drawing pin or your finger at B, while you tilt up the back of gol quarter until the inside edge of range is perfectly *parallel* with the folded edge of paper or line A B produced, then mark round the remainder of the wings. This will produce a most economical pattern as seen in Fig. 7. The wings are fully parallel with the centre line B D, and the space between them—according to the way we have marked off the width of wings or depth of gol on our standard—is equal or a shade larger than either wing. This allows the wing of one vamp to fit exactly between wings of another (the only method of clicking economical with a whole gol pattern). Each wing is about ⅓ each, and the space between them about ⅓ also. Some patterns have to be tilted more than others to bring the range straight. This depends upon the position of toe of standard (correctly speaking, spring of last). In Fig. 6 you will notice that the gol will require no tilting at all, for the range is parallel with the centre line A B already. The moderate spring in a whole gol makes it not only economical, but also adds to its utility in fit; a sort of draft is caused around the range in machining that makes the gol fit tightly and comfortably under the ankles. Slippers should be always well sprung; it is usual to see fancy worked slippers with the wings apart very much the same as seen by dotted outline in Fig. 7, but nothing can cure the ill effect of a slipper cut in this manner.

A great variety of curvilinear forms can be produced by arcs of different circles tangentially connected. They may be constructed so as to satisfy various conditions, or to approximate the form of any curvilinear figure whatever, which is increased accordingly as we use a greater number of centres, and diminish the extents of the several arcs. A skilful geometrician would astonish the inex-

perienced student by the unlimited number of perfect figures he could produce with a pair of compasses alone. Standards, covering patterns, sole shapes, top-pieces, toe-caps, have all been produced by the compasses, or by the compasses and ruler. Though the constructions are most interesting, yet they have not been simplified enough to render them popular and practical. However, it will, I am sure, be instructive to the studious reader for me to explain two simple and useful methods of this application to top-piece and toe-cap patterns. Although in theory no portion of an ellipse is any part of a circle, yet for practical purposes we will see how an elliptical curve for heel or top-piece can be produced with compass, when I explain anon the designing of sole shapes. Mark any vamp upon a sheet of

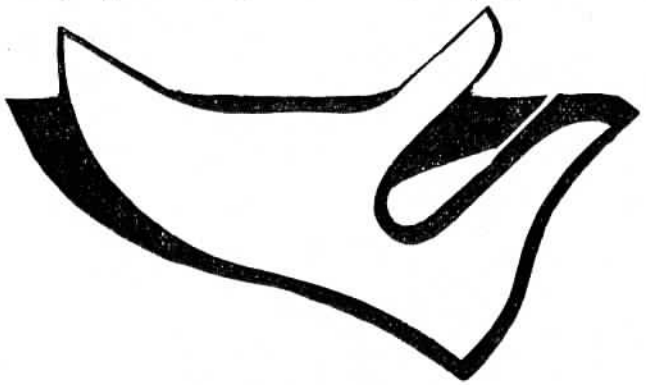

FIG. 10.

paper and draw the line B D, Fig. 7, passing through its centre. Upon this line make the height you want your toe-cap to be—point A (a proper height of toe-cap is two-thirds the depth of vamp B K), add ¼ of B A to top of toe-cap, this gives us point K, through this draw the line C F, crossing B D at right angles. Now, with A as centre, and radius ¾ of height of toe-cap B A, describe the middle circle cutting the horizontal cross line at the points F and C, with these points as centres, using the same radius, describe the outer circles, and the parts of the circles not dotted, as seen in diagram, forms the peak of

our toe-cap. By changing the position of the points, and altering the extent of the radii of the circles, any shape may be produced. But this construction forms a good outline of cap. The straight or oval-shape cap is fixed to our liking by producing D B downwards, and taking a point for centre below the toe of vamp, according to the curve we want, using a radius reaching to a point half way up height of vamp.

There is a very simple and self-evident truth in mathematical science that is capable of the most general and useful application, *i.e.*, the whole is not only larger than its part, but the part must have a certain relation to the whole. All the parts of a design have a certain proportion to the length of standard or to themselves. The problem is to find them out and fix them correctly by rule or scale. I have utilised this axiom in settling upon the height of vamp; this showed us that the height of vamp was in proportion to length of standard as 1 to 3, and by fixing the width of wing or depth of golosh, you learned that when the proportion of the part to whole is too complex to specify in many fractions, it can be simplified by finding the proportion of one part with another. All the parts of the numerous designs can be scientifically fixed in this way, and not only that, but all the measurements of the foot, and the principal points in the outline of the standard, can be also valuably arranged in like manner. I said before, it was one of the most important studies for sculptors and painters to fix the proportion which the limbs, &c., of the human figure had to the height or to each other. Why not make it our business to decide upon the proportions of "the foot and its covering?" Grading has become mechanical; and leaving mock modesty aside, I think I can claim to have rendered standard construction almost automatic, so it only remains for us to bring designing under rule to make the three divisions of pattern-cutting completely scientific. It is not for me to give in numerous figures the proportions I consider would constitute the most useful and beautiful designs, for design is governed to a great extent by individual taste. If all were unanimous in their ideas we could fix the points by geometrical proportion; but I won't

ask to impress in detail my views too much. I will give a general rule on a geometrical construction which you can make subservient to your liking. It matters little to me now whether you will have a backward inclination to your standard or not, employ a hygienic sole shape, or a fashionable one, coincide with my ideas or design, or stick to your own. I will fulfil my duty by giving a general construction and explaining how it may be altered to suit individual taste.

The *American Reporter* some time ago gave the following as a test for correct proportions :—

"Divide the length measure into twelve equal parts. Then all the parts should be very near the following proportions to produce a good appearing boot, or one which will be a good fitting one :—

	Parts.
Length	12
Height	12
Ball	2
Instep	4
Heel	6
Ankle	4
Leg	5
Length of vamp	4
Length of quarter on bottom	4
Location of ball measure from toe ...	3
Location of instep	6

"The front line of leg should be exactly perpendicular, starting at the point indicated by seven parts from the toe.

"These proportions give true measures for a medium boot calculated to fit the greatest number of feet in this or the Eastern market. They are intended only to present a perspective delineation of a good fitting boot when made, and as a measure for either a pattern or a foot, as a good fitting boot will look when truly photographed or drawn."

Applying the law of proportion in this way is most advantageous. If by artistic power and great exertion you produce an ideal standard, perfect in outline and faultless in design,

by this rule you can fix all the essential points, thereby enabling you to realise the same perfection at any time with very little effort. To apply this geometrically, say you have a pattern, a model of beauty and utility, and you are afraid you could not make the same again, or tell others how it is done. If by chance you accomplish this valuable production, and by fortune you are likely to lose it, well, secure yourself against loss by this insurance : Draw a line A B (Fig. 9), the length of standard from heel to toe, and divide it into ten equal parts (twenty would be better, for the more divisions made, the more accurate will be the proportion) ; now take the width of all or any of the principal parts in design of the standard in your compasses, and lay them along the line from B to A, and whatever they register write it down upon a slip, that is, make a scale of proportions in twenty or more parts, as done above with twelve. Fig. 8 only shows ten, you can imagine each division subdivided again into two parts to make twenty. Suppose you want to fix the height of vamp, well take the height you have on your ideal standard, and lay it along from B to A. Say it comes between division three and four; if so, mark down height of vamp 7-20. Suppose the ankle of standard came to division four when placed along B A, then register the ankle as 4-10 of whole or greatest length of standard.

Suppose you have the individual measurement and not the proportion of any particular part in a certain size, and you want to find out what this part should measure in some other size, you will have to use a little trigonometry to get it. As an example, you know the measure of a man's 11's vamp to be right at 4¾ in. for height. But you want to know what will be the exact measure for an 8's vamp. Draw the line A B the length of your 8's standard, at any angle to this make the line B C, upon this mark off the length of the 11's standard, which comes to point 10, join A 10, now measure off the height of your 11's vamp from B towards C, and suppose it comes to point 4. From 4 draw the vertical line parallel to A 10, and where this vertical line meets A B is the correct height from B for the 8's vamp. This is one of the most valuable construc-

tions in plane geometry, for by its aid we can get one data from another. If you know that the pitch of 8's standard is 7¾ in. from toe, by this rule you can get the measure for any other size pattern from the toe to the throat. If the difference between the location of inside and outside joint on a 7's sole shape is ¾ in., by the above you can easily find the disparity for any other size. If we know the location and measure of instep joint, width of heel, &c., for any size pattern, we are enabled by trigonometry or the science of triangles to obtain the same for any other size.

Although the field for designing is not completely tilled, still there does not exist the same scope for inventive genius that lay uncultivated some years ago, when the different styles of patterns were very limited. During this last few years back, the standard has been pencilled and manipulated into so many new or modified designs, that the modern drummer would have to carry not less than a thousand or more samples to display the designs his firm can manufacture. Now and then a legitimate novel pattern is put on the market. This has been followed by so many imitations slightly modified as to render the supply of designs almost innumerable. This has been the outcome of some very novel and useful innovations. We have "Jack" or hunting boots, apparently all in one piece, but in reality having *one* seam coming down the front of the leg, across the throat, terminating at the inside waist, closed with a flat seam, and completely hidden by ingenious enamelling. Goloshes have been made without any seam at all; shoes with one only. But I have "a real technical shoe pattern" in my possession that is cut from one piece of leather, and can be made without any closing or stitching whatever. The vamp, quarters, quarter linings, tongue, tabs, and side linings being all in one piece. Mr. Bradfield, foreman pattern-cutter, Heather Bros. & Co., has shown me a prize shoe—Oxford cut, without any seam whatever, blocked from a solid piece of kip shoulder or calf skin. A useful pattern which I have designed appeared in *The Shoe and Leather Record*, illustrated with diagrams, Nov. 26, 1887. It was a Derby bellows boot

cut in one piece, *i.e.*, it had no side-seams in it; the vamp and quarter were all in one; the necessary seam was at the back, which could be covered with an unsuspicious-looking and ornamental backstrap. It was made from what would be a casting pattern of a whole-blocked military, split down the centre as far as height of vamp and cross-ways ⊥ shape to admit an outside facing wide at top so as to form curve at ankle. Button boots may be cut gol and tab together, the button piece coming up the front like an outside tongue, is scolloped on both sides and fastened to buttons on both leg quarters of upper. This tab so cut is often used as an inside tongue for lace boots if the leg-quarters are fitted outside. It is usual to see some uppers cut with gol and backstrap in one, especially Albert bals (gol Derbys). Alberts are made without blocking by the insertion of a small corner piece at one side of front, from throat to top of ankle. A pieced Balmoral can be cut upon the same principle, if not required high in the leg, which leaves the upper all in one piece, except a small square piece on the inside front corner of leg. If a whole back of a lace boot is put on a sheet of paper and marked round, while the vamp is held to the prick marks at one end, you will have the pattern for a laced upper with only one seam on the inside. An advantage is gained in seam to toe cloth work, if the toe be curved downwards. Many of us laughed at the idea of making long work to fit closely round the ankle, yet this is accomplished in an Italian boot by a spring, and by a bellowsed opening in the "Field boot." The invisible spring boot is an ordinary elastic-side pattern, but in place of the usual web are five or so narrow bands of elastic ¼ in. apart. A stiffish piece of leather, the exact shape of gore, is fitted outside, and another of the same shape inside. These are fastened in position by stitching them together, the rows of machine-sewing running through the ¼ in. space between the elastic bands. This completely hides and preserves the springs, and at the same allows full freedom of action for their expansion. "The hidden spring shoe" an elastic shoe with only one seam at the back, the gore being simply a 2½in. slit on front of instep, like an Oxford

lace shoe. When it is fitted it must not be machined at where the edges of the shoe meet, but about a ½in. from edge, to allow a stretch of fully one inch when admitting the foot. A handy set of low elastic shoes can be procured from a set of whole gol vamps by a peculiar little pattern called "the fox's hide." This small pattern is made thus:—Get an 8's whole gol vamp, mark its outline upon a sheet of paper, cut all round its outside edge, but leave the space between the wings alone. Double this in two and pencil the curve from instep to back for the top of shoe quarters; then pencil out the form of gusset at the usual place. Cut out this pencilled portion and open it out and you have the figure of the fox's hide. To utilise this, say you want an 11's low elastic shoe without any side seams: get your 11's whole gol vamp pattern, and while cutting out a pair of vamps don't touch or cut out the space between the wings; fold these vamps in two, then open out again, place the fox's head level with centre crease, but slightly forward for large sizes; cut round it and you will have the covering for the shoe required. By having this little pattern, or two sizes of them, you would not require a set of elastic shoe patterns. The coverings of the usual gol elastic boot contain nine pieces of leather. These are reduced to three in the chaste design, having the gol in one piece—the front legs, and backs the same. The fronts, of course, require to be blocked. This may be changed again by letting the gol vamp run only as far as breast of heel, and making the remainder of gol quarter and leg back in one piece, shaped like a "Garibaldi" or Albert quarter. The space between the wings of the whole gol has been utilised in ways without being *separated* from the vamp. It has done duty as a variegated front strap, a tongue, facings, a button-piece, and it has been manipulated—for spring designs—even into a double leg front itself. That is, a pattern has been designed with the whole gol and the front legs (with the exception of a small triangular insertion) all in one piece. The vamp of the once very popular boot called the Garibaldi, can have the centre piece, instead of being cut out, continued from the vamp as an ornamental front strap or a mock-lace-

piece. This Garibaldi usually has the vamp and quarter joined at the breast of the heel; but often, for the sake of variety, no joining is made, which makes the pattern somewhat like an Albert castor. The best design in a mock-button gol elastic is manipulated from a Chelsea castor. A gol is marked round the trenching pattern as far as bottom of gusset, and from that run up the back of gore as an ordinary military quarter. The rounding pattern is now placed upon one side of castor, a button-bit is placed tangent with instep of rounder, and all marked round upon the castor. By cutting out the part not marked, a design is obtained, having the inside of upper plain, like a whole military with a mock gol made in front. Then, by the addition of a front to go under button-bit it is made into a mock-buttoned Edinburgh. An Albert can be made cut all in one piece, the seam coming upon the inside of boot, *i.e.*, there is no back seam, the quarters are in one. Gol quarters are sometimes made to have no joining at the back; the back-strap and gol quarters being all in one. Lorne and Oxford shoes have been made with no back seam, the quarters being whole. A most useful design, a luxury for old folk with tender feet, is the ordinary seam-to-toe bal; but a splendid improvement upon this is obtained by cutting a wide whole gol vamp or narrow military castor down the centre for opening of lace-way, and adding a curved facing to this to complete any deficiency as regards shape. This makes a wonderfully plain and easy covering for a tender foot. It is easy got on or off. There are no seams. A comfortable spring boot for the same purposes can be very easily made on this principle, or on the whole gari design. But very old people prefer, as a rule, a lace boot. In Albert Balmoral Derbys—where the tabs are outside, the space between the gol vamp can be admirably utilised as a tongue for boys' work without separating it from the vamp. A design has been registered which constitutes a gol spring boot with vamp and elastic web alone. A very good little boot known as the boys' mock goloshed Balmoral—a design with no inside counters or linings, but having gol-in quarters. This boot is sometimes lined all

through, and golosh quarters imitated by the sewing machine when such is the case. In this boot the quarters are reversed —that is, the grain side is turned out and blackened by first scouring it with soda dissolved in hot water, and then dyeing it with iron liquor, and finished with a coat of glue size.

In 1882, *The Boot and Shoe Trades' Journal* instituted a pattern-cutting competition, with a view to develop the inventive powers of those engaged in our trade, which was successful in the highest degree. The interest it created in technological circles was all an enthusiast might wish for, and the valuable productions it brought forth were everything a wide-awake manufacturer could ask. Some of the best specimens of the age were thus placed gratuitously before the trade. One prize pattern was a sort of gol Derby, without any watertight tongue or lace to press on the instep. A mock-laced tab, with four eyelet holes, covered the top of vamp, and was continued under the real leg quarters in the form of an ordinary tongue. The boot is laced on the outside by the aid of hooks. Another pattern was a Derby in a single piece, having a mock gol, but required to be blocked from a large and peculiar trenching pattern. A lace boot was shown with button imitation bit, and elaborately ornamented with many fantastic additions and perforations. A design appeared for a boot intended to be worn with a Scotch dress. It was a kind of gol-buckle boot. One part was like a whole gol vamp, and having a front attached like the front leg of an ordinary Edinburgh, and coming from the back (in place of the gol bal quarter) was a low-cut leg, to which was attached a button or stud bit, which was to buckle over the front leg at the throat. A prize design of very novel construction was the pattern of a lady's boot having a whole gol vamp, with a loop flap and back strap in a single piece. The fly piece was supposed to lap over an ordinary leg quarter. But the principal point was in the mode of fastening it. It had an ornamental facing, on which was fitted a row of hooks, and the flap, or what we might call a button bit, had a corresponding number of eyelet holes. A lace is run half-way through bottom eyelet hole, and

other holes are run up by inserting one end of lace in, while the other end is put out through the same hole. This causes a series of loops on inside and outside of fly. When the boot is to be fastened, the bottom loop is pulled out slack and cast over the bottom hook. This is continued with the rest up along—the raising of one loop tightening the other. Then a final pull at the top secures the whole arrangement, when a bow is tied. A lady's gol button boot also came to view, the praiseworthy feature of which was, the greater portion of the inside and outside leg quarters and button piece were united in one piece. The peculiarity of a lady's gol lace boot, called "The Stuart," was that the legs (of drab cloth) were scalloped with a large gouge at the bottom, and attached outside of a whole gol (patent calf). The scallops along the range were to be left loose, and the holes round them worked with silk. The notable point in another design, which we would call a lady's elastic side, was the arrangement at the gusset. Instead of an elastic web being used, a piece the shape of the gore was supposed to slide up and down in slots at the edges of the front and quarter, and when the boot would be on the foot, the "gusset slide" was drawn up and fastened by looping over a button at the top. A very commendable effort was a water-tight or dust-proof boot, with bellows tongue and covering produced from one solid piece of leather, worked easily into position by blocking. The block, instead of being the shape of the standard, was the shape of upper when the tongue would be expanded to its fullest extension (sufficient width being left in castor for same). When blocked, a curve the shape of top of tongue was cut from top of front downwards and inwards to a little below throat. This separated the top of tongue from quarter, so as to admit the foot. To make the edges for lacing, a neat facing was stabbed to each side at the back edge, and the front edges being free, were allowed to meet. The portion of the inner front between them falling into a fold, placed the bellows tongue in position.

We have had boots with all sorts of fastenings and variations of design—the mock lace, the button, and elastic, the laced buttoned and laced elastic interchanged. We have had insoleless boots, the stitch-down Blucher, the "Fedora" (having the vamp button-piece and inside quarter of one piece); we have been favoured with the "Wolseley" (a sort of high watertight Blucher, fastened with looped lace and buckle strap); the "Desideratum," a useful modification of a Derby, with shield to protect tongue; and the "Impregnable," as an improvement, having a flap secured by button-studs. A long boot has been manipulated without any seam whatsoever, from the part of the epidermis or hide which covers the leg of an American horse. We have had Derby and brogue vamps fitted to elastic patterns. The characteristic portion of one design has been intermingled with some part of another pattern, in as much as to realise a new conception. The mixture of one pattern with another has been used with the greatest freedom, in order to create a new design supposed to be novel. Boots and shoes have been fastened with laces, buttons, hooks, studs, solitaires, loops, numerous metallic catches, wire springs, elastic rubber, and God only knows what has been, or yet to come. Some specimens of real technical patterns in the way of novel boot designs were displayed by "The Co-operative Boot and Shoe Society" at the "Gem of the Jubilee" (The Manchester Exhibition). Some startling monstrosities in the way of foot-gear, of wonderful design and skilful execution, dazzled and astonished the admirers of prize work, when the "dons" and "crans" had their day. Jockey boots were made to weigh only a couple of ounces; sixty stitches to the inch were used if not more in welted work. We had shell heels, flat seams made on blotting paper invisible closing, &c. But to expect me to give a detailed and clear account of all these wonderful productions would be rather a little too hard altogether upon your humble servant. I have tried to suggest as many modifications as I possibly could, and explain to the best of my ability the novel points in existing ones; to do more would necessitate a great, if not a tedious amount of detailed explanation, accompanied with a greater number of diagrams

than I could afford to place before you. By reading of designs which are or have been in existence, we are greatly assisted in the formation of new ones—like the habit many celebrated writers have had of retaining the ideas of standard authors in order to create splendid ones of their own. Get any of the usual designs, examine it earnestly, and it will surprise you what a vast amount of changes or modifications you can make of it, and thereby enhance its value in the way of utility, beauty, novelty or economy. To obtain the trenching patterns for blocked work is far from difficult, yet some have looked upon this operation in a very different light, because they

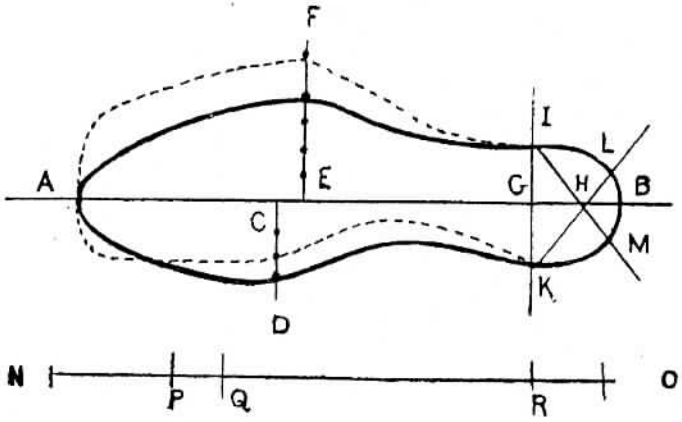

FIG. 11.

lack the necessary experience or the technical knowledge. To many who have looked upon this as a mystery, the elucidation will appear very simple indeed; yet in actual work, if judgment is not used, or a wrong deviation made from the correct principle, there is no saying what trouble will ensue in the after work. The principle is this—when the first pattern *must* be a flat surface, which is to be manipulated into a concave or convex one, the caster must be prepared by averaging the curves of the rounder. Suppose we want the trenching pattern for a whole military, get a large sheet of paper and double it in two; then place the rounding pattern upon it so that the curve

from the leg to the toe will be evenly balanced upon the edge of the folded sheet. The exact angle cannot be described on paper, but the diagram Fig. 10 will give the best idea possible. The white outline represents the rounding pattern, and the black part the caster as cut from the doubled sheet of paper. The whole secret lies in having the front curve properly balanced, and then slitting at the right spot for gore opening. This spot is adequately represented in diagram. The extra opening at the bottom of slit is to facilitate the blocking- Care must be taken to make ample allowance for the irregularities which are inevitable in all blocking. If the opening for the gore be too small, the blocking will be very difficult, and if too large, there will be too much disparity between the back and front of graft at ankle, although the height of a blocked front is limited ; yet the wider the caster is at the corners of the heel, and the longer it is in length, the higher in the leg it will be.

Some careful pattern-cutters in working out a caster, get a joined rounding front, and place about 2½ in. of front seam of rounder at toe, level with folded edge of paper, and then marking 3 in. round bottom ; the rounder is then pulled down a little until another 2½ in. of front seam is level with fold of paper, while the marking is continued along the bottom another 3 in., and so on alternately rolling the front seam of rounder from the toe to top of ankle, and marking portions round bottom until the pattern is completed. Many people imagine that if the folded edge of a caster is equal in length to the front seam of rounder, that the caster is correct. This is not the case, as they would very soon find out in practice. It must be kept in the mind's eye that in blocking two things happen—first, the concaved portion is contracted or compressed, while the outer or convex part is stretched and extended. If blocking meant stretching alone, then it might be all right. But in this process a double action of both compression and extension happens in the material. Therefore, I would recommend that the castor be cut a little large. A pair of fronts cut by this should be blocked, then any superfluous material that would show itself when applied to the rounding pattern can be correspondingly

taken from the caster pattern. The reason I give this caution is because I have found in actual work that you cannot depend exactly upon the result of blocking. Light calf blocks differently from strong kip, or split ; even fronts of the same material I have had blocked both by hand and machine; still the action of compression and expansion was different in each. Therefore, the whole art is to balance the curve of any rounder upon the folded edge of castor, and make allowance for crimping or compression of different materials, tack-holes, and slight irregularities.

The easiest and best way to work out the trencher for a full common Wellington, is to get the rounding pattern (see Fig. 17) and place it on a folded sheet of paper so as to average the curve from toe to instep by the edge of paper ; mark round from toe to extreme bottom corner, and 2 in. up side-seam, allow plenty of overplus for crimping, &c. (which is carefully trimmed off after a trial blocking) ; now place your finger or an awl at the very bottom corner (not at the throat, as it is often done), of cutting over pattern. Then swing the leg backwards until a point at ankle just 2 in. above throat is brought down to fold of paper, while in this position place awl at this point 2 in. above pitch, and swing the leg completely down until level with folded edge of paper, then make the usual allowance, and score out.

To design button-stuff patterns, we must begin with the foundation of them all, the insole pattern, the utility of this pattern is principally the position of the tripod bearings (heel and joints), and the measurements of the lines that would connect them. These three principal points in the sole shape have been fixed by constructing a triangle having its sides in a settled proportion. But the best construction I could make out myself is that shown by Figure 11, which is based upon three or four recognised rules, the first of which is, the width of tread is one-third the length of *foot*, medium-fitting, or one-third of length of *last* for extra full fitting. The second rule tells us that the centre between joints is located—one-third the length of foot from end of big toe. The next rule gives us the width of heel as three-fourths

of the tread. And lastly, we find the outside joint is situated about three-fourths inch behind the inside one, for men's sole shapes.

Draw line N O (Fig. 11) the exact length of *last;* make a point R three sizes from O, which makes N R, the length of the *foot.* From N mark point Q, width of tread (one-third of N R); also set off point P width of heel (three-fourths of N Q). Thus we have the principal measurements for our insole shape set out, which we can transfer when required to the construction which we are going to work out, all our measurements coming from one data—the length of last.

Draw any straight line A B, and crossing at right angles draw K I; transfer the width of heel N P to K I, placing half each side of G. We are now going to mechanically make the shape of heel, which should be always elliptical. From G set off point H almost the length of half the width of heel, G I. From I and K draw the lines cutting each other at H. With K as centre, and radius K I, describe the arc I L. With I as centre, and radius I K, describe the corresponding arc, K M. Connect these arcs together by another, using H as centre, and H L as radius. This gives us geometrically the shape of seat. From the back of the heel set off N O (the length of last) along the line B A. From A measure to C, a distance equal to ⅓ of A B, and ½ in. From C draw the perpendicular C D. This perpendicular gives us the situation of the inside joint; ¾ in. behind E erect E F, which gives us the location of the outside joint. Now, to these vertical lines E F and C D we have to transfer the width of tread, N Q, in certain proportions each side of the line A B. It is upon addition of this proportion depends the characteristic shape of our insole. If you want to realise Dr. Camper's theory, apply equal divisions of tread to E F and C D. Should you want to obtain Professor Meyer's extreme hygienic sole shape, well, divide the width of tread into seven parts; give two of them to the inside joint C D, and the other five to the outside joint E F. But the best proportion to bring forth a modified and popular shape, as used by the best firms in the trade, who aim to supply a boot in accordance with the natural

requirements of the foot, yet so pleasing to the taste as to render the wearer neither eccentric nor conspicuously odd. Divide the tread into seven parts, add three parts at C D and four at E F. Then connect all the points found, either free-hand or with French curves, or by the aid of any other sole pattern. The shape of the toe and waist is governed by taste. But the hygienic or twisted shape is left very wide, and square at the toes. The point H, to correspond with the forepart in Professor Meyer's shape, should be placed a little one side of centre line towards K. Different shapes of seat can be made by changing the point H more towards C or B. The French or symmetrical sole shape is obtained by situating the points E and C exactly opposite each other in a straight line, and adding *equal* divisions of the tread and width of heel each side of the line A B. To take an insole pattern from a last:—Fasten a sheet of notepaper to the sole of the last with drawing-pins or gutta-percha, turn the last upright and clip round with a pair of scissors, while you utilise your fingers by pressing the paper well to the edge of the last while cutting. Having the paper roughly made out, trim round with your knife. Of course, the sole of the last is the main guide for getting the insole right at forepart and heel, But the waist depends mostly upon the taste of the cutter. From the insole we are now to get the outsoles, and from the outsoles the middlesoles. Place the new insole upon a sheet of stiff paper, mark round with pencil and add ¼ in. at toe and heel; graduate this to 1-8 in. at forepart—that is, each side of the joints—and allow 1-16 in. at the waist. Extra substance of upper and wide feather will require rather more addition. The middlesole is made from the outsole by cutting off the waist and heel, the division being at about ½ in. below the inside and outside ball. If the middle sole pattern be correctly cut with an S curve below the joints—it will answer for repairing half-soles. Stiffening patterns should be cut from the gols or counters of the coverings. It is wrong to have these high and short, as it is to have the counters either. They should be rather low, fairly long, and slightly pitched inwards by drafting, or

cutting 3-16in. off edge of bottom corners, and tapering to nothing at centre. Lift pattern can be easily taken from seat of sole shape, the middle ones being a graduation between top-piece and first seat lift patterns. Welts, shank-pieces, runners, and split-lifts require no special patterns, as they can be marked out by rough-stuff cutters with a straightedge. A skeleton middle pattern is often cut for cheap work somewhat like a whole gol pattern in shape. In cutting, one is locked into the other on what is known as the horse-shoe system; when attaching to insole in making, the laster pulls the sides out and into position as he proceeds to revit it in its place. Two middles can be obtained by this pattern, where only one could be got before.

In laced, buttoned, or elastic designs, the boot is most stylish, and appears to best advantage when it is higher in the front of leg than at the back. All kinds of strong laced boots should be full up to measure, and sometimes over at the ankle, and especially at the heel. All tongues should appear half an inch above top of quarters. Leather linings are best as regards economy when two patterns are used—one whole and the other cut in halves. Button boot standards require to be one-sixteenth larger in fitting than a laced one. If required to fit as well, take care not to make the button tab too narrow at bottom, or the lower buttons will come too much to the front to look well when all the rest are so distinctly at the side. Again, the buttons coming upon a tender part of the instep their shanks are likely to cause inconvenience, if not pain, to the wearer. It is a frequent complaint from retailers that the button-holes in their common class of work are always bursted after a day or so in wear. This is because button-bit is of cheap material and not beaded. A most reliable remedy in such a case is as follows :—After the fitter has pasted the button-bit and lining together and cut or punched out the holes, the button-holes only should be stitched round. Then thread a common bodkin with a yard of six-fold flax (not waxed). This is now passed between button-bit and lining, and doubled round each button-hole. When the flax has been passed round every

hole, the ends are cut off, leaving a little projecting to be caught in the front seam. The button-bit and lining can now be machined round the outer edge. A button-bit stayed in this manner absolutely prevents any tendency to break out at the holes.

In cutting elastic designs make the spring as small as possible, while sufficient freedom of action is left in it to allow the foot to enter and exit easily. To help the realisation of this object we must consider one or two things—Firstly, in what position will the elastic have best play as regards expansion ; and, secondly, how are we to guage the width of gore so as to give sufficient spring and no more. To answer the first question, we must remember that expansion of the web must coincide with the expansion of the boot. Therefore, bring the front edge of gusset obliquely forward towards bottom, and have the front of leg sufficiently higher than the back as to cause the top of web when in position to be parallel with the direction of expansion of boot. The back edge of gore should not be drawn too slanting, for the bottom of gusset would become too narrow, or on the top too wide. There is as much elasticity required at the middle of gusset as there is at the top. To calculate how wide the spring should be, compute the difference between the ankle and heel measure ; also estimate the elasticity of the web used. We see that the heel has to be passed through the ankle ; therefore the stretch of the elastic must equal the difference between the ankle and heel. Suppose you have a standard 4in. at ankle and 6in. at heel, and the elastic web you intend to use expands to double its original length when pulled out—that is a piece of the web 6in. long will stretch to 12in. The ankle must expand 2in., or the heel won't pass through it. Therefore, make the width of gore 2in., for as the web will double its length when stretched, a 2in. width of gore will give the necessary 2in. expansion ; so we see the width of gore depends upon the stretch and position of the elastic. As a general rule, the width of gore is quarter of the whole ankle circumference. If the front line of gusset is not brought obliquely forward at the bottom, and the leg made higher in the

front than the back, the expansion of the elastic web will not coincide with that of the boot, consequently only about two-thirds of the function of the spring is brought into proper action. Laced, buttoned, or elastic designs demand our best consideration, for these boots are at present so popular with the public that no pains should be spared to perfect them as much as possible in order to bring credit to our trade.

The following concise hints will, doubtlessly, assist the novice in the prevention of many common blunders which usually arise from want of experience :—

A very ticklish point to determine in the standard is the correct length; so whether you follow the Eclectic system, or the usual method, don't bother yourself with all the variations that some cutters have to encumber their minds with regarding modifications for different sizes, fittings, or substance of material. Simply place your measure-tape on last from centre of back of heel, and bring it over the toe. Allow the usual amount for lasting-over purposes, and the registered results will be most correct. A standard for a full-fitting last will require more length than for a slim one, although both standards may be for the same size last. Small children's standards, intended for a slim fitting, hand-sewn, and of light material, may only require the standard two sizes longer than last; whereas a standard for a man's strong, rivetted Blucher—full fitting—would require five and a-half sizes over the length of last. All this judgment and remembrance of the numerous variations may be altogether ignored if the measure-tape be applied in the manner described. Never rise the toe of your standard above the spring of your last, for, no matter how perfect the pattern may otherwise be cut, this would counteract the influence of every other good point. If anything, have your standard quite dead, for no laster can fully eradicate the pleats round the upper which eminate from an excessively sprung pattern, especially when working on a spike-toed last with such material as crup or enamelled leather. Never peak the bottom corner of heel by hollowing the waist, as the heel measure will be too short, the peak being sure to be lasted

away. You cannot too often remember that though the bottom of the last may have a considerable curve in the waist, yet to give the pattern a corresponding one would not allow sufficient stuff there, again the sole being very narrow at this part; the upper must almost cover the insole, or meet within one inch or so. Every pattern-cutter should strive as much as possible to obtain a thorough knowledge of fitting, or machining and lasting; at least it is indispensable to fully understand the theoretical principles. The instep portion of standard will generally measure the same as the ankle. In designing, always mark your standard in such a manner that no seam shall come directly on a tender part of the foot. And I say over again, don't spoil the utility of the pattern for the sake of its beauty, nor its beauty for the sake of economy. Place utility first, beauty second, and economy last. But our ideal is the combination of those three most desirable elements. A great number of cutters advocate that the end of wing of vamp and side seams in all work should come in the waist of pattern (bottom of instep), or halfway between heel and toe of standard, Lorne shoes should have the end of wing of vamp as long as the tongue. A most graceful curve for ladies' wing vamps is fixed by the method of Rectangular Co-ordinates (Fig. 8)—the most fertile of inventions made in the advancement of geometry. It belongs to modern times, and is due to Descartes. We have six points in the curve, which makes a wrong drawing of its form almost an impossibility. Of course, the more points we get in a curve the easier their connection will be. The points on the horizontal line give the length, and those on the vertical line settle the height. To obtain the exact position of the points in the curve, horizontal lines are drawn from all the points in A B, and perpendiculars from the points in B C; where the lines from the corresponding figures cross each other is the position of the points in the curve. It is seen at a glance that point 6 is near the bottom line B C, and far from B A (the curve specified in Fig. 8 is at half scale, therefore double the distance of the points to obtain actual size). Impart unto your productions as much studied neatness and fanciful

decoration as you possibly can. *Never* "let well enough alone" (what we think well enough). True greatness looks more at what has to be done than at what has been already accomplished. Always thirst for information that bears upon your occupation. Take in all the trade journals that you can afford to buy and *read*. Your ideas will become greatly expanded and well tempered by seeing how the boot and shoe trade "wags" at home and abroad—a wonderful adjunct towards the suggestion of originality and final success. The more you learn the more you will like to learn, and see what you have to learn. As one of our illustrious shoemakers was wont to say: "I have learned enough to know how little I do know."

CHAPTER V.

REGULAR GRADATION

The numerous methods for graduating.—Repeated construction.—Arithmetic fractions.—How to compile a correct and complete scale of fittings.—Simple and useful method of grading.—American process.

"*Lost, yesterday, somewhere between sunrise and sunset, two golden hours, each set with sixty diamond minutes. No reward is offered, for they are gone for ever.*"—HORACE MANN.

"*Dost thou love life? Then do not squander time, for that is the stuff life is made of.*"—FRANKLIN.

With this chapter we now enter upon the consideration of the most scientific, if not the most useful, division of pattern-cutting, viz.:—The grading of single standard patterns and coverings into complete sets. It is a great thing to see that, after all our minute pains with the primary patterns and covers, a correct system for graduating obtains the remainder of the set for us, with a great saving of time and skill. By applying the methods explained and recommended hereafter, you need not repeat the construction of pitch and inclination, scientific or artistic designing of upper or bottom patterns, for the practical application of the principles of proportion affords us the greatest facility in completing the set, regarding economy of time combined with accuracy of construction. The necessity of a ready and exact rule for obtaining this most desirable result has been the outcome of many useful and ingenious inventions, which, though having simplicity for a recommendation, yet are far from rivalling the proportional or mechanical system, which may be said to condemn all others to oblivion. Suppose we accept the standard, our sole shape and coverings as most correct. By some method of grading we must produce the remainder of the set. To grasp thoroughly the principle of gradation, it will be necessary for us to consider the numerous methods which have been used for this operation from time to time. Not so very long ago, sets of patterns were produced without any rule of grading whatever; simply by repeated construction. When a pattern was cut for one size the same action was done over

again to obtain that for another, and so on, until the set was completed. Each pattern was specially and separately designed for every size last. This entailed a vast expense of skill and time upon the pattern-cutter, and seldom, if ever, were uniform results obtained. But as the possession of one pattern would naturally suggest the advisability of cutting another from it, or the utilisation of it to facilitate the production of another size, the idea could not be possibly lost, and from it eminated our rudest system of grading. One mode was ousted by the improvement of another, and this progression was continually in motion until we ultimately reached the climax—the application of geometrical science.

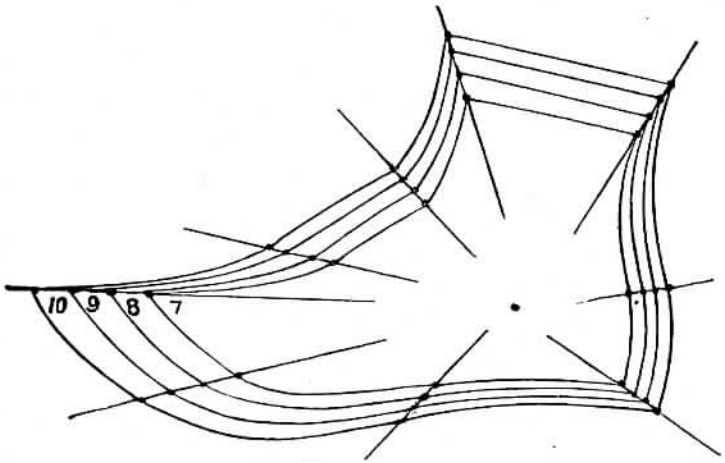

FIG. 12.

The first method of grading we shall note is that worked out by applying arithmetic fractions or amount of grade at certain parts of the pattern. By the amount of grade is meant the difference between the measurements of one foot, last, or pattern, and those of another a size larger or smaller. It is not quite as great at instep or ankle as at the heel, though at each of these points it is nearly an invariable quantity for each size, and in the length is exactly so, being a third of an inch to a size or number through the whole scale, from the smallest to

largest. At the instep it is, as near as can be stated, ¼in., and this holds good down through most of the small sizes as well as large ones. Some have supposed it equal to a third, the same as the difference in length; but a measurement of lasts will convince anyone that a quarter is much more correct. Others think it greater in the large sizes than in the small ones; but the variation, if it exists, is so little we cannot practically find it, unless by the geometrical system Perhaps the statement may be improved by calling the grade a trifle less than a quarter amongst the cack sizes, and a trifle greater among the largest of the men's, leaving a quarter as the average, and the proper amount for the majority of sizes, and those the most common ones.

At the ankle the amount of grade is a quarter, likewise, or a trifle less, running through all the sizes up and down, with so little variation for large or small ones as not here to be taken into account.

At the heel, where the whole extent of surface is larger, there is a correspondingly larger difference between the sizes. Or, to state it otherwise, there is a greater difference between the heel measurements of a large and small pattern than there is between the instep of the same pattern. This difference amounts to just about ⅓in. to each size, though the scale, or at least down to the smallest of the misses' sizes, if not through most of the cacks also.

The grade at the instep is for the whole circumference of the foot; but as part of this circumference is covered by the sole of the shoe, the difference in the width of soles makes necessary a slight deduction from the amount of grade in the upper. It will hence be, like the ankle grade, a scant ¼in. rather than a full one. And as the pattern is half or three-fourths of an inch narrower than it would be if there was no sole, its width is but little different from that of the ankle; we should, therefore expect the pattern itself to have very nearly the same increase or decrease at both these parts.

The addition at the ball for extra sizes was generally 3-16in., and for the length, of course, ⅓in. Those fractions had to be

applied in equal divisions at top and bottom of standard patterns. The various parts of the numerous designs also had this amount of grade specified by many fractions, also more than the ordinary mind could well remember. Many cutters being aware of the fact that the majority of lastmakers applied an unvarying ¼in. to the circumference of the joints and insteps of their lasts, used a method of gradation for the standard pattern known as the "eighths" system, applied in this manner. The primary pattern was placed upon a sheet of paper, an eighth of an inch was taken in the dividers or compasses, and marked all up the frontseam and cross-top of standard, a size was added to the length, and nothing at the back or bottom. Others applied this ⅛in. addition down the back seam and along the bottom, while nothing was applied to front seam or top of leg. A decided improvement upon either of these applications was a method called "the one-sixteenth all round system." This meant that 1-16in. taken in the dividers and marked completely round the primary standard, but when cutting out with knife a little extra was allowed at the heel and slightly under at joint, and full ¼in. at toe. Pattern-markers were used not only for marking out the primary pattern, but for grading. Sometimes the standard was cut in four pieces, and when slightly separated gave the shape and measure of a larger size. Patterns were also increased and decreased upon the square principle of enlarging drawings; the pattern or picture to be copied has many horizontal and perpendicular lines drawn across its surface (lines of thread fastened with pins are better); this divides the picture into a large number of small squares. The paper upon which the copy is to appear is ruled off in like manner; but when the drawing is intended to be smaller than the original, make the squares on the copy smaller, or larger if the copy is intended to be larger. Then by filling in these squares with portion of the curves seen in the corresponding squares of the original your copy is easily made. We have many other methods known as the "shifting process," the best of which is that explained by the excellent writer, Airedale, in *The Boot and Shoe Trades' Journal*, in his articles on

"Practical Manufacture." "As is well understood," he writes, "the outline of the boot is a series of curves of both concave and convex forms. It follows, therefore, that while retaining the same forms, these curves must be increased or decreased in length according to the gradation of sizes. The centre point of each curve should, therefore, be distinctly marked upon the original or starting pattern. Now take this and mark it out upon a piece of paper. Add to this the increase or decrease of length, namely, one-ninth at full swell of heel, two-ninths at toe end; rule a line across the original pattern, and a corresponding one upon the drawing. Now mark the difference in width, which will be required in the following manner: The proper variation between size and size is one-ninth of an inch at joints, five thirty-sixths at instep, one-sixth at heel, and one-ninth at ankle. These measurements must be divided, one-half of each being given to the top on front line of pattern, and the other to the bottom on lowest line. If the position for the joints, instep, heel, and ankle are properly marked upon the primary pattern, there will be no difficulty in placing these measurements in their exact positions. Now, taking the pattern and beginning at the length required, it must be shifted all round to meet the marked measurements, so that the centre or middle parts of all the curves correspond in position with each other."

What is called "Hannibal's" system was another method of shifting, which was brought conspicuously before the boot trade through the publication of his articles on "Last Fitting and Pattern-cutting," in book form. The standard is traced upon a sheet of paper, and two holes are pricked through at about ¼in. from toe end. The portion of the pattern forward of the ball is marked round with a pencil; then the pattern is shifted backwards and slightly downwards until the first dot becomes visible, then the top of the pattern, from the joint to the instep, is marked. Shift backwards again until the second dot appears, and complete the front line and top of leg. Slide the standard backwards until a full size is clear between the toe of standard and outline on paper; draw half way down back-seam, pull standard downward, and leave ⅛in. clear at top of leg or

instep; continue marking round as far as waist, shove pattern slightly forward, and mark round swell of joints. Mr. Hannibal's system is somewhat similar to the above in principle, only differing slightly in detail.

To grade patterns correctly and intelligibly requires a knowledge of anatomy and Euclid, the characteristics of the human foot in infancy and maturity, or the influences which age and climate have upon this member of the body. We should be also conversant with the various scales and proportions which have been advanced from time to time as the correct measurements for the increase or decrease of the foot at different stages, and under different conditions. Likewise, we must possess the technical knowledge, so as to apportion these measurements to agree with the correct adaptability. The statistics of anatomical measurements show, us that the increase in bulk of the average human foot is governed strictly by the law of true proportion. From the statistics of numerous measurements of the foot we also learn the peculiarities of the different types of feet. Geometry then affords us the means of applying these modifications with the greatest ease and precision. And lastly, technology tells us the proper method of application. For we all know "a little knowledge is a dangerous thing"—sometimes. It is all very well to learn a rule in parrot style, but if you do not know how to suitably apply it, the simile is like getting a sword for protection, and, by not knowing its use, catch it by the wrong end, and to say the least only hurt yourself. The systems given in the next chapter are founded on the most advanced and undoubted anatomical proportions and geometrical science for the gradation of single patterns into complete groups. Still, if you find out that true proportion is not correct for application to the foot, the last and the pattern, or does not suit your class of trade, well, don't cast the systems overboard. You can alter them to agree with any fact or idea you possess as regards the proper amount of grade. Suppose you have a table of measurements for different sizes, and you want your lasts, standards, insoles, or parts of them, &c., to coincide with this scale; well,

the proper understanding of the systems and hints given in the next chapter will enable you to realise your wish with the greatest facility, uniformity, and accuracy; each part or part of a part will come out in harmony with the whole. The thing revolves itself into this: If your scale is wrong, the grading won't be right; not only that your standard will be wrong, your covers, your bottom-stuff patterns will be wrong, your completed boot will be wrong; in short, your entire system of manufacture will be a miserable failure. The great importance which dwells upon this table of measurement has led me to give it the consideration it so much stood in need of. How a correct and complete scale of fitting can be compiled will be learned from the history of how I have constructed my own: First, I arranged all the sizes on a correct measure-stick (the first size being 4¼in. long, with a distance of 3·9in. between the other sizes), these I grouped into the following sets:—Infants, 1's to 5's; children's, 6's to 9's; girls', 10's to 1's; women's, 2's to 7's; and men's, 6's to 11's. I then got the measurements for the middle size of each set and graded them; the measurements given in Chapter II. were averaged for the Irish trade, but those below are the best I could average for a universal table. Having written for most accurate inquiries on this point, I received the measurements adopted in various localities and countries. These I compared with the tables arranged and issued by our technical journals both old and new. The map published by Mr. C. F. Alden, and the large and numerous scales issued by Gustav Pabst, Hamburg, and the standard table adopted by the Shoe Dealers' Associations of America, I also brought into play. The measurements which appeared in the "Students' Column" of *The Shoe and Leather' Record*, and those given by Airedale in *The Boot and Shoe Trades' Journal*, likewise fell in for their share of the comparison. After obtaining evidence from every conceivable source, and arranging it at a fair average, I have come to this conclusion. First, that the following measurements would be the most universal:—

Joint.	Instep.	Heel.	Ankle.
Men's Size—7.			
8⅝in.	9⅜in.	12⅝in.	8⅞in.
Women's Size.—4.			
7⅞in.	8¼in.	11⅛in.	7⅞in.
Boys' Size—13.			
7⅛in.	7⅝in.	10⅛in.	7in.
Girls' Size—9.			
6⅝in.	6⅝in.	8⅜in.	6⅞in.
Infants' Size—5.			
5⅜in.	5⅝in.	6⅜in.	5⅛in.

In the above, the joint and instep measures are intended for the last, while the heel and ankle measures are applied to the pattern.

The second conclusion I came to is, that the above sizes, with their accompanying measures, should be gradated into a complete set, almost in true proportion, by the method explained and recommended in the next chapter. The infants' sizes will have to be scaled by the unproportional system. The next consideration I have fixed is this: That in working out the girth fittings (usually five) for the same length of last, the ordinary system of gradation must be dispensed with. For this reason, the girth measurements of a full foot have a different proportion between each other than those of a slim foot. Take an average full foot and you will find that the difference between the joint and instep is very little. Measure a slender foot of the same length, and the disparity between the joint and instep circumference will be most glaring. The difference observed in the measurement of the joint and instep in the slender fitting decreases 1-9 in. for each fitting as they become fuller. For example, the difference between the girth measures of joint and instep in each fitting is:—

Fitting 1	Fitting 2	Fitting 3	Fitting 4	Fitting. 5
⅝in.	⅞in.	¾in.	⅝in.	⅝in.

The above is the only eccentric point we have to guard against in constructing a complete and correct scale of fittings. The location of these girths agree with that given in Chapter I. The rule for width of thread and heel was explained by Fig. 11,

in Chapter IV. Our 3's fitting would about correspond with the adopted 4's fitting in America, or the German 5's fitting (Pabst's Table, which shows twenty-four different fittings exclusive of different shapes and styles).

Many advocate that the gradation of these fittings be scaled in each size by ⅜ in. at joint and instep; but it will be better to apply the geometrical system of grading. A very simple and useful method of grading for those who cannot grasp the principles of proportional grading, and the best possible substitute of this perfected system, is the method taught by a Mr. Dodge, according to which, after getting the outline of a large-sized pattern on a piece of paper, and that of a smaller one inside the larger one, the space between any poin on one pattern or outline and the same point on the other is

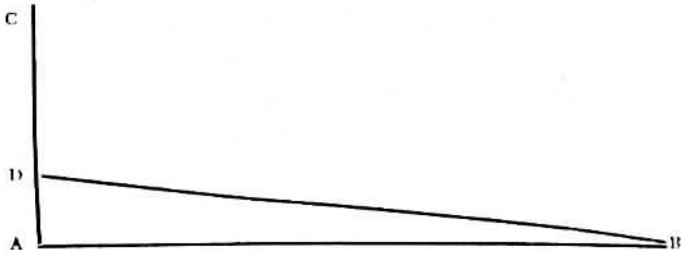

Fig. 13.

divided into as many equal portions as there are sizes or numbers between the large and small ones. For example, if there were twelve sizes between the large and the small, exclusive of both, there would be twelve points or marks, made with compasses or something similar, between the corner of the one and the other. In like manner there would be twelve points at the turn of the ankle, opposite heel, and twelve more each at instep, ball, toe, both corners of the quarter, and at several places between these, on all sides. Draw in a line from one of these points to the corresponding point in the next line of points, and thus going entirely around twelve times in succession, the outlines of twelve (or rather fourteen) patterns would be found on the paper, and by these the copies in pasteboard could be

cut, commencing with the largest; or the outlines could probably be cut without the lines, with nearly as much correctness, after the points had been located.

By this practice a tolerable degree of correctness would be secured; the intermediate patterns would probably be as perfect as those at the extremes of the set. Grading from a single pattern would have to be done by marking off the proper amount of grade at top, bottom and ends, in a manner similar to what has been already explained, or by the proportional system. The methods explained in the beginning of this chapter, such as the "eighths system," "the one-sixteenth all round," &c., only enable you to grade standards, or at the most, vamps; but by the above simple method you can grade every possible pattern. It has one drawback, that is, you must possess the two extreme patterns in order to obtain the intermediate ones. There is another method of grading, which a contributor to the *New York Boot and Shoe Reporter* proclaimed to be "the best, the surest, easiest, and altogether the most correct and reliable process." Whether it is or not, the reader can judge. The method is this: Get some thick, solid pasteboards, neither gritty nor very hard, take the proper pattern for the largest size, of any particular part, quarter, vamp or whatever, if divided, or of the whole side if undivided, and cut an exact copy of it from the pasteboard. Then proceed to block out roughly as many others as there are sizes, or sizes and half sizes, in the whole set, aside from the largest, taking care only that they shall all be large enough to whittle down considerably afterwards. Take the small pattern for the same part or whole side, paste it around the edges, and stick it on to one of the smallest of these blocks, so there shall be a margin left all round it. Then pile them all up together, the largest one that is already cut at the bottom, and the small paper one on top, as nearly over the middle of the lowest one as can be judged; after which drive three or four tacks, pegawl blades, or sharp-pointed nails through the whole, to keep them firmly held together while being whittled. It is not strictly necessary that the small pattern lie directly over the middle of the bottom one, though the whittling will be easier done if such is the case; but it may vary to either side without affecting the shape or grade of the intermediate patterns, provided it does not at any point project beyond the one at the bottom.

The next step is to whittle off all the margin of the whole mass between the edge of the small paper pattern and that of the large pasteboard one, leaving a straight, regular, smooth, even bevel from one to the other all round, but without cutting into either of these, though the closer the knife comes to them without touching the better. It must be done with a good deal of care, requiring a sharp knife and a steady hand. A large knife, sharpened so as to be shoved rather than drawn, will be found best for the purpose.

With this bevel from the small pattern to the large one nicely cut, the most difficult part of the job is done. What now remains is, to take the whole set apart, and cut off the bevel, whether much or little, from each one separately, leaving the edge perfectly square all round. To finish them up neatly, the paper may be taken off from the smallest one, and a rasp used to smooth and even all the edges and corners.

In this way each one of the intermediate patterns is given as regular and correct an outline as that of the original patterns of paper. And, provided the pasteboard is all alike in thickness, the amount of grade is equal, and exactly what it should be, between everyone, not only in a general way, but at every particular point. If the bevel is cut with care, to make it true and regular, and equal care is taken in cutting it off from each one separately, the grading will be perfect, and there is no chance for mistake at any part of the pattern. A slightly larger amount of grade can be secured to the larger sizes, if desired, by selecting the thicker pieces of pasteboard to represent those sizes. But I think we can say this method is neither easy nor practical to anyone but a full-fledged adept in the process.

Chapter VI.

MECHANICAL GRADING.

The property of the triangle.—Explanation of geometric grading.—Grading tools.—Use of mathematical instruments.—The proportional compass.—Universal system applicable to all patterns.—Unproportional grading applicable to various countries.

"*The fundamental principle which underlies geometrical grading is the principle of strict proportion.*"—J. T. Day.

"*Keep virtue's simple truth before your eyes,*
Nor think from evil good can ever rise."—Thompson.

"*Knowledge is power.*"—Lord Bacon.

The geometrical, the proportion, or the mechanical system of grading may be said to be the same thing, the only difference being in the method of execution. Each system is founded upon Euclid's theorem. "Similar triangles have their corresponding sides proportional" (book 6, proposition 4). Practical geometry shows us how this valuable property of the triangle can be utilised to increase or decrease similar figures with the most accurate proportion, whether for gradation of an insignificant top-bit, or the design of the mighty Eiffel Tower. By the practical application of this theory, lines can be divided into any number of parts with speed and facility. If we have the measure of any part of a particular design, we are enabled to obtain the size of the corresponding part in any larger or smaller similar design. With this rule we can measure the height of some of the largest buildings and monuments, or even a balloon in the air, without stirring from the ground. The width of inaccessible rivers, or the inclination of dangerous projections can also be gained by the same means. In short, this wonderful property of triangles has been classified as a science in itself, under the name of trigonometry. A similar triangle is made by producing or reducing one of its sides to a point, and drawing a parallel from that point to the adjacent side. When we want to divide lines we make similar triangles, as we did in Fig. 5. When we want

to find the relation of a part to the whole, or having the measurement of a certain portion of a specified figure, and we want to find the measurement of the corresponding portion in a larger or similar figure. Well, we again make similar triangles, as explained in the construction of Fig. 8; the ten triangles in this figure have all their sides proportional, because the triangles are similar. Suppose we require the triangle A 10 B made smaller, but still of the same shape; well, cut off any portion of B C, say at point 7, draw a parallel from point 7 to 10 A, and you have a smaller triangle identically the same shape. It is this reliable principle we are going to utilise in grading our patterns, *i.e.*, the principle of true proportion, and once it is grasped by the student its value must be apparent. The fallacy of applying an unvarying addition all round an irregular figure becomes at once contemptible. If a boy grows an addition of three feet in height, should you add an addition of three feet to his nose? No, certainly not. In like manner, if the foot grows one inch in length, surely it won't grow an inch everywhere in girth. To begin we must grade our patterns proportionately or with a very slight modification of strict proportion. Strict proportion means this: Suppose you have a rectangular figure six inches long and three inches wide, and you have to increase it one inch in length; therefore you must only add half-an-inch to the width, because the length is double the width. This is really strict proportional graduation; but a rectangular figure of the above dimensions seldom occurs in pattern-cutting. For instance, take a sole shape and hardly any two parts of it will measure the same; consequently, to grade it proportionally at every point would necessitate numerous and tedious calculations in arithmetical fractions if we had not some other easy rule, which—thanks to those who brought geometrical science to bear upon our trade—we are fortunate to possess. By utilising the property of the triangle all these intricate questions can be solved automatically by anyone of ordinary intelligence. The system is easy, rapid, accurate, and, in short, perfect. What more can we ask. The mode of application can be varied—

not only that but altered—to suit your particular ideas. You can grade any way you like by the principle. But you know what you are doing—nothing happens by chance. It enables you to complete your set in half the time occupied in applying other methods. It may appear too scientific and roundabout, but in reality it is the essence of simplicity. Nothing can be more accurate, for one pattern is a perfectly graduated fac-simile of the other. It is like photography; if there is a fault in the original the same fault will appear in all the copies. If the primary be exact the remainder will be identically equal; the same spring and draft, the same pitch and incline, the same curves, only on a different scale. The principle of geometrical gradation being so valuable as all this, we should spare no pains to render the primary pattern as perfect as possible, for if it contains the least error it will be accelerated as we proceed with its gradation. Every test should be applied to the original before we accept it as correct. Dr. Johnson on one occasion, being asked if he could make his "Ramblers" better, replied that "he could make the best of them better," meaning, of course, that by applying extra pains in the way of careful revision they were bound to be highly improved. The principle of proportion is applied not only to the standard but likewise all its accompanying parts, whether large or small—its covering patterns, our measurements, sections of last, &c. This gradation governs the *whole* as well as the *part*; the complete boot, or any part of it, sole, heel, middle, &c.

To illustrate one mode of application. Say we want to grade a set of standard patterns—sevens to tens. Place your primary 7's pattern upon a sheet of cartridge-paper, and trace round it an outline with a dull knife. Then make any point (the radial centre) within it. This point has no specified location, but it is always well to place it in such a position within the pattern that all straight lines drawn from it should definitely cross the outline of pattern, and not run along or coincide with it. Theoretically it does not matter where this point is situated, but it is practical to place it as above described. Fig. 12 shows a good position of the radial centre in a standard; from this

centre we have to draw straight lines crossing the outline as shown; these lines should pass all the principal points and curves in the 7's outline; the more lines we make the more accurate will be the work. The beginner will require many, while the practised hand only about ten or twelve. The best way to line round the pattern is to fix a very fine awl in the radial centre, and keep the straight-edge (a

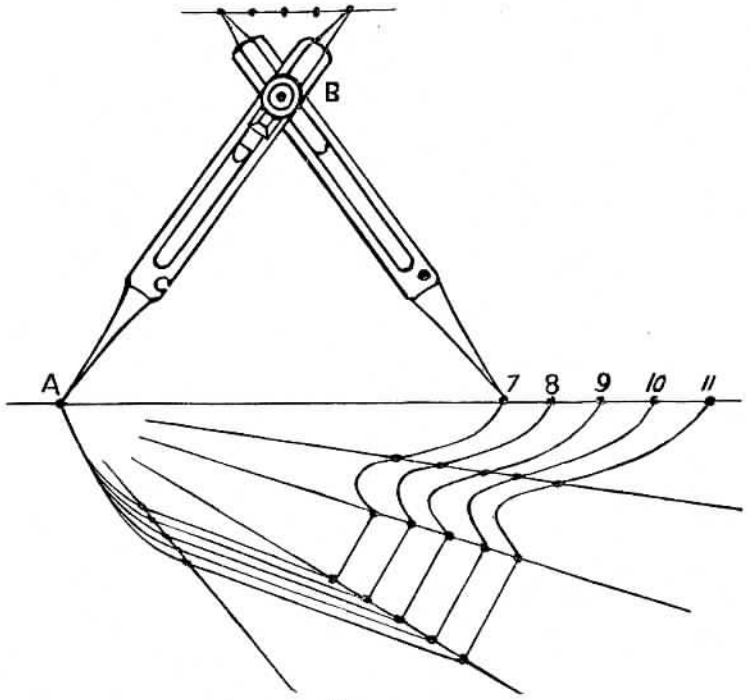

FIG. 14.

piece of spring brass is the best) pressed against it while it is carried round the outline. We want now to find out what amount of grade is to be added to the outline of pattern at the points crossed by the radial lines. To make this out we must construct what is called a "tool," or grader. Draw the line A B, Fig. 13. This line must be same length as the

length of the middle standard of the set. Suppose the set is a woman's 2's to 6's. Well, make A B the length of the 4's standard. At right angles to A B draw A C, and from A mark off one size, or ⅛in. to D, join D B, and you have your grader. This narrow triangle should be drawn on a strip of cartridge-paper, and the lines A B and B D coinciding with the edges of the strip. The grader is used in this manner: Place the end (B) of grader to the radial centre of pattern, and let the edge A B run along any of the radiatory lines. Exactly where the edge (A B) of grader crosses outline of pattern the strip of paper should be creased at right angles. The portion of crease contained between the lines A B and D B of grader is the correct amount of grade that should be added at that part of outline. In fact, if end of tool be held upon radial centre, and other end carried round the outline, and additions made at different portions, no radial lines might be drawn on the pattern whatever. That is, place end of grader at radial centre, and where the other end crosses the pattern, crease it at right angles; then this creased portion is the proportionate addition that is to be applied to that part of outline, which can be marked there by pricking with a fine awl. This tool only gives the amount of grade for one size, but it is only necessary to repeat the addition as many times as there are sizes required. The tool might be improved by marking a large number of small lines inside of triangle, perpendicular to the edge A B. Begin a short distance from point B by making a mark, then the space between the edges of grader is to be indicated from that point on the line B A. Again, the space between the sides of the triangle at this last found point is likewise specified upon the edge B A, and so on. With this sort of grader there is no necessity to be continually creasing it, as the amount of grade is indicated upon the flat. Any other pattern or part of a pattern is graded in the same manner as above. But they should be always nett, *i.e.*, without any allowances for seams or underlaying. If the covers are graded with the seams on, the allowances for closing will be increased or decreased, whereas they

should not be so. Some tools have been constructed with as many triangles, minus one, as there would be sizes to the set. Others have been bounded by arcs, in order to alter the gradation to what many think is more correct. But the tool (Fig. 13) can be made to give any grade you like if you produce or reduce the line A B according as you wish the gradation to be more or less. Personally, I prefer this line to be the length of the medium standard of the set. If you want the amount of grade to be less; well, make the line A B the length of largest standard; or, if more, make it the length of the smallest. Some tools have the line A B 11½in. long, and is used to grade all sizes or sets. This gives women's and children's patterns a larger amount of grade proportionally than the men's. Still, after considering the subject every possible way, I hold that the first mode I explained to be the most exact. We are not absolutely held to strict proportion by this method, which is best understood when you see that I leave the allowance for lasting purposes on the standard. Again, I repeat a regular amount of grade, whereas if we really graded proportional in the full sense of the word, the larger patterns would have a larger amount of grade than the smaller ones. In other words, as the patterns would increase or decrease so would the amount of grade correspondingly increase or decrease. To grade in strict proportion, each pattern would have to be graded separately, which evidently must result in a varying gradation.

Our outline, having the amount of grade indicated, with awl punctures at all the principal parts of the pattern and for the required number of sizes, we have only to cut out the patterns in paper from this stencil. Place these outlines or stencil over a new sheet of paper, prick through with a fine awl the size nearest to that already cut. Then take original pattern, and lay it to the marks, running a fine-pointed pencil round it, and pushing it along to touch the punctures. In this way a regularity of curve is obtained, fewer radial lines are necessary, and no patterns have to be cut twice, for when the set is cut and shaken together the most absolute grading will be apparent.

The above is the simplest method of applying the principle of geometric grading. No arithmetical calculations are necessary whatever if the grader be constructed as described. No data is required (as some cutters think essential) for the component parts or design of standard. Neither is their any necessity to have the radial centre situated outside of the perimeter in grading any part of the covers. Simply proceed in the same manner as I have explained in grading the standard. The principle of proporton can be applied with the aid of several mathematical instruments and geometrical problems, such as the parallel rule, the sector, the diagonal scale, the proportional compasses, the pantagraph, the set squares, or by the geometric applications of graphic arithmetic. I will just note the principal drawing materials and mathematical instruments an earnest pattern-cutter should provide himself with.

(1.) A Drawing Board.—This should be quite square at its corners, and present a perfectly level surface. The size would of course depend upon the kind of work to be done; but a board 22 in. by 17 in. will be found very generally useful.

(2.) A T Square.—By means of this instrument, perpendicular and horizontal lines can be drawn parallel to the edges of the board ; and if the head be so constructed as to turn upon the blade, lines at any angle with these perpendiculars, &c., can be obtained. The edge of the blade should be bevelled, as the instrument will not then throw a shadow where the line is to be drawn.

(3.) Paper and Pencils.—*Cartridge paper* is the cheapest and best which can be used for geometrical drawing or pattern-cutting purposes, as it is stout enough to prevent the points of the instruments from penetrating, if they are used carefully. The pencils should be those marked "H." and "H.B."; the former for what are termed construction lines, and the latter for completed figures, which should be draw in firm dark lines.

(4.) Drawing Pins.—These are required to keep the paper in a fixed position upon the board. The best are those which have the pins soldered into the heads, but not penetrating quite through them. By using this kind, the annoyance of the pin coming through and pricking the finger, or unscrewing when taking out, is avoided.

(5.) Two Set-Squares.—These consist of two triangular pieces of wood or vulcanite. Those having angles of 60^0 and 45^0 are the most convenient ; or, better still, have the corner of one set-square to correspond with the angle that the pitch makes with the line A O (Fig. 3), then it will admirably work as a pitch regulator. By means of these squares, perpendiculars can be drawn to cross each other, or parallels in any direction can be determined. Always draw your parallels with set-squares by sliding one against the other. Parallel rules used for this purpose are very limited in their performances, besides they are seldom accurate. One set-square made of wood, and the other of zinc—No. 14—will be best for the pattern-cutter.

(6.) A Set of Mathematical Instruments, which should comprise, at least—A large compass, with moveable pen and pencil legs ; a pair of dividers ; bow pen and pencil compasses, a ruling pen, which can also be used for marking closing seams. Indian ink should be used with the instruments, because it will not corrode them. After using, they should be wiped quite clean, to preserve them from rust.

The protractor is our instrument for measuring or setting off angles. It is made in two shapes, rectangular and semi-circular ; but the scale of chords, as seen upon the ordinary decimal rule, is generally used in its place. The instrument which will be most valuable to the pattern-cutter is the ingenious proportional compasses (see Fig. 14). By means of these we can divide lines into any number of parts with the greatest rapidity and accuracy.

We are also enabled by their use to solve mechanically the most minute and complicated proportions. They likewise serve to describe regular polygons, and to take the square roots and cube roots of numbers. To the pattern-cutter the utility of these compasses must be greatly enhanced when he considers with what importance proportion is attached to pattern-cutting in all its branches, and when he learns that the most perfect system of grading is performed by their proper use. The pro-

portional compass is somewhat like a scissors. Two legs are pivotted together by a peculiar nut at B (Fig. 14). This nut, when slightly loosened, has a sliding action, which constitutes its principal characteristic. On the front of one of the legs are engraved, at different parts, numbers, from 1 to 10. Sometimes the divisions are more numerous, being accompanied with various sorts of scales. To set the compass it must first be carefully closed, so that the two legs appear but as one. The nut being unscrewed, the slider may be moved until the line across it coincides with any required division (number on leg); now tighten screw, and the compass is set. Suppose you want to divide the line A 7 into four parts. Well, set the slider to number 4 on leg, open out the long legs until the space between them is equal to the length A 7, then the distance between the prongs of the small legs will be exactly one-fourth of A 7. Outside dividing lines, the correct result arising from what we understand as strict proportion is found with equal facility. The whole thing is similar triangles over again. The legs of instrument automatically form the sides of two similar triangles, while the imaginary lines between the end of the larger and smaller legs fully represent the bases.

Suppose we require to grade a set of military casters (remember any other pattern undergoes the same *modus operandi*), say 6's to 11's. Our first pattern being a 7's, place it on a sheet of paper, and trace out its outline. Your radial centre will be placed best at A (Fig. 14); draw radiating lines as shown in diagrams. Now, set compass in this manner Keep sliding the nut B until you get the proportion of compasses, so that while the large prongs of compass reaches the exact length of *standard* (not caster) the other prongs span four sizes (fine dots). In other words, the slide has to be tried up and down, irrespective of the numbers on the leg, until the space between large prongs is the length of the net-lining pattern, while the space between the small prongs is to be four sizes or 1⅓in. The compass being set in this manner, one of the large prongs of compasses is placed at radial centre

A, and the other to point 7. The compasses are now turned upside down, and one of the small prongs is placed at point 7; then you will find that the other small prong just reaches to point 11, which is the correct amount of grade for four sizes—that is, the distance from point 7 to point 11 is the proportional addition that should be added to the part of pattern (point 7 or line A 7). This application is repeated on the other radiating lines, *i.e.*—the large prong is placed at radial centre A, while the other long leg is extended where any other radiating line crosses the original 7's outline. Then the compass is reversed, and distance between the small prongs is applied out-

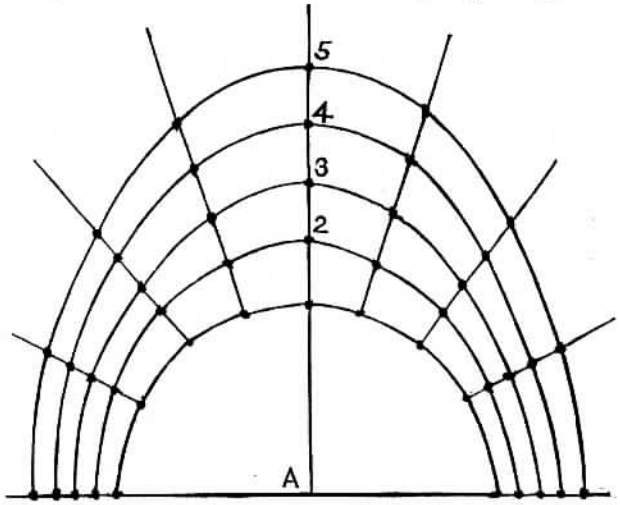

FIG. 15.

side of the original outline on that radiating line. By this means we obtain the principal points in the outline of our 11's pattern. Then all we have to do is to divide the space between the outline of the 7's and the 11's into four equal divisions, and we have all the points for the intermediate sizes. To divide the space between the two outlines at points 7 and 11, set the nut of your proportional compasses to number 4 seen upon front of compass. Then place large prong of compass at point 7, and bring the other large prong to point 11. You will

find then that the space between the small prongs will be exactly ¼ the line 7 11. Mark this ¼ distance off four times, beginning at point 11's, and you will have the correct point at this part of your pattern for the outline of your 7, 8, 9, and 10's size. If you want more patterns in your set, run this ¼ along the radiating lines as many times as you require sizes, say five times, and you have the stencil for a set of 6's to 11's, one of the ¼ divisions coming inside the original 7's outline. This is the easiest, the quickest, and the most accurate system I know of. It is both mechanical and perfect. If once used, it will always be used. Above all others, I have no hesitation in lauding this, or recommending its general and valuable application. We are not held strictly to proportion by its use if we wish to be free of it, for I will now show one simple method of grading unproportionally by it. The reason I apply different terms to the different methods of scaling, which are not exactly significant, is in order to distinguish the various systems. The use of the parallel rule or set-squares is called the geometrical system, the grader or tool the proportional system, the proportional compasses the mechanical system, and the following modification the unproportional system: Suppose we require to graduate figures which are *not similar* to each other, say a small 1's semi-circle to a 5's half an ellipse (see Fig. 15). Draw semi-circle upon a sheet of paper, grade it 1 to 5 by the mechanical system; this will give us outline of a 5's semi-circle. Alter this to the required elliptical shape; now place small semi-circle evenly within the half ellipse as seen in diagram, fix radial centre at A, and line out as shown, set slide of proportional compasses to number 4 on leg; then, by dividing the difference between the two outlines in the ordinary way at the parts crossed by the radiating lines, you get the points, in stencil fashion, for all the intermediate sizes, exact in measurement and shape. By this method we are enabled to correctly graduate, even from a circle to a square. The construction of Fig. 15 merely shows how this essential modification can be applied. But the method is most useful in grading lift patterns, the top-piece being a different shape

from the first seat lift or heel of sole shape. Infants' patterns are to be scaled by this method. Again, as the inhabitants of many countries and localities often possess eccentric characteristics peculiar to their feet, the above system must be most valuable in grading the patterns for same. It will be noticed that in grading proportionately we break up our primary figure into triangles by means of the radiating lines. These triangles are increased to larger similar ones by taking points in the smaller curves, and drawing parallels to them in order to obtain the points in the larger curves. A fair proportional compass, for practical purposes, can be had from most instrument shops, price 7s. 6d. There are several other mathematical instruments, less simple in their action, that are very useful to the scientific pattern-cutter. Also many geometrical truths on area, perimeter, curves and solids that well claim his attention. But as this is to be a "Pattern-cutting made Easy" book, I thought it better to explain the application of more simple and less deep theoretical principles, when they are equally if not more useful than higher speculations.

Chapter VII.

APPENDIX.

Bespoke work.—Improved system of measurement.—Last fitting.—Cutting to irregular measures.—Long work.—Metallic patterns.—Systematic arrangement of working patterns.

"I bought me a new pair of shoes to-day. I put them on, and they didn't hurt me. I walked about in the store with them, and they didn't hurt me. I walked clean out to the base-ball park, and they didn't hurt, and they don't hurt now. I puzzled myself to know the reason of this phenomenon. It has just occurred to me." "What is it?" asked Cooper. "They were made for another fellow," answered Sam.

"Thunder," said Macdonald: "I won't be able to get these boots on me until I wear them awhile."

Notwithstanding the rapid and continuous advancement of the factory system and the facilities it offers to retailers and the public at large, the demand for boots to measure at the present time is equal if not greater than it has been for many years back. There will always be a class in the community who will prefer to have their foot-gear made specially to suit either some pedal peculiarity or eccentric notion with regard to comfort or style—irregularities which the largest wholesale manufacturers could not possibly bring within range of his numerous fittings and varied designs.

The first and most important step in the getting up of bespoke work is to accurately take the dimensions of the foot. That this should be founded upon solid principles, so as to ensure a good fit, is quite unquestionable, yet the method of measuring adopted by most bootmakers is far from perfect. It is often remarked that the best man in the world is sure to make many misfits at times. If this be really as true as it appears to be, we need not wonder that bespoke work is often accounted a lottery, and he who makes the least blunders esteemed "a lucky fellow." This is not as it ought to be; measurement, if brought to its highest development, must be uniform and exact. For my own part, I can confidently state that I never made a mistake yet that I could not attribute

either to carelessness or haste. And with the aid of a good system of measurement, together with attention to details, if I ever make up my mind to really fit, I always succeed. I should, however, explain that I have an advantage that many others have not. I generally take the measure, fit up the last, and cut the uppers myself.

After taking the name and address of the customer down in the order book, the date of order, when wanted, find out minutely what style of boot is required, even at the risk of being tedious; note down every particular, especially if the customer is any way exacting. Settle upon the price as a guide as to quality of material, and to prevent any misunderstanding afterwards. Show the customer to a comfortable seat, "away from the vulgar gaze," politely ask him to take off his boot, and listen patiently to all he has to say. Then proceed in a businesslike manner to take the size of his foot. In order that you may have full freedom to concentrate your attention at this important juncture, and not be hampered in any way, it would be well to have a second person to take down the figures which you will call out. Taking measures is a very delicate operation, especially with ladies, who often desire to wear shoes shorter than their feet. Suppose you call out 6's, and she exclaims, with a horrified expression on her face, that she positively never wears more than 4's, give way at once; but you know what to do afterwards. Should you, in measuring both feet, happen to observe that her right is *larger* than the left, excuse yourself directly, and you may be forgiven by her only indignantly gasping "No, sir; if you knew but all, it is the left that is *smaller* than the right." Devlin gave a good hint in this connection when he said: "Guard against the double vanity of a too great haste to show ability, and a mannered sloth to be thought careful. It is better to be slow and sure than to risk your reputation and your leather; and again, it is wiser to be *actually thinking* of what you are about than busy dreaming of what may be thought of you. A slight move of the hand, heedlessness of eye, or drowsiness of attention, may occasion drawbacks not at the time to be imagined, and not easily got over."

After criticising every system of measurement, from the taking of a plaster cast of the foot to the vague method of working by the guidance of an old boot, I have come to the conclusion that there is nothing better than the ordinary inch tape and the use of a few symbolic marks. For example, if the instep be a flat one, I would use the sign —— over the girth measure. If it be well arched I would use this ⌒, and when the foot is very steep or hoof-like this /. A bunion might be denoted thus (o), and a corn on the outside of the little toe explained by an asterisk, so *. In some feet it is necessary to take the joint measure in a diagonal direction. When such is the case it should be noted thus /. The signs suggested I always place over the measurements to which they refer, leaving nothing to memory. It is well, after taking the measure, to immediately choose a last as near the shape of the foot as possible while the form of the foot is in mind. This I have found to be a great help. The measure-tape I recommend is two straps fastened together at right angles. The value of this system of measuring is, that while one strap is taking the circumference of the foot, the other is used as a distance regulator; by passing it over the big toe it will show the distance of the girth measures from that point. This is a very important thing, for the location of the points of measurement is as necessary to know as the girth measures themselves. Many misfits are made, not because the measurements were incorrect, but because they were located upon the last differently than upon the foot; so we see according to this system we require two measures for each point; first the circumference and then its distance from the toe. The locating tape should have a piece of lead at the end, so that the strap may lie down well over the end of big toe.

Paper strips for measuring are very popular, but they are liable to a lot of unforeseen accidents. When too many of them accumulate, it is very difficult to prevent them getting mixed. The advantage claimed for the paper measures is that they are very exact. Still, though the ordinary tape-measure is not divided beyond eighths, yet by using the letters T and F you can signify whether any number is tight or full.

When a foot is conspicuously abnormal, I would bring to my aid a sheet of cardboard, doubled in two to represent what is called in geometry the plan and elevation planes. The lower half is placed upon the ground and a trace of the foot is taken with a carpenter's pencil, while the other half of the cardboard is held upright against the side of the foot, then we take the outline of the foot and leg as seen from a side view. This must be a great help to the pattern-cutter as well as the last-fitter, for if the foot is disproportionate or the profile curves are irregular he can see the form his last or pattern should take at once. It would, perhaps, be an improvement if a few square pieces of wood of different heights were used to put under the

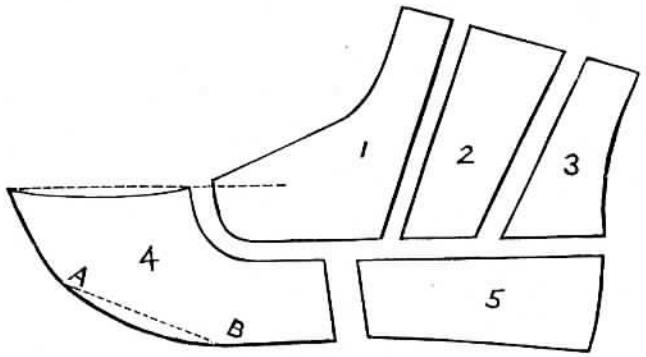

FIG. 16.

heel of the foot while taking the elevation, so that the leg would show the inclination it would have when the boot was on the foot.

There still remains another very important thing to explain, namely, how to take an impression of the foot. Get a sheet of writing paper and blacken it all over with blacking or ink. Let it dry, and rub it well all over with wet soap. Take a piece of cardboard and shake powdered chalk or ochre over it, and rub it well in. Place the black writing paper on this, and then place the bare foot over the two. Steadily bear upon it with an even pressure, and the result will be a splendid print of the

foot showing the tread, bearings, points of pressure, and general character of the sole shape. It would be well when taking the print to mark round the foot with a carpenter's pencil, and thereby obtain both an impression and outline. With this system of plan and elevation the ordinary inch-tape is sufficient, for the location of the girth measures can be marked upon the drawings.

There is another useful system of measurement by the aid of the paper strips. The method is this: A couple of paper strips are cut out of cartridge paper, three-quarters of an inch wide, and of any covenient length. One end is tapered off to show the beginning of the strap, and while the strap is taking the circumference of the foot it is slightly nicked with the thumb nail to denote the correct spot. It is then passed round the back of the heel and along the sides of the foot; this side measure is used as a locater. In order that the ankle measure may not be confused with the joint measure it is the other side of the strip that is nicked for such. Take the length of foot while resting, the trace will show the length while standing. In measuring the joints keep the strap at a fair tension, not tight, but to gather up all looseness. Be sure and denote whether it was taken straight or obliquely. The instep should have its location specified, especially if the prominence be any way unusual. The principal peculiarity of the heel measure is, that if not taken while the foot is flexed (not in a state of rest), it will be too small. For experiment take a hard bony foot and measure it when the toes are inclined downwards, and again while they are held up as much as possible; the difference will astonish most people. The ankle should be measured at the small part of the leg, just above the ankle joint. It should not be tight, but rather slack as a rule. Any other girth measure on the leg must always be carefully located. Always measure both feet, as very often they require different treatment. Be sure your tapes are correct; a false measure-strap would cause no end of trouble. That is, a strap that does not tally with the others. When putting down the measures upon the order docket write them out so that the last will be fitted to them exactly, and

the uppers cut the same. Leave as little as possible to the judgment of the last-fitter, for he has not the advantage the measurer has of knowing whether the foot is hard and bony, fleshy and spongy. Neither can he judge whether it is an elderly person, who wants his boots easy, or a dashing young fellow, who requires a tight fit.

Following in the natural order of things, after measurement comes last-fitting, a very careful and responsible operation, requiring a complete mastery of all technical details, which can only be acquired by considerable practical experience, together with proper deductions from theoretical knowledge.

The following modifications of the foot measurements have been found by experience to be most suitable:—In men's sizes the general allowance over the length of the foot is 3 sizes, or 1 inch; women's, 2½ sizes; boys' or girls', 2 sizes; children's, 1½ size. Sometimes these additions should be less, sometimes more. If the length of the foot is taken standing—that is while the foot is fully extended, having the weight of the body upon it—the allowance should be less; but if the customer insinuates that he likes his boots a little long, or his feet are abnormal and very full, somewhat more is necessary. It is always well to give the length of the foot as well as the length of last. Particularly note the increase of length as shown by the trace and impression, for this will mainly determine the amount of allowance.

So far for the length. Now for the girth measurements. The general rule is:—For men's sizes, ⅛ in. under; and women's, ¼ in.; and children's, ⅛ in. over; small sizes, as much as ¼ in. over. These will have to be altered according to circumstances. Some people cannot bear the slightest pressure on their feet. I have known others to squeeze their feet into so small a space as to surpass belief. Substance and quality of material equally require a share of our judgment. Strong uppers, such as kip or split, will require the last up to measure, as a rule. Light materials, such as glove kid, require more allowance under than the above-mentioned. The cause of one person being able to wear a tighter boot than another may be

attributed to the different formations of the foot. A hard, angular foot, generally said to be bony, having joints and projections fully marked, will stand little or no pressure. In fact, it may require room, because such a foot is fully developed, having no superabundance of flesh. This is generally the characteristic of men's feet. A lady's foot is generally round and soft, and like a sponge, capable of being compressed into small compass, having the joints and other angular points fully protected by a bountiful supply of flesh, acting as an elastic pad or cushion. Of course, in many cases, both men and women will have characteristics the very reverse of these, but they are the exception, not the rule.

So we see we must consider, firstly, if the uppers will be fine and elastic, or heavy and unyielding; secondly, is the foot fleshy, soft, bony, or hard? With elastic material and a fleshy foot a much greater allowance must be made than for the reverse.

The first thing the last-fitter has to do after carefully reading over the directions of his order is to sort out a last which he thinks will be most suitable; then try the strap, and see that the girths correspond as wanted; also that the points are located properly. But he must here remember that location of the girths as measured from the toe is different on the last than on the foot. He will easily see that if the last is three sizes longer than the foot, he must add 1 in. to the distance measurement, so as to situate the point upon the last correctly. The trace of the foot shows the general shape of the bottom of the last. The impression shows him the points of pressure, bearings of the foot, the width of seat, and a fair idea of the concavity of the waist, also the tread and the direction of the joints.

Leathers for increasing the girth of the last are best made out of insole bellies of about 1/8 in. substance. After being cut to the proper shape, they are wetted, and, after soaking awhile, they are blocked upon the last while mellow, and then allowed to dry. Good "leathers" can also be made from the thick and sometimes useless necks of wax-calf. Leather fittings may be divided into three shapes, the

full leather covering the instep and toes making the last larger all through, the instep leather only going a little below the cone of instep (never as far as toes), and toe leather. These last two leathers are like a whole leather cut in two. It is usual to have three sets of leathers of the same size, in case of necessity. These fittings will answer for three or four sizes, and should be attached to the last with French tingles, as these do not seriously injure the last, for pegs always do. In providing for a bunion, a piece of insole leather or stout kip is preferred, which is cut about the same size and shape as the profile of an egg, and attached to the required spot (care must be taken to have this spot properly located). If this leather bunion is fastened with tingles or rivets, it must be first pared and skived to the correct shape. If fastened with pegs, the rough piece can be pegged on at once, and pared afterwards. It is always well, when putting a leather bunion on, to place half upon the inside of the joint, and the remainder upon the sole of the last. (A full ball upon the natural foot is generally so situated.) Let this be pretty large, more so than the protuberance of the foot, for if the swelling of the last is smaller, the ball of the foot cannot fall into the hollow, which instead of giving ease will only be a source of annoyance. It again requires to be larger, so as to meet the continued motion of the foot in walking. If the last requires to be lengthened an extra half-size, either a toe-bit or a "heel-pin" may be attached. Should the heel of the last be short and stumpy, a heel-pin is preferable; but it should be noticed that when a heel-pin is used the circumference of the last is increased, because the points of measurement are located half a size forward in consequence. If the last measure is right, and only a slight increase in length is desired, a toe-bit should be used. Sometimes this toe-bit is a triangular piece of leather covering the top of the toe of the last, and coming down in front also. Some lasts are so defective that permanent fittings are necessary, and the same applies to old lasts injured by a constant use of the hammer. Pieces of stout kip are workable for temporary fittings, but only good, firm insole leather should be used for permanent ones. These should be pasted on before being pegged.

Iron lasts are temporarily fitted up with gutta-percha, the last being well heated before the application of the gutta-percha, so as to remove any dampness that is contained in the iron. They may also be fitted up permanently, and repaired by soldering. It is very handy to have a few holes drilled over iron lasts, and plugged up with leather, so that leather fitting can be attached easily.

In cutting patterns to measure, rules and proportions are but of secondary use. All our little schemes which hold the field in the wholesale trade are knocked out of time in the bespoke trade; when backed against practical experience, the educated eye being always triumphant, and the ability to judge by the brain predominant when called upon to meet the requirements of irregular measurements. There are some measurements which it is almost impossible to bring within the range of elegance, and it is generally the case that those customers whose feet are anything but proportional are always the most exacting about beauty of design.

Before commencing to cut the pattern to measure, it will be necessary to have by your side the left-foot last already fitted up, so as to take therefrom the dimensions for your standard. Though it is often essential to cut a pattern from the last, yet in these "go-a-head times," when time, labour, and money are accounted synonymous terms, the quickest, simplest, and perhaps the best method of cutting patterns to measure will be as follows:—First, carefully read the directions and make sure that you really understand the requirements. Then compare the measurement with the scale of fittings as used by your firm (which every cutter should have pasted upon a wall or post near his board); you can then select at once the nearest regular pattern in use, both in fitting and design. Try the zinc lining pattern with your inch tape (most firms use the standard for lining patterns), and if the measure corresponds, no alteration, of course, is required, and the uppers can be cut by the regular patterns. Here I may remark that when even I receive measures by post from persons outside the trade, I always find it better to cut to the regular scale if there is

not much disparity between them, because it is better to chance the usual measurement than depend upon the uncertainty of an amateur. When there is much difference between the order and the regular measurement, a new pattern will have to be cut. Place the zinc standard upon a sheet of paper, and mark round with a pencil. Any deficiency in this outline will have now to be made good by supplying the necessary addition. Suppose the pencilled outline is all right, except at the ankle, which shows a deficiency of say one inch (that is, two inches in circumference), we therefore have to increase the ankle point of the outline one inch. It is the application of this addition that is the test of the pattern-cutter's skill. As a general rule it is not to be added at the back, neither in the front; half-and-half is not far out, but one-third in front and two-thirds at back is about correct. The use of the side view, or what I called the elevation in my first note, will be of good service here. It must be understood that any addition applied to the ankle, if not rightly placed, will materially alter both the pitch and inclination of the pattern. The heel measure is often a source of annoyance in this respect. The measure may be right, but the throat may be caught, that is, the pitch corner is too angular and short, and the extreme back of the heel, in consequence, projects too much. Or it may be the reverse of this, the corner of heel being too tight and the throat too full, while the measurement seems all right. Some feet will require a pattern cut on the former and some on the latter plan. The designer will be all at sea in regard to this if he is not provided with side elevation, which is the best indication of peculiarities, such as long or short, arched or flat insteps; turned up, flat, thick, or thin toes; projecting, pointed, or wing thick heel, and so on. When the pattern has to be increased at the instep and joints, the necessary addition must not be placed all along the top of the pattern, because this would raise the toe above its right position. The increase must be equally shared at both the top and bottom of the pattern, and tapered to nothing at the extremities. Judgment must guide this, for there are a lot of little things which have to be guarded against

—apparent trifles, which it is impossible to communicate, but which the bespoke pattern-cutter will learn by a kind of instinct.

It seems strange when we find out that a pattern can hardly be altered in any one place without influencing the position of another. For instance, when we try to reduce the heel measure by cutting a piece off at the bottom of the pattern,

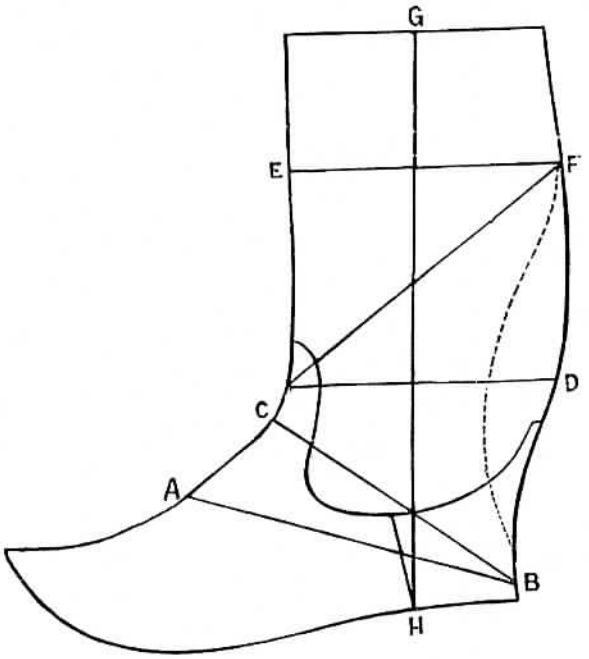

FIG. 17.

we change the inclination; and if at the throat we cut away, the pitch is altered. Also, if the back of the heel is cut away when trying to reduce the heel measurement, we shorten the whole pattern in length.

When a pattern has to be increased by a full fitting, $\frac{1}{16}$in. added all round, except at the toe and back of pattern, will be right, if a trifle extra is allowed at the throat. This increases

the fitting $\frac{1}{4}$in. all through, and about $\frac{3}{8}$ at heel. If an increase of two fittings is necessary, $\frac{5}{8}$in. is used instead of $\frac{1}{16}$in., and so on. In reducing one or two fittings, the reverse of this process should be adopted. Some pattern-cutters, in reducing a standard from a 5 fitting to a 3's, cut off a $\frac{1}{4}$in. from the toe to the top of leg, leaving the back and bottom of the pattern in its original state. This is a serious error, for the pitch of the pattern is disarranged. Such a pattern will never fit properly, for, as a general rule, slender, bony feet require a design the very opposite of this. With most people who have hard, bony feet, it will be observed that their leg has altogether a forward tendency—a long, projecting heel, thin ankle, and toes wide in comparison. The pattern to fit such people must conform to the character of the foot. In cutting patterns quick methods may be handy, but when they are wrong a misfit is unpleasant.

The temporary standard being obtained, a second one is cut by the first, if the patterns are to be preserved for future use (which they should be if the measurements are very unusual). This second pattern is now to be cut up into the parts which constitute the required design. This design is marked out first with a pencil, using the regular covering patterns as a guide to prevent the blunders so common in many bespoke-made boots. The regular patterns must be of great service in designing bespoke ones, for it stands to reason that a cutter will be likely to have taken special pains with a pattern that was required for general use. Suppose we have to cut the standard into the parts which make a man's elastic boot with a joined golosh. We must first of all settle upon the height of vamp, width of wings or depth of golosh, width and pitch of gore, &c. Although these points are found by the relative proportions of the parts to the whole, yet in designing bespoke patterns, the quickest and safest guide is to use the nearest covering patterns. Fig. 16 shows the standard cut into its component parts. All that is now necessary is to add the allowance for seams, &c., to the parts marked 1, 2, 3, 5. The vamp part, No. 4, is placed against a double sheet of paper, and scored

round. The dotted line upon the top shows how the curve should be placed against the straight edge of the folded paper. The vamp, I find, should never be placed any other way than this. Drafting the standard is, of course, necessary; but springing the vamp is nonsensical. It will be noticed that a vamp got out in this manner will gain a certain amount of fullness across the joints. To counteract this, and give the pattern a more economical set, a piece, as shown by the dotted line A B, should be cut off. This is all the more necessary in round vamps, where in clicking the toe of one is placed in the hollow of the other. The parts 1 and 3, besides having the allowance for seams and overlapping, sometimes have peaks at the top. These can be arranged for in the clicking.

The cutting of what is generally known as "long work" appears far more difficult than it really is. A great quantity of this class of work is cut at the present day by the extolled "jockey-closer," who generally cuts direct from the leather, taking little or no help from one or two patterns which he jealously keeps from the prying eyes of those who are "not in the know." Whatever may be the practice of those who make this specialty their sole occupation, it is advisedly our business to consider the cutting of patterns alone.

We have, in the first place, to construct our long standard—see Fig. 17. From this foundation it is simplicity itself to obtain all the various designs which come under the category of long work, embracing as it does the different heights and styles from the low "Clarence" to the tall thigh boot. In cutting this long standard, the important thing that has to be calculated, is to secure the free passage of the foot into the boot. The fundamental rule, then, that governs the whole range of long work is that the ankle portion must almost equal the heel measure. In ordinary standards the small of the leg is cut to the ankle measure; but if this was so in long work, it is evident the foot could not pass through, for the simple reason that the heel is larger than the ankle. Get a large sheet of paper and mark upon it a man's 7's ordinary standard, produce the front line of this standard 10in. up from the "pitch" of pattern, keeping to the same "inclination." From the top of this front ne draw a horizontal line to represent height of standard. Then proceed to measure off the lines at C B, C D, and E F. Make C B fully up to heel measure, and C D equal to C B, minus ½, which is necessary for draft; E F is to be ¼ over the fullest calf measure (two measures are often required for the calf one at E F, and another below it). The top line passing G is to be ¼in. under E F. The draft which we give at the small of the leg must be varied according to the elasticity of the leather and the formation of foot. Practice, as in a great many more cases, has taught the trade to know that the line C D should almost equal the heel measure, though very few, I believe, have troubled themselves to observe the cause. In reality, it is not the heel measure that has to be calculated at all; it is the line A B we must provide for. Carefully observe a man putting on a long boot, and you will see that when his foot is half way down the leg, it is the low instep and not the throat of his foot that presses against the front of the boot, while the tip of his heel is in contact with the back-seam. Now, the line C D would have to equal the line A B, only that when the foot is passing through the leg it comes down at a very obtuse angle; therefore, line A B in coming down the leg would about correspond with C F, and, consequently, C F being in this oblique position enables us to make C D as small as the side of a square, of which C F would be the diagonal. It will then be found, as a rule, that C D will about correspond with the heel measure. But though the heel has been used generally as the guide for the width at small of leg, yet some people can get on boots nearly 2 in. less than the heel measure. Against this, many others require the small of leg much larger than heel measure. The cause is this: One person will have a high protruding instep, which causes the line A B to be longer; again, some people can hardly bend the foot out of its square position, while others can extend the foot so obliquely as would cause the line C F to be almost vertical.

Measure for long work the same as in short work, only take the measure of the calf, its location, and the distance the top of

boot is to be from outside waist (cuboid bone). It was fashionable at one time to have the portions of back-seam from D to F come out in a great swell, but in high-class work no curvature is permissible. The popular wish at the present time is to have this portion perfectly straight. The part below D should be distinctly but slightly curved in, as seen in diagram. This, together with making C D ½ inch under heel measure, means what we call drafting the long standard. This draft depends to a great extent upon substance of material used. If we did not give this draft the boot would come off too easily, and the foot would be very loose and constantly slipping at the heel, whereas there should be a *little* difficulty in getting the boot on at the ankle portion. Then the foot will enter the lower portion of boot with a sudden jerk, which is the very thing that is required to grip the boot on the foot. Sometimes you will hear it said, in measuring the ankle in a long pattern, "Place your tape across from the throat to seat (line C B); then every part of leg above line should be equal to the heel measure." But I hold that a line coming from C to a point between D and B should be ½in. at least less than heel measure, for if not there is no other possible means to keep the boot comfortably on the foot. To pencil out this standard for the design of a hunting, jockey, or coachman's boot, all we have to do is to mark off the shape and range of "tongue" and "counter." The curve seen in diagram coming from top of tongue down along "range," and continued up back of counter, is the most suitable for the utility and ware of this design, especially the ordinary style. If the portion of range at turn of tongue be made more acute than shown, an unsightly amount of looseness is bound to appear after a short time in the leg. In opposition to this, we have the majority of what is called "stylish-cut long work," having the range completely straight like an ordinary gol, and the curve at turn of tongue decidedly angular. The peak of tongue is often marked in many different curves, but the plain shape seen in Fig. 17 is only permissible for strong work. The range should always pass under the ankle joint. As a rule, the line separating the counter and tongue at H should measure from

2½in. to 2⅞in. The height of ordinary jockey boot is 15in., but when not "jacked," and intended to "bellows in the leg," 2in. extra is necessary. The "jockey top" is cut to correspond with the top of leg; 5in. deep and ½in. wider than E F. A back strap about ⅜ in. wide and about 11 in. long is all that is required in the way of covers. By manipulating this pencil work by the ordinary principles, and leaving the usual allowances for seams (flat-seams require no extra material) under-laying, &c., we get out the coverings for our jockey boot.

A Napoleon is designed same as above, only the front comes up with a kind of ogee curve to about 3 in. higher. When Napoleons are to be worn with trousers they should be cut about 2 in. wider in the leg, and 1 in. lower at back.

A thigh boot is got out like the above. The extra height is marked off to measurements of both location and girth of thigh. A line is graduated from the back of thigh to meet top and back of our original standard. To give the boot a natural sit, we have to cut out a gore piece at what would be the bend of the knee. This gore should be curved somewhat like the top of a Napoleon, and be 2in. wide at back, tapering through until it comes to nothing at about 1in. from front line. Fishermen's, or strong boots cut on the principle of the above, or the shorter Napoleon design, sometimes have the tongue cut plain like an ordinary Blucher vamp, and closed outside the leg. Wellington boots, instead of having the seam down the back of leg, contain one at each side. The front and back of the common Wellington has the front in one piece and the back likewise. Inside counters are also the features of this boot. The dress Wellington is made up of four parts—the front and back legs, the tongue and outside counter. Wellingtons are drafted by cutting out a curve at each side of seams five inches from bottom of pattern; the middle of curve should be concaved enough as to take ¼in. of small of leg. This altogether gives the boot a draft of 1 in. The Newmarket is cut like the jockey boot, but the seam of counter should come at back. The measurements for the average run of long work is:—Size 7's, 14in. high; toes, 8¾in.; instep, 9½in.; heel, 12¾in.; calf, 14in.;

A "cran pumped out" of a jockey closer is "measure from the throat 5in. down instep and up leg; then a 9in. line connecting these points would fix the 'inclination.'" All long work is generally cut very dead, especially with light material.

To prepare working patterns for the clicking room, it is only necessary to transfer our paper ones to some material that would be both handy and serviceable. Wood, leather, cardboard, tin, zinc, sheet-iron, &c., have been used for working patterns; but the only two materials which hold their own as yet are No. 15 zinc or strawboard (afterwards bound with brass). Tin, with strong brown paper glued on each side, is a very nice and light substance. Still, I think myself that zinc is the most suitable for this purpose. Mark out the outline of your paper patterns with a short awl, then cut out with a shears. (Price 2s. 6d.; a very good machine for this purpose is manufactured by most tool manufacturers, price £1 15s.). When the zinc is roughly cut out it must be hammered level on a hard-wood block. Then the sharp edge is to be filed off, and finished smooth with emery paper. The patterns are next to be punched and stamped. A punch about the size of a shilling is very useful for getting at awkward spots. Instead of stamping the patterns they can be marked with an indelible ink, composed of 1 oz. verdigris, 1 oz. sal-ammoniac, ½ oz. lampblack, mixed with half-pint of water in an earthenware bottle. The zinc should be cleaned, either with a little soda or emery; if not, this acid won't take.

In conclusion, I only say, for myself, I have tried to deal thoroughly with every detail of pattern cutting. Through a miscalculation, I am brought to rather an abrupt close; I intended to deal more minutely with long work, and the arrangement of patterns, &c., but find it impossible at present. However, as the treatise stands, I only ask that my instructions be carefully read; then no misunderstanding can arise. If it be done, the success that I heartily wish all earnest students in this profitable study will, I am sure, be fully attained.

THE END.

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Closed Uppers, Gaiters, Leather Grindery and Shoe Mercery.

UPPERS OF EVERY DESCRIPTION MADE TO CUSTOMERS' OWN MEASURES, WITH PUNCTUALITY.

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Machine Sewn, Stitched, Standard Screwed, Wire Quilted, Pegged and Riveted Boots and Shoes,

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SEA, FISHING, SHOOTING, and BUTCHERS' BOOTS,
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OXFORD SHOES,
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In all Qualities.

MEN'S AND BOYS' CRICKET, FOOTBALL, AND LAWN TENNIS SHOES.

The above are made in all the Newest Shapes, and Latest Styles.

JONES'S PATTERN MARKER

BOOT & SHOE PATTERN MARKER.

Guaranteed that anyone by the aid of the Marker, can mark out any pattern, from a child's to a man's jockey, without any previous knowledge of the trade. In submitting the above, F. A. J. begs to call special attention to its simplicity and accuracy. The marker is a piece of zinc or steel, which, by moving about in different directions, so forms the pattern required. To Youths learning the trade and inferior pattern cutters it is invaluable. Shall be pleased to allow anyone (who may call) to mark out any pattern they may desire. Purchase optional. Heads of Manufactories and Teachers of Classes are especially invited.

Price, ZINC, 5s. 6d.; STEEL, 21s.

Obtainable only of the Patentee—**F. A. JONES,** 103, Crawford-st., Marylebone, London.

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The following London Testimonials can be seen at the Office:—

From S. HARRISON, Boot & Shoe Manufacturer,
307-309, Grays Inn-road, W.C.

Dear Sir,—Your new method of Pattern Cutting is without doubt a very clever and useful invention, it being so simple that it may be learned by anyone of ordinary capacity in a short time.

Yours truly,
S. HARRISON.

From THOMAS WATTS, Boot & Shoe Manufacturer,
42, Myrtle-street, Hoxton.

Dear Sir,—Having seen your Pattern Cutter in use, I have pleasure in testifying to its speed and accuracy, and consider it a most useful invention, more especially to bespoke cutters. It enables a person to cut a pattern of anything, from an infant's boot or shoe to a Wellington, in a very short space of time.

Yours truly,
T. WATTS.

From E. L. BROWNING, 1a, Dean-street, Fetter-lane.

Dear Sir,—I received your letter and High Leg Pattern enclosed cut by your Patent Pattern Marker, and after seeing you use it last week, consider it very useful to the trade, and a ready system of Pattern Cutting.

I remain, yours truly,
E. F. BROWNING

To Mr. Jones.

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GENERAL SHOE FINDING WAREHOUSE.

A Large and Well-Seasoned Stock of Lasts, remarkable for Finish and Cheapness, always on hand.

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THE LOWEST QUOTATION OF ALL WELL-KNOWN TANNAGES GIVEN IMMEDIATELY ON APPLICATION.

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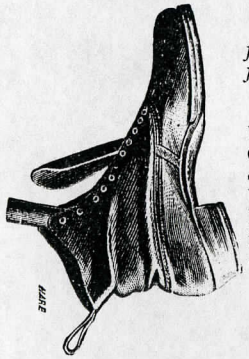
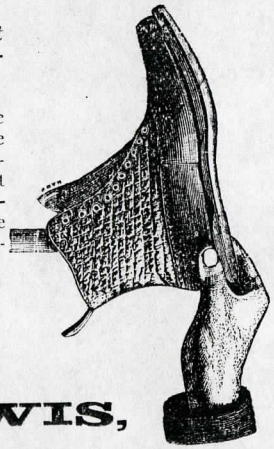
EASY-EXIT-LAST.



Hundreds of Sets to select from, also made to Manufacturers' own Models.

No matter how correct the Pattern is Cut, by using the Old Last, every boot is strained during Manufacture, but by using the EASY-EXIT-LAST every boot and shoe is made and removed without strain.

KNIVES
Of guaranteed quality.



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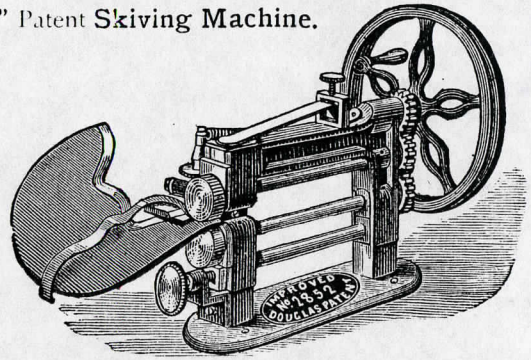
Improved "Douglas" Patent Skiving Machine.

PRICES:—

Machine Complete for Hand - £4 4 0

Machine Complete for Power - £5 5 0

Machine on Strong Iron Stand, with Treadle £6 6 0



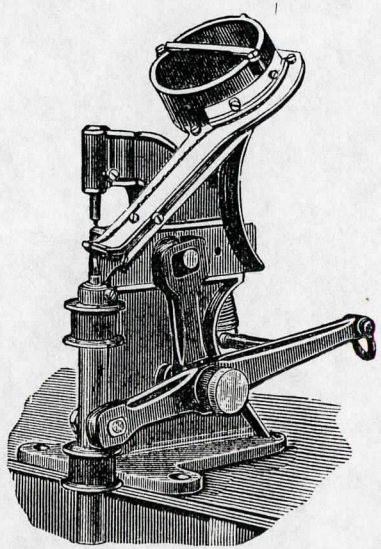
Sample of Testimonials.

Kingswood Hill, near Bristol,
November 17th, 1884.

Gentlemen,

Please supply us with another "Douglas" Improved Skiver, with power appliance. We are pleased to state, we consider this machine one of the most valuable in the trade, and shall be glad to give you a testimonial at any time.

Yours truly, E. W. PRATT.



The "Douglas" Patent
Self-Feeding Eyelet Machine.

Colchester, *August 10, 1887.*

DEAR SIRS,

In reply to your letter of yesterday's date, I have pleasure in enclosing cheque in payment for Eyeletting Machine, and to inform you that the machine has been in constant work for several weeks, doing its work satisfactorily and well.

Yours truly, J. KAVANAGH.

PRICES:—

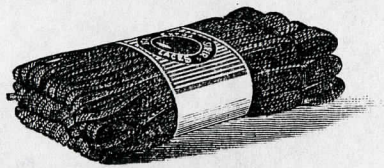
Machine with Treadle, to fix on bench - - £4 4 0

Machine on Strong Iron Stand with table - - £5 5 0

Sent on approval on receipt of sample box of eyelets.

KINGSWOOD .·. HILL, .·. BRISTOL.

WAREHOUSE
Southampton St.



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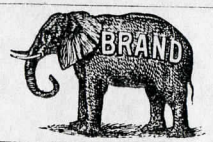

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