

CHRISTOPHER WHALL

STAINED GLASS WORK:
A TEXT-BOOK FOR
STUDENTS AND
WORKERS IN GLASS

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Christopher Whall Stained Glass Work: A text-book for students and workers in glass

" ... And remembering these, trust Pindar for the truth of his saying, that to the cunning workman—(and let me solemnly enforce the words by adding, that to him only)—knowledge comes undeceitful."

—Ruskin ("Aratra Pentelici").

"'Very cool of Tom,' as East thought but didn't say, 'seeing as how he only came out of Egypt himself last night at bed-time.'"

—("Tom Brown's Schooldays").

To his Pupils and Assistants, who, if they have learned as much from him as he has from them, have spent their time profitably; and who, if they have enjoyed learning as much as he has teaching, have spent it happily; this little book is Dedicated by their Affectionate Master and Servant,

THE AUTHOR.



EDITOR'S PREFACE

In issuing these volumes of a series of Handbooks on the Artistic Crafts, it will be well to state what are our general aims.

In the first place, we wish to provide trustworthy text-books of workshop practice, from the points of view of experts who have critically examined the methods current in the shops, and putting aside up a standard of quality in the crafts which are more especially associated with design. Secondly, in doing this, we hope to treat design itself as an essential part of good workmanship. During the last century most of the arts, save painting and sculpture of an academic kind, were little considered, and there was a tendency to look on "design" as a mere matter of *appearance*. Such "ornamentation" as there was was usually obtained by following in a mechanical way a drawing provided by an artist who often knew little of the technical processes involved in production. With the critical attention given to the crafts by Ruskin and Morris, it came to be seen that it was impossible to detach design from craft in this way, and that, in the widest sense, true design is an inseparable element of good quality, involving as it does the selection of good and suitable material, contrivance for special purpose, expert workmanship, proper finish, and so on, far more than mere ornament, and indeed, that ornamentation itself was rather an exuberance of fine workmanship than a matter of merely abstract

lines. Workmanship when separated by too wide a gulf from fresh thought—that is, from design—inevitably decays, and, on the other hand, ornamentation, divorced from workmanship, is necessarily unreal, and quickly falls into affectation. Proper ornamentation may be defined as a language addressed to the eye; it is pleasant thought expressed in the speech of the tool.

In the third place, we would have this series put artistic craftsmanship before people as furnishing reasonable occupations for those who would gain a livelihood. Although within the bounds of academic art, the competition, of its kind, is so acute that only a very few per cent. can fairly hope to succeed as painters and sculptors; yet, as artistic craftsmen, there is every probability that nearly every one who would pass through a sufficient period of apprenticeship to workmanship and design would reach a measure of success.

In the blending of handwork and thought in such arts as we propose to deal with, happy careers may be found as far removed from the dreary routine of hack labour as from the terrible uncertainty of academic art. It is desirable in every way that men of good education should be brought back into the productive crafts: there are more than enough of us "in the city," and it is probable that more consideration will be given in this century than in the last to Design and Workmanship.

Our last volume dealt with one of the branches of sculpture, the present treats of one of the chief forms of painting. Glass-painting has been, and is capable of again becoming, one of

the most noble forms of Art. Because of its subjection to strict conditions, and its special glory of illuminated colour, it holds a supreme position in its association with architecture, a position higher than any other art, except, perhaps, mosaic and sculpture.

The conditions and aptitudes of the Art are most suggestively discussed in the present volume by one who is not only an artist, but also a master craftsman. The great question of colour has been here opened up for the first time in our series, and it is well that it should be so, in connection with this, the pre-eminent colour-art.

Windows of coloured glass were used by the Romans. The thick lattices found in Arab art, in which brightly-coloured morsels of glass are set, and upon which the idea of the jewelled windows in the story of Aladdin is doubtless based, are Eastern off-shoots from this root.

Painting in line and shade on glass was probably invented in the West not later than the year 1100, and there are in France many examples, at Chartres, Le Mans, and other places, which date back to the middle of the twelfth century.

Theophilus, the twelfth-century writer on Art, tells us that the French glass was the most famous. In England the first notice of stained glass is in connection with Bishop Hugh's work at Durham, of which we are told that around the altar he placed several glazed windows remarkable for the beauty of the figures which they contained; this was about 1175.

In the Fabric Accounts of our national monuments many

interesting facts as to mediæval stained glass are preserved. The accounts of the building of St. Stephen's Chapel, in the middle of the fourteenth century, make known to us the procedure of the mediæval craftsmen. We find in these first a workman preparing white boards, and then the master glazier drawing the cartoons on the whitened boards, and many other details as to customs, prices, and wages.

There is not much old glass to be studied in London, but in the museum at South Kensington there are specimens of some of the principal varieties. These are to be found in the Furniture corridor and the corridor which leads from it. Close by a fine series of English coats of arms of the fourteenth century, which are excellent examples of Heraldry, is placed a fragment of a broad border probably of late twelfth-century work. The thirteenth century is represented by a remarkable collection, mostly from the Ste. Chapelle in Paris and executed about 1248. The most striking of these remnants show a series of Kings seated amidst bold scrolls of foliage, being parts of a Jesse Tree, the narrower strips, in which are Prophets, were placed to the right and left of the Kings, and all three made up the width of one light in the original window. The deep brilliant colour, the small pieces of glass used, and the rich backgrounds are all characteristic of mid-thirteenth-century glazing. Of early fifteenth-century workmanship are the large single figures standing under canopies, and these are good examples of English glass of this time. They were removed from

Winchester College Chapel about 1825 by the process known as restoration.

W. R. LETHABY.

January 1905.

AUTHOR'S PREFACE

The author must be permitted to explain that he undertook his task with some reluctance, and to say a word by way of explaining his position.

I have always held that no art can be taught by books, and that an artist's best way of teaching is directly and personally to his own pupils, and maintained these things stubbornly and for long to those who wished this book written. But I have such respect for the good judgment of those who have, during the last eight years, worked in the teaching side of the art and craft movement, and, in furtherance of its objects, have commenced this series of handbooks, and such a belief in the movement, of which these persons and circumstances form a part, that I felt bound to yield on the condition of saying just what I liked in my own way, and addressing myself only to students, speaking as I would speak to a class or at the bench, careless of the general reader.

You will find yourself, therefore, reader, addressed as "Dear Student." (I know the term occurs further on.) But because this book is written for students, it does not therefore mean that it must all be brought within the comprehension of the youngest apprentice. For it is becoming the fashion, in our days, for artists of merit—painters, perhaps, even of distinction—to take up the practice of one or other of the crafts. All would be well, for such new workers are needed, if it was indeed the *practice* of the craft

that they set themselves to. But too often it is what is called the *designing* for it only in which they engage, and it is the duty of every one speaking or writing about the matter to point out how fatal is that error.

One must provide a word, then, for such as these also here if one can.

Indeed, to reckon up all the classes to whom such a book as this should be addressed, we should have, I think, to name:—(1) The worker in the ordinary "shop," who is learning there at present, to our regret, only a portion of his craft, and who should be given an insight into the whole, and into the fairyland of design.

(2) The magnificent and superior artist, mature in imagination and composition, fully equipped as a painter of pictures, perhaps even of academical distinction, who turns his attention to the craft, and without any adequate practical training in it, which alone could teach its right principles, makes, and in the nature of things is bound to make, great mistakes—mistakes easily avoidable. No such thing can possibly be right. Raphael himself designed for tapestry, and the cartoons are priceless, but the tapestry a ghastly failure. It could not have been otherwise under the conditions. Executant separated from designer by all the leagues that lie between Arras and Rome.

(3) The patron, who should know something of the craft, that he may not, mistrusting, as so often at present, his own taste, be compelled to trust to some one else's Name, and of course looks

out for a big one.

(4) The architect and church dignitary who, having such grave responsibilities in their hands towards the buildings of which they are the guardians, wish, naturally, to understand the details which form a part of their charge. And lastly, a new and important class that has lately sprung into existence, the well-equipped, picked student—brilliant and be-medalled, able draughtsman, able painter; young, thoughtful, ambitious, and educated, who, instead of drifting, as till recently, into the overcrowded ranks of picture-making, has now the opportunity of choosing other weapons in the armoury of the arts.

To all these classes apply those golden words from Ruskin's "Aratra Pentelici" which are quoted on the fly-leaf of the present volume, while the spirit in which I myself would write in amplifying them is implied by my adopting the comment and warning expressed in the other sentence there quoted. The face of the arts is in a state of change. The words "craft" and "craftsmanship," unheard a decade or two ago, now fill the air; we are none of us inheritors of any worthy tradition, and those who have chanced to grope about for themselves, and seem to have found some safe footing, have very little, it seems to me, to plume or pride themselves upon, but only something to be thankful for in their good luck. But "to have learnt faithfully" one of the "ingenuous arts" (or crafts) *is* good luck and *is* firm footing; we may not doubt it who feel it strong beneath our feet, and it must be proper to us to help towards it the doubtless quite

as worthy or worthier, but less fortunate, who may yet be in some of the quicksands around.

It also happens that the art of stained glass, though reaching to very high and great things, is in its methods and processes a simple, or at least a very limited, one. There are but few things to do, while at the same time the principles of it touch the whole field of art, and it is impossible to treat of it without discussing these great matters and the laws which guide decorative art generally. It happens conveniently, therefore, as the technical part requires less space, that these things should be treated of in this particular book, and it becomes the author's delicate and difficult task to do so. He, therefore, wishes to make clear at starting the spirit in which the task is undertaken.

It remains only to express his thanks to Mr. Drury and Mr. Noel Heaton for help respectively, with the technical and scientific detail; to Mr. St. John Hope for permission to use his reproductions from the Windsor stall-plates, and to Mr. Selwyn Image for his great kindness in revising the proofs.

C. W. WHALL.

January 1905.

PART I

CHAPTER I INTRODUCTORY, AND

CONCERNING THE RAW MATERIAL

You are to know that stained glass means pieces of coloured glasses put together with strips of lead into the form of windows; not a picture painted on glass with coloured paints.

You know that a beer bottle is blackish, a hock bottle orange-brown, a soda-water bottle greenish-white—these are the colours of the whole substance of which they are respectively made.

Break such a bottle, each little bit is still a bit of coloured glass. So, also, blue is used for poison bottles, deep green and deep red for certain wine glasses, and, indeed, almost all colours for one purpose or another.

Now these are the same glass, and coloured in the same way as that used for church windows.

Such coloured glasses are cut into the shapes of faces, or figures, or robes, or canopies, or whatever you want and whatever the subject demands; then features are painted on the faces, folds on the robes, and so forth—not with colour, merely with brown shading; then, when this shading has been burnt into the glass

in a kiln, the pieces are put together into a picture by means of grooved strips of lead, into which they fit.

This book, it is hoped, will set forth plainly how these things are done, for the benefit of those who do not know; and, for the benefit of those who do know, it will examine and discuss the right principles on which windows should be made, and the rules of good taste and of imagination, which make such a difference between beautiful and vulgar art; for you may know intimately all the processes I have spoken of, and be skilful in them, and yet misapply them, so that your window had better never have been made.

Skill is good if you use it wisely and for good end; but craft of hand employed foolishly is no more use to you than swiftness of foot would be upon the broad road leading downwards—the cripple is happier.

A clear and calculating brain may be used for statesmanship or science, or merely for gambling. You, we will say, have a true eye and a cunning hand; will you use them on the passing fashion of the hour—the morbid, the trivial, the insincere—or in illustrating the eternal truths and dignities, the heroisms and sanctities of life, and its innocencies and gaieties?

This book, then, is divided into two parts, of which the intention of one is to promote and produce skilfulness of hand, and of the other to direct it to worthy ends.

The making of glass itself—of the raw material—the coloured glasses used in stained-glass windows, cannot be

treated of here. What are called "Antiques" are chiefly used, and there are also special glasses representing the ideals and experiments of enthusiasts—Prior's "Early English" glass, and the somewhat similar "Norman" glass. These glasses, however, are for craftsmen of experience to use: they require mature skill and judgment in the using; to the beginner, "Antiques" are enough for many a day to come.

How to know the Right and Wrong Sides of a Piece of "Antique" Glass.—Take up a sheet of one of these and look at it. You will notice that the two sides look different; one side has certain little depressions as if it had been pricked with a pin, sometimes also some wavy streaks. Turn it round, and, looking at the other side, you still see these things, but blurred, as if seen through water, while the surface itself on this side looks smooth; what inequalities there are being projections rather than depressions. Now the side you first looked at is the side to cut on, and the side to paint on, and it is the side placed inwards when the window is put up.

The reason is this. Glass is made into sheets by being blown into bubbles, just as a child blows soap-bubbles. If you blow a soap-bubble you will see streaks playing about in it, just like the wavy streaks you notice in the glass.

The bubble is blown, opened at the ends, and manipulated with tools while hot, until it is the shape of a drain-pipe; then cut down one side and opened out upon a flattening-stone until the round pipe is a flat sheet; and it is this stone which gives the glass

the different texture, the dimpled surface which you notice.

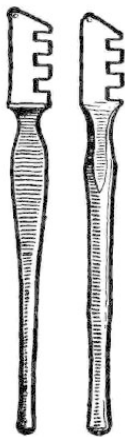
Some glasses are "flashed"; that is to say, a bubble is blown which is mainly composed of white glass; but, before blowing, it is also dipped into another coloured glass—red, perhaps, or blue—and the two are then blown together, so that the red or blue glass spreads out into a thin film closely united to, in fact fused on to, and completely one with, the white glass which forms the base; most "Ruby" glasses are made in this way.

CHAPTER II

Cutting (elementary)—The Diamond—The Wheel—Sharpening—How to Cut—Amount of Force—The Beginner's Mistake—Tapping—Possible and Impossible Cuts—"Grozeing"—Defects of the Wheel—The Actual Nature of a "Cut" in Glass.

No written directions can teach the use of the diamond; it is as sensitive to the hand as the string of a violin, and a good workman feels with a most delicate touch exactly where the cutting edge is, and uses his tool accordingly. Every apprentice counts on spoiling a guinea diamond in the learning, which will take him from one to two years.

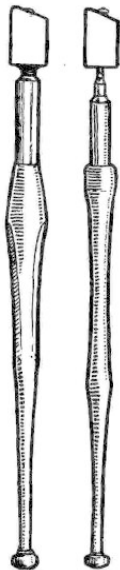
Most cutters now use the wheel, of which illustrations are given (figs. 1 and 2).



Figs. 1 and 2.

The wheels themselves are good things, and cut as well as the diamond, in some respects almost better; but many of the handles are very unsatisfactory. From some of them indeed one might suppose, if such a thing were conceivable, that the maker knew nothing of the use of the tool.

For it is held thus (fig. 5), the pressure of the *forefinger* both guiding the cut and supplying force for it: and they give you an *edge* to press on (fig. 1) instead of a surface! In some other patterns, indeed, they do give you the desired surface, but the tool is so thin that there is nothing to grip. What ought to be done is to reproduce the shape of the old wooden handle of the diamond proper (figs. 3 and 4).



Figs. 3 and 4.

The foregoing passage must, however, be amplified and modified, but this I will do further on, for you will understand the reasons better if I insert it after what I had written further with regard to the cutting of glass.

How to Sharpen the Wheel Cutter.—The right way to do this is difficult to describe in writing. You must, first of all, grind down the "shoulders" of the tool, through which the pivot of the wheel goes, for they are made so large that the wheel cannot reach the

stone (fig. 6), and must be reduced (fig. 7). Then, after first oiling the pivot so that the wheel may run easily, you must hold the tool as shown in fig. 8, and rub it swiftly up and down the stone. The angle at which the wheel should rest on the stone is shown in fig. 9. You will see that the angle at which the wheel meets the stone is a little *blunter* than the angle of the side of the wheel itself. You do not want to make the tool *too sharp*, otherwise you will risk breaking down the edge, when the wheel will cease to be truly circular, and when that occurs it is absolutely useless. The same thing will happen if the wheel is *checked* in its revolution while sharpening, and therefore the pivot must be kept oiled both for cutting and sharpening.

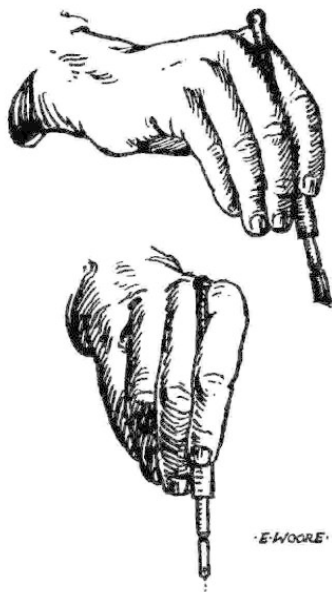
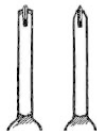


Fig. 5.

It is a curious fact to notice that the tool, be it wheel or diamond, that is *too sharp* is not, in practice, found to make so good a cut as one that is less sharp; it scratches the glass and throws up a line of splinters.



Figs. 6 and 7.



Fig. 8.

How to Cut Glass.—Hold the cutter as shown in the illustration (fig. 5), a little sloping towards you, but perfectly upright laterally; draw it towards you, hard enough to make it just *bite* the glass. If it leaves a mark you can hardly see it is a good cut (fig. 10b), but if it scratches a white line, throwing up glass-dust as it goes, either the tool is faulty, or you are pressing too hard,

or you are applying the pressure to the wheel unevenly and at an angle to the direction of the cut (fig. 10a). Not that you can make the wheel *move* sideways in the cut actually; it will keep itself straight as a ploughshare keeps in its furrow, but it will press sideways, and so break down the edges of the furrow, while if you exaggerate this enough it will actually leave the furrow, and, ceasing to cut, will "skid" aside over the glass. As to pressure, all cutters begin by pressing much too hard; the tool having started biting, it should be kept only *just biting* while drawn along. The cut should be almost *noiseless*. You think you're not cutting because you don't hear it grate, but hold the glass sideways to the light and you will see the silver line quite continuous.

Having made your cut, take the glass up; hold it as in fig. 11, press downward with the thumbs and upward with the fingers, and the glass will come apart.



Fig. 9.

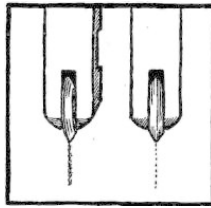


Fig. 10, a and b

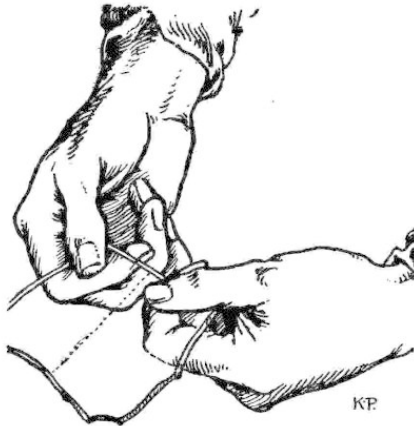


Fig. 11.

But you want to cut shaped pieces as well as straight. You cannot break these directly the cut is made, but, holding the glass as in fig. 12, and pressing it firmly with the left thumb, jerk the tool up by little, sharp jerks of the fingers *only*, so as to tap along

the underside of your cut. You will see a little silver line spring along the cut, showing that the glass is dividing; and when that silver line has sprung from end to end, a gentle pressure will bring the glass apart.

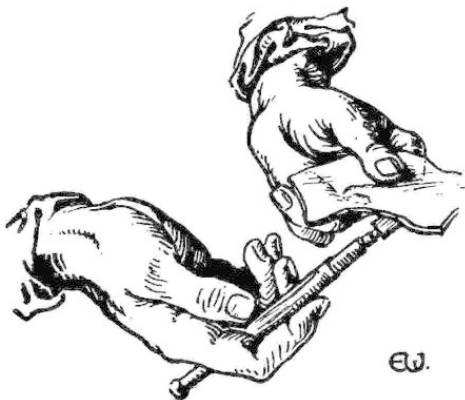


Fig. 12.

This upward jerk must be sharp and swift, but must be calculated so as only just to *reach* the glass, being checked just at the right point, as one hammers a *nail* when one does not want to stir the work into which the nail is driven. A *pushing* stroke, a blow that would go much further if the glass were not there, is no use; and for this reason neither the elbow nor the hand must move; the knuckles are the hinge upon which the stroke revolves.

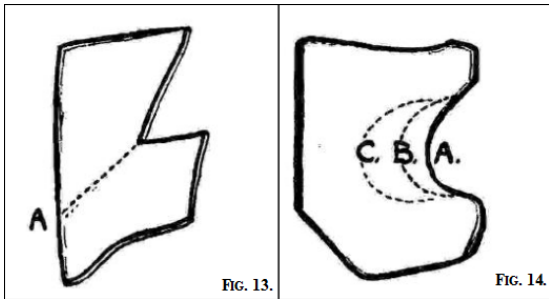


FIG. 13.

FIG. 14.

But you can only cut certain shapes—for instance, you cannot cut a wedge-shaped gap out of a piece of glass (fig. 13); however tenderly you handle it, it will split at point A. The nearest you can go to it is a curve; and the deeper the curve the more difficult it is to get the piece out. In fig. 14 A is an average easy curve, B a difficult one, C impossible, except by "groseing" or "grozeing" as cutters call it; that is, after the cut is made, setting to work to patiently bite the piece out with pliers (fig. 15).

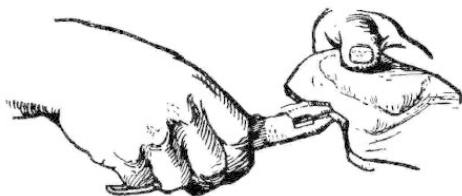


Fig. 15.

Now, further, you must understand that you must not cut round all the sides of a shaped piece of glass at once; indeed, you must only cut one side at a time, and draw your cut right up to the edge of the glass, and break away the whole piece which *contains* the side you are cutting before you go on to another.

Thus, in fig. 16, suppose the shaded portion to be the shape that you wish to cut out of the piece of glass, A, B, C, D. You must lay your gauge *anglewise* down upon the piece. Do not try to get the sides parallel to the shapes of your gauge, for that makes it much more difficult; angular pieces break off the easiest.

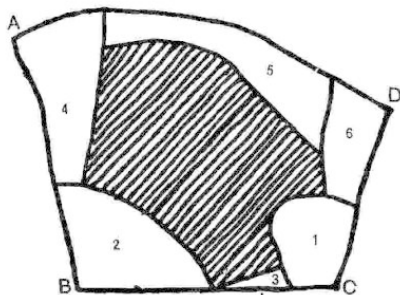


Fig. 16.

Now, then, *cut the most difficult piece first*. That marked 1. Perhaps you will not cut it quite true; but, if not, then shift the gauge slightly on to another part of the curve, and very likely it may fit that better and so *come* true.

Then follow with one of those marked 2 or 3. Probably it

would be safest to cut the larger and more difficult piece first, and get *both* the curved cuts right by your gauge; then you can be quite sure of getting the very easy small bit off quite truly, to fit into its place with both of them. Go on with 4, and then with one of those marked 5 or 6. Probably it would still be best to cut the curved piece first, unless you think that shortening it by cutting off the small corner-piece first will make the curved cut easier by making it shorter.

In any case you must only cut one side at a time, and break it away before you make the cut for another side.

Take care that you do not go back in your cut. You must try and make it quite continuous onwards; for if you go back in the cut, where your tool has already thrown up splinters, it will spoil your tool and spoil your cut also.

Difficult curves, that it is only just possible to get out by groseing, ought never to be resorted to, except for some very sufficient reason. A cartoonist who knows the craft will avoid setting such tasks to the cutter; but, unfortunately, many cartoonists do *not* know the craft. If people were taught the complete craft as they should be, this book would not have been written.

Here let me say that we cannot possibly within the narrow limits of it go thoroughly into all the very wide range of subjects connected with glass—the chemistry, the permanence, the purity of materials. With the exception of the practice of the craft, probably we shall not be able to go thoroughly into any one of

them; but I shall endeavour to *mention* them all, and to do so sufficiently to indicate the directions in which work and research and experiment may be made, for they are all three much needed in several directions.

It becomes, for instance, now my task, in modifying the passage some pages back as I promised, to go into one of these subjects in the light of inquiries made since the passage in question was written; and I let it for the time being stand just as it was, without the additional information, because it gives a picture of how such things crop up and of the way in which such investigations may be made, and of how useful and pleasant they may be.

Here then let us have—

A LITTLE DISSERTATION UPON CUTTING

Through the agent for the wheel-cutter in England I communicated with the maker and inventor in America, and told him of our difficulties and perplexities over here, and chiefly with regard to two points. First, the awkwardness of the handle, which causes the glaziers here to use the tool bound round with wadding, or enclosed in a bit of india-rubber pipe; and, secondly, the bluntness of the "jaws" which hold the wheel, and which must be ground down (and are in universal practice ground down), before the tool can be sharpened.

His reply called attention to a number of different patterns of

handle, the existence of which, I think, is not generally known, in England at any rate, and some of which seem to more or less meet the difficulties we experience, most of them also being made with malleable iron handles, so that fresh cutting-wheels can be inserted in the same handle. His letter also entered into the question of the actual dynamics of "cutting," maintaining, I think rightly, that a "cut" is made by the edge of the wheel (this not being very sharp) forcing the particles of the glass down into the mass of it by pressure.

With regard to the old-fashioned pattern of tool which we chiefly use in this country, the very sufficient explanation is that they continue to make it because we continue to demand it, a circumstance which, as he declares, is a mystery to the inventor himself! Nevertheless, as we do so, and, in spite of the variety of newer tools on the market, still go on grinding down the jaws of our favourite, and wrapping round the handle with cotton-wool, let us try and put this matter straight, and compare our requirements with the advantages offered us.

There are three chief points to be cleared up. (1) The actual nature of a "cut" in glass; (2) the question of sharpening the tool and grinding down of the jaws to do so; and (3) the "mystery" of our preference for a particular tool, although we all confess its awkwardness by the means we take to modify it.

(1) With regard, then, to the nature of a "cut" in glass I am disposed entirely to agree with the theory put forward by the inventor of the wheel, which an examination of the cuts under

the microscope, or even a 6 diameter lens, certainly also tends to confirm.

What happens appears to my non-scientific eyes to be this.

Glass is one of the most fissile or "splittable" of all materials; but it is so just in the same way that ice is, and just in the opposite way to that in which slate or talc is.

Slate or talc splits easily into thin layers or laminae, *because it already lies in such layers*, and these will come apart when the force is applied between them: but *it will only split into the laminae of which it already is composed, and along the line of the fissures which already exist between them.*

Glass, on the contrary (and the same is true of ice, or for that matter of currant-jelly and such like things), appears to be a substance which is the same in all directions, or nearly so, and therefore as liable to split in one direction as in another, and is so loosely held together that, once a splitting force is applied, the crack spreads very rapidly and easily, and therefore smoothly and in straight lines and in even planes.

The diamond, or the wheel-cutter, is such a force. Being pressed on to the surface, it forces down the particles, and these start a series of small vertical splits, sometimes nearly through the whole thickness of the glass, though invisibly so until the glass is separated. And mark, that it is the *starting* of the splits that is the important thing; there is no object in making them *deep*, it is only wasted force; they will continue to split of themselves if encouraged in the proper way (see Plates [IX.](#) and [X.](#)). Try this

as follows.

Take a bit of glass, say 3 inches by 2, and make the very smallest dint you can in it, in the middle of the narrowest dimension. You cannot make one so small that the glass will hold together if you try to break it across. It will break across in a straight line, springing from each end of the tiny cut. The cut may be only $1/8$ of an inch long; less—it may be only $1/16$, $1/32$ —as small as you will, the glass will break across just the same.

Why?

Because the cut has *started* it splitting at each end; and the material being the same all through, the split will go straight on in the direction in which it has started; there is nothing to turn it aside.

So also the pressure of the wheel starts a continuous split, or series of splits, *downwards*, into the thickness of the glass. No matter how small a distance these go in, the glass will come asunder directly pressure is applied.

Now, if you press too hard in cutting, another thing takes place.

Imagine a quantity of roofing-slates piled flat one on top of another, all the piles being of equal height and arranged in two rows, side by side, so close that the edges of the slates in one row touch the edges of those in the other row, along a central line.

Wheel a wheelbarrow along that line over the edges of both. What would happen?

The top layer of slates would all come cocking their outer

edges up as the barrow passed over their inner ones, would they not?

Now, just so, if you press hard on your glass-cutting wheel, it will press down the edges of the groove, and though there are no layers *already made* in the glass, the pressure will *split off* a thin layer from the top surface of the glass on each side in flakes as it goes along (Plate X., d, e).

This is what gives the *noise* of the cut, c-r-r-r-r-r-; and as the thing is no use the noise is no use; like a good many other things in life, the less noise the better work, much cry generally meaning little wool, as the man found out who shaved the pig.

But the wheel or the diamond is not quite the same as the wheel of the wheelbarrow, for it has a *wedge-shaped* edge. Imagine a barrow with such a wheel; what *then* would happen to your slates? besides being cocked up by the wheel, they would also be *pushed out*, surely?

This happens in glass. You must not imagine that glass is a rigid thing; it is very elastic, and the wedge-like pressure of the wheel pushes it out just as the keel of a boat pushes the water aside in ripples (Plate X., d, e).

All these observations seem to me to bear out the theory of the inventor, and perhaps to some extent to explain it. I am much tempted to carry them further, and ask the questions, why a penknife as well as a wheel will not make a cut in glass, but will make a perfectly definite scratch on it if the glass is placed under water? and why this line so made will yet not serve for separating

the glass? and why a piece of glass can be cut in two (roughly, to be sure, but still cut in two) with a pair of scissors under water, a thing otherwise quite impossible?

But I do not think that the knowledge of these questions will help the reader to do better stained-glass windows, and therefore I will not pursue them.

(2) The question of sharpening the tool is soon disposed of.

If the tool is to be sharpened, the jaws must be ground down, whether the maker grinds them down originally or whether we do it. Is sharpening worth while, since the tool only costs a few pence?

Well, it's a question each must decide for himself; but I will just answer two small difficulties which affect the matter.

If grinding the jaws loosens the pivot, it can be hammered tight again with a punch. If sharpening wears out the oil-stone (as it undoubtedly does, and oil-stones are expensive things), a piece of fine polished Westmoreland slate will do as well, and there is no need to be chary of it. Even a piece of ground-glass with oil will do.

(3) But now as to the handle. I am first to explain the amusing "mystery" why the old pattern shown in fig. 1 still sells.

It is because the British working-man *is convinced that the wheels in this handle are better quality than any others.*

Is he right, or is it only an instance of his love for and faith in the thing he has got used to?

Or can it be that all workmen do not know of the existence of

the other types of handle? In case this is so, I figure some (fig. 17). Or is it that the wheel for some reason runs less truly in the malleable iron than in the cast iron?



Fig. 17.

Certain it is that the whole trade here prefers these wheels, and I am bound to say that as far as my experience goes they seem to me to work better than those in other handles.

But as to all the handles themselves, I must now voice our general complaint.

(1) They are too light.

For tapping our heavy antique and slab-glasses we wish we had a heavier tool.

(2) They are too thin in the handle for comfort, at least it seems so to me.

(3) The three gashes cut out of the head of the tool decrease the weight, and if these were omitted the tool would gain. Their only use that I can conceive of is that of a very poor substitute for pliers as a "groseing" tool, if one has forgotten one's pliers. But (as Serjeant Buzfuz might say) "who *does* forget his pliers?"

The whole question of the handle is complicated by the fact that some cutters rest the tool on the forefinger and some on the middle finger in tapping, and that a handle the sections of which are calculated for the one will not do equally well for the other.

But the whole thing resolves itself into this, that if we could get a tool, the handle of which corresponded in all its curves, dimensions, and sections with the old-established diamond, I think we should all be glad; and if the head, wheel, and pivot were all made of the quality and material of which fig. 1 is now made, but with the handle as I describe, many of us, I think, would be still more glad; and if these remarks lead in any degree to such results, they at least of all the book will have been worth the writing, and will probably be its best claim to a white stone in Israel, as removing one more solecism from "this so-called twentieth century."

I shall now leave this subject of cutting for the present, and describe, up to about the same point, the processes of painting, taking both on to a higher stage later—as if, in fact, I were teaching a pupil; for as soon as you can cut glass well enough to cut a piece to paint on, you should learn to paint on it, and carry the two things on step by step, side by side.

CHAPTER III

Painting (elementary)—Pigments—Mixing—How to Fill the Brush—Outline—Examples—Industry—The Needle and Stick—Completing the Outline.

The pigments for painting on glass are powders, being the oxides of various minerals, chiefly iron. There are others; but take it thus—that the iron oxide is a red pigment, and the others are introduced, mainly, to modify this. The red pigment is the best to use, and goes off less in the firing; but, alas! it is a detestably ugly *colour*, like red lead; and, do what you will, you cannot use it on white glass. Against clear sky it looks pretty well in some lights, but get it in a sidelight, or at an angle, and the whole window looks like red brick; while, seen against any background except clear sky, it always looks so from all points of view. There are various makers of these pigments. Some glass-painters make their own, and a beginner with any knowledge of chemistry would be wise to work in that direction.

I need not discuss the various kinds of pigment; what follows is a description of my own practice in the matter.

To Mix the Pigment for Painting.—Take a teaspoonful of red tracing-colour, and a rather smaller spoonful of intense black, put them on a slab of thick ground-glass about 9 inches square, and drop clean water upon them till you can work them up into a paste with the palette-knife (fig. 18); work them up for a minute

or so, till the paste is smooth and the lumps broken up, and then add about three drops of strong gum made from the purest white gum-arabic dissolved in cold water. Any good chemist will sell this, but its purity is a matter of great importance, for you want the maximum of adhesiveness with the minimum of the material.

Mix the colour well up with the knife; then take one of those long-haired sable brushes, which are called "riggers" (fig. 19), and which all artists'-colourmen sell, and fill it with the colour, diluting it with enough water to make it quite thin. Do not dilute all the pigment; keep most of it in a tidy lump, merely moist, as you ground it and not further wetted, at the corner of your slab; but always keep a portion diluted in a small "pond" in the middle of your palette.



Fig. 18.

How to Fill the Brush with Pigment.—Now you must note that this is a heavy powder floating free in water, therefore it quickly sinks to the bottom of your little "pond." *Each time you fill your brush you must "stir up the mud,"* for the "mud" is what you want to get in your brush, and not only so, but you want to get your brush *evenly full* of it from tip to base, therefore you must splay out the hairs flat against the glass, till all are wet, and then in taking it off the palette, "twiddle" it to a point quickly. This takes long to describe, but it does not take a couple of seconds to do. You must have the patience to spend so much pains on it, and even to fill the brush very often, nearly for each touch; then you will get a clear, smooth, manageable stroke for your outline, and save time in the end.

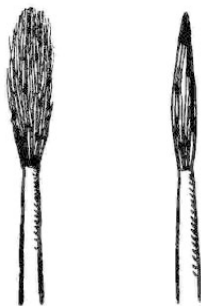


Fig. 19.

How to Paint in Outline.—Make some strokes (fig. 20) on a

piece of glass and let them dry; some people like them to stick very tight to the glass, some so that a touch of the finger removes them; you must find which suits you by-and-by, and vary the amount of gum accordingly; but to begin, I would advise that they should be just removable by a moderately hard rub with the finger, rather less hard a rub than you close a gummed envelope with.

Practise now for a time the making of strokes, large and small, dark and light, broad and fine; and when you have got command of your tools, set yourself the task of doing the same thing, *copying an example placed underneath your bit of glass*. You will find a hand-rest (fig. 21) an assistance in this.



Fig. 20.

It is difficult to give any list of examples suitable for this stage of glass, but the kind of line employed on the best *heraldry* is

always good for the purpose. The splendid illustrations of this in Mr. St. John-Hope's book of the stall-plates of the Knights of the Garter at Windsor, examples of which by the author's courtesy I am allowed to reproduce (figs. 22-22A), are ideal for bold outline-work, and fascinatingly interesting for their own sake. In most of these there is not only excellent practice in *outline*, and a great deal of it, but, mixed with it, practice also in flat washes, which it is a good thing to be learning side by side with the other.



Fig. 21.

And here let me note that there are throughout the practice of glass-painting *many* methods in use at every stage. Each person, each firm of glass-stainers, has his own methods and traditions. I shall not trouble to notice all these as we come to them, but describe what seems to me to be the best practice in each case; but I shall here and there give a word about others.

For instance: if you use sugar or treacle instead of gum, you get a rather smoother-working pigment, and after it is dry you can moisten it as often as you will for further work by merely

breathing on the surface; and perhaps if your aim is *outline only*, it may be well to try it; but if you wish to pass shading-colour over it you must use gum, for you cannot do so over treacle colour; nor do I think treacle serves so well for the next process I am to describe, which here follows.



Fig. 22.



Fig. 22a.

How to complete the Outline better than you possibly can by One Tracing.—When you take up a bit of glass from the table, after having done all you can to make a correct tracing, you will be disappointed with the result. It will have looked pretty well on the table with the copy showing behind it and hiding its defects, but it is a different thing when held up to the searching daylight. This must not, however, discourage you. No one, not the most skilful, could expect to make a perfect copy of an original (if that

original had any fineness of line or sensitiveness of touch about it) by merely tracing it downwards on the bench. You must put it upright against the daylight, and mend your drawing, freehand, faithfully by the copy.

These remarks do not, in a great degree, apply to the case of hard outlines specially prepared for literal translation. I am speaking of those where the outline is, in the artistic sense, sensitive and refined, as in a Botticelli painting or a Holbein drawing, and to copy these well you want an easel.

For this small work any kind of frame with a sheet of glass in it, and a ledge to rest your bit of glass on and a leg to stand out behind, will do, and by all means get it made (fig. 23); but do not spend too much on it, for later on you will want a bigger and more complicated thing, which will be described in its proper place—that is to say, when we come to it; and we shall come to it when we come to deal with work made up of a number of pieces of glass, as all windows must be.

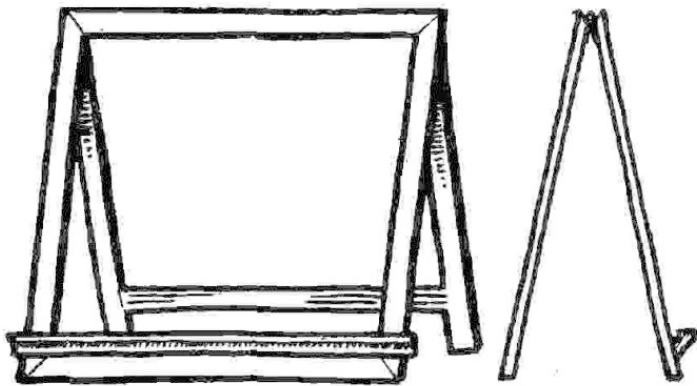


Fig. 23.

This that you have now, not being a window but a bit of glass to practise on, what I have described above will do for it.

A note to be always industrious and to work with all your might.—I advise you to put this work on an easel; but this is not the way such work is usually done;—where the work is done as a task (alas, that it could ever be so!) it is held listlessly in the left hand while touched with the right; but no artist can afford to be at this disadvantage, or at any disadvantage.

Fancy a surgeon having to hold the limb with one hand while he uses the lancet with the other, or an astronomer, while he makes his measurement, bunglingly moving his telescope by hand while he pursues his star, instead of having it driven by the clock!

You cannot afford to be less keen or less in earnest, and you want both hands free—ay! more than this—your whole body free: you must not be lazy and sit glued to your stool; you must get up and walk backwards and forwards to look at your work. Do you think art is so easy that you can afford to saunter over it?

Do, I beg you, dear reader, pay attention to these words; for it is true (though strange) that the hardest thing I have found in teaching has been to get the pupil to take the most reasonable care not to hamper and handicap himself by omitting to have his work comfortably and conveniently placed and his tools and materials in good order. You shall find a man going on painting all day, working in a messing, muddling way—wasting time and money—because his pigment has not been covered up when he left off work yesterday, and has got dusty and full of "hairs"; another will waste hour after hour, cricking his neck and squinting at his work from a corner, when thirty seconds and a little wit would move his work where he would get a good light and be comfortable; or he will work with bad tools and grumble, when five minutes would mend his tools and make him happy.

An artist's work—any artist's, but especially a glass-painter's—should be just as finished, precise, clean, and alert as a surgeon's or a dentist's. Have you not in the case of these (when the affair has not been too serious) admired the way in which the cool, white hands move about, the precision with which the finger-tips take up this or that, and when taken up use it "just so," neither more nor less: the spotlessness and order and perfect

finish of every tool and material, from those fearsome things which (though you prefer not to dwell on their uses) you cannot help admiring, down to the snowy cotton-wool daintily poked ready through the holes in a little silver beehive? Just such skill, handling, and precision, and just such perfection of instruments, I urge as proper to painting.

What Tools are wanted to complete the Outline.—I will now describe those tools which you want at this stage, that is, *to mend your outline with.*



Fig. 24.

You want the brush which you used in the first instance to paint it with, and that has already been described; but you also want points of various fineness to etch it away with where it is too thick; these are the needle and the stick (fig. 24); any needle set in a handle will do, but if you want it for fine work, take care that it be sharp. "How foolish," you say; "as if you need tell us that."

On the contrary,—nine people out of ten need telling, because they go upon the assumption that a needle *must* be sharp, "as sharp as a needle," and cannot need sharpening,—and they will go on for 365 days in a year wondering why a needle (which *must* be sharp) should take out so much coarser a light than they want.

Now as to "sticks"; if you make a point of soft wood it lasts for three or four touches and then gets "furred" at the point, and if of very hard wood it slips on the glass. Bamboo is good; but the best of all—that is to say for broad stick-lights—is an old, sable oil-colour brush, clogged with oil and varnish till it is as hard as horn and then cut to a point; this "clings" a little as it goes over the glass, and is most comfortable to use.

I have no doubt that other materials may be equally good, celluloid or horn, for example; the student must use his own ingenuity on such a simple matter.

How to Complete the Outline.—With the tools above described complete the outline—by adding colour with the brush where the lines are too fine, and by taking it away with needle or stick where they are too coarse; make it by these means exactly like the copy, and this is all you need do. But as an example of the degree of correctness attainable (and therefore to be demanded) are here inserted two illustrations (figs. 25 and 26), one of the example used, and the other of a copy made from it by a young apprentice.



FIG. 25.



FIG. 26.

CHAPTER IV

Matting—Badgering—How to preserve Correctness of Outline—Difficulty of Large Work—Ill-ground Pigment—The Muller—Overground Pigment—Taking out Lights—"Scrubs"—The Need of a Master.

Take your camel hair matting-brush (fig. 27 or 28); fill it with the pigment, try it on the slab of the easel till it seems just so full that the wash you put on will not run down till you have plenty of time to brush it flat with the badger (fig. 29).

Have your badger ready at hand and *very clean*, for if there is any pigment on it from former using, that will spoil the very delicate operation you are now to perform.

Now rapidly, but with a very light hand, lay an even wash over the whole piece of glass on which the outline is painted; use vertical strokes, and try to get the touches to just meet each other without overlapping; but there is a very important thing to observe in holding the brush. If you hold it so (fig. 30) you cannot properly regulate the pressure, and also the pigment runs away downwards, and the brush gets dry at the point; you must hold it so (fig. 31), then the curve of the hair makes the brush go lightly over the surface, while also, the body of the brush being pointed downwards, the point you are using is always being refilled.



Fig. 27.

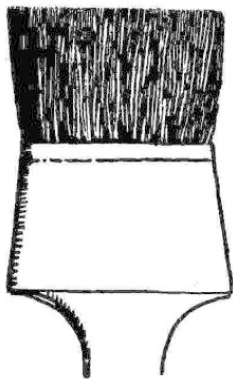


Fig. 28.

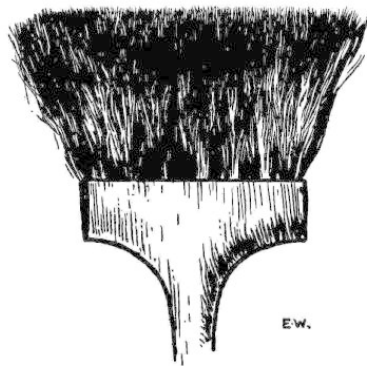


Fig. 29.

It takes a very skilful workman indeed to put the strokes so evenly side by side that the result looks flat and not stripy; indeed you can hardly hope to do so, but you can get rid of what "stripes" there are by taking your badger and "stabbing" the surface of the painting with it very rapidly, moving it from side to side so as never to stab twice in the same spot; this by degrees makes the colour even, by taking a little off the dark part and putting it on the light; but the result will look mottled, not flat and smooth. Sometimes this may be agreeable, it depends on what you are painting; but if you wish it to be smooth, just give a last stroke or two over the whole glass sideways, that is to say, holding the badger so that it stands quite perpendicular to the glass, move it, *always still perpendicular*, across the whole surface. You must not sway it from side to side, or kick it up at the end of each stroke

like a man white-washing; it must move along so that the points of the hairs are all just lightly touching the glass all the time.

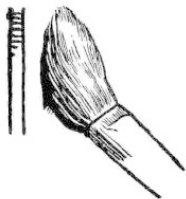


Fig. 30.

How to Ensure the Drawing of a Face being kept Correct while Painting.—If you adopt the plan of doing the first painting over an unfired outline, you must be very careful that the outline is not brushed out of drawing in the process. If you have sufficient skill it need not be so, for it is quite possible—if all the conditions as to adhesiveness are right—and if you are light-handed enough—to so lay and badger the "matt" that the outline beneath shall only be gently softened, and not blurred or moved from its place. But in any case the best plan is at the same time that you trace the outline of a head on to the glass to trace it also with equal care on to a piece of tracing paper, and arrange three or four well-marked points, such as the corner of the mouth, the pupil of the eye, and some point on the back of the head or neck, so that these cannot possibly shift, and that you may be able at any time to get the tracing back into its proper place, both on the cartoon

and on the piece of glass on which you are to paint the head. On which piece of glass also your first care should be that these three or four points should be clearly marked and unmovable; then during the whole progress of the painting you will always be able to verify the correctness of the drawing by placing your piece of tracing paper over the glass, and so seeing that nothing has shifted its place.



Fig. 31.

It requires a good deal of patience and practice to lay matt successfully over unfired outline. It is a question of the amount and quality of the gum, the condition of your brush, even the dryness or dampness of the air. You must try what degree of gum suits you best, both in the outline and in the matt which you are to pass over it. Try it a good many times on a slab of plain glass or on the plate of your easel first, before you try on your painting. Of course it's a much easier thing to matt successfully over a small piece than over a large. A head as big as the palm of your hand is not a very severe test of your powers; but in one

as large as the *whole* of your hand, say a head seven inches from crown to chin, the problem is increased quite immeasurably in difficulty. The real test is being able to produce in glass a real facsimile of a head by Botticelli or Holbein, and when you can do that satisfactorily you can do anything in glass-painting.

Do not aim to get *too much* in the first painting, at any rate not till you have had long practice. Be content if you get enough modelling on a head to turn the outline into a more sensitive and artistic drawing than it could be if planted down, raw and hard, upon the bare, cold glass. After all it is a common practice to fire the outline separately, and anything beyond this that you get upon the glass for first fire is so much to the good.

But besides the quality of the *gum* you will find sometimes differences in the quality or condition of the *pigment*. It may be insufficiently ground; in which case the matt, in passing over, will rasp away every vestige of the outline, so delicate a matter it is.

You can tell when colour is not ground sufficiently by the way it acts when laid as a vertical wash. Lay a wash, moist enough to "run," on a bit of your easel-slab; it will run down, making a sort of seaweed-looking pattern—clear lanes of light on the glass with a black grain at the lower end. Those are the bits of unground material: under a 100-diameter microscope they look like chunks of ironstone or road metal, or of rusty iron, and you'll soon understand why they have scratched away your tender outline.

You must grind such colour till it is smooth, and an old-

fashioned *granite* muller is the thing, not a glass one.

Now, after all this, how am I to excuse the paradox that it is possible to have the colour ground *too* fine! All one can say is that you "find it so." It can be so fine that it seems to slip about in a thin, oily kind of way.

It's all as you find it; the differences of a craft are endless; there is no forecasting of everything, and you must buy your experience, like everybody else, and find what suits you, learning your skill and your materials side by side.

Now these are the chief processes of painting, as far as laying on colour goes; but you still have much of your work before you, for the way in which light and shade is got on glass is almost more in "taking off" than in "putting on." You have laid your dark "matt" all over the glass evenly; now the next thing is to remove it wherever you want light or half-tone.

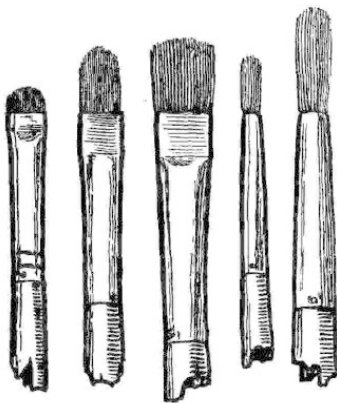


Fig. 32.

How to Finish a Shaded Painting out of the Even Matt.—This is done in many ways, but chiefly with those tools which painters call "scrubs," which are oil-colour hog-hair brushes, either worn down by use, or rubbed down on fine sandpaper till they are as stiff as you like them to be. You want them different in this: some harder, some softer; some round, some square, and of various sizes (figs. 32 and 33), and with these you brush the matt away gently and by degrees, and so make a light and shade drawing of it. It is exactly like the process of mezzotint, where, after a surface like that of a file has been laboriously produced over the whole copper-plate, the engraver removes it in various degrees, leaving the original to stand entirely only for the darkest of all shadows, and removing it all entirely only in the highest lights.

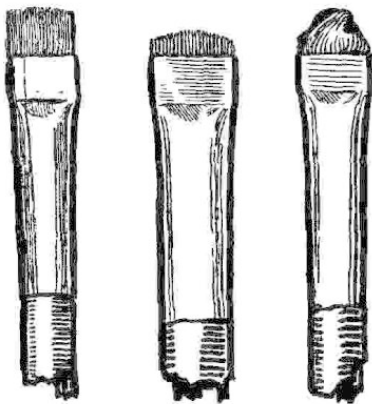


Fig. 33.

There is nothing for this but practice; there is nothing more to *tell* about it; as the conjurers say, "That's how it's done." You will find difficulties, and as these occur you will think this a most defective book. "Why on earth," you will say, "didn't he tell us about this, about that, about the other?" Ah, yes! it is a most defective book; if it were not, I would have taken good care not to write it. For the worst thing that could happen to you would be to suppose that any book can possibly teach you any craft, and take the place of a master on the one hand, and of years of practice on the other.

This book is not intended to do so; it is written to give as much

information and to arouse as much interest as a book can; with the hope that if any are in a position to wish to learn this craft, and have not been brought up to it, they may learn, in general, what its conditions are, and then be able to decide whether to carry it further by seeking good teaching, and by laying themselves out for a patient course of study and practice and many failures and experiments. While, with regard to those already engaged in glass-painting, it is of course intended to arouse their interest in, and to give them information upon, those other branches of their craft which are not generally taught to those brought up as glass-painters.

CHAPTER V

Cutting (advanced)—The Ideal Cartoon—The Cut-line—Setting the Cartoon—Transferring the Cut-line to the Glass—Another Way—Some Principles of Taste—Countercharging.

We have only as yet spoken of the processes of cutting and painting in themselves, and as they can be practised on a single bit of glass; but now we must consider them as applied to a subject in glass where many pieces must be used. This is a different matter indeed, and brings in all the questions of taste and judgment which make the difference between a good window and an inferior one. Now, first, you must know that every differently coloured piece must be cut out by itself, and therefore must have a strip of lead round it to join it to the others.

Draw a cartoon of a figure, *bearing this well in mind*: you must draw it in such a simple and severe way that you do not set impossible or needlessly difficult tasks to the cutter. Look now, for example, at the picture in Plate [V](#). by Mr. Selwyn Image—how simple the cutting!

You think it, perhaps, too "severe"? You do not like to see the leads so plainly. You would like better something more after the "Munich" school, where the lead line is disguised or circumvented. If so, my lesson has gone wrong; but we must try and get it right.

You would like it better because it is "more of a picture"; exactly, but you ought to like the other better because it is "more of a window." Yes, even if all else were equal, you ought to like it better, *because* the lead lines cut it up. Keep your pictures for the walls and your windows for the holes in them.

But all else is *not* equal: and, supposing you now standing before a window of the kind I speak of, I will tell you what has been sacrificed to get this "picture-window" "like a picture." *Stained-glass* has been sacrificed; for this is *not* stained-glass, it is painted glass—that is to say, it is coloured glass ground up into powders and painted on to white sheets of glass: a poor, miserable substitute for the glorious colour of the deep amethyst and ruby-coloured glasses which it pretends to ape. You will not be in much danger of using it when you have handled your stained-glass samples for a while and learned to love them. You will love them so much that you will even get to like the severe lead line which announces them for what they are.

But you must get to reasonably love it as a craft limitation, a necessity, a thing which places bounds and limits to what you can do in this art, and prevents tempting and specious tricks.

How to Make a "Cut-line."—But now, all this being granted, how are we to set about getting the pieces cut? First of all, I would say that it is always well to draw most, if not all, of the necessary lead lines on the cartoon itself. By the necessary lead lines I mean those which separate different colours; for you know that there *must* be a lead line between these. Then, when these

are drawn, it is a question of convenience whether to draw in also the more or less optional lead lines which break up each space of uniform colour into convenient-sized pieces. If you do not want your cartoon afterwards for any other purpose you may as well do so: that is, first "set" the cartoon if it is in charcoal or chalk, and then try the places for these lead lines lightly in charcoal over the drawing: working thus, you can dust them away time after time till they seem right to you, and then either set them also or not as you choose.

A good, useful setting-mixture for large quantities is composed by mixing equal parts of "white polish" and methylated spirit; allowing it to settle for a week, and pouring off all that is clear. It is used in the ordinary way with a spray diffuser, and will keep for any length of time.

The next step is to make what is called the cut-line. To do this, pin a piece of tracing-cloth over the whole cartoon; this can be got from any artist's-colourman or large stationer. Pin it over the cartoon with the dull surface outwards, and with a soft piece of charcoal draw lines $\frac{1}{16}$ to $\frac{1}{8}$ of an inch wide down the centre of all the lead lines: remove the cloth from the cartoon, and if any of the lines look awkward or ugly, now that you see them by themselves undisguised by the drawing below, alter them, and then, finally, with a long, thin brush paint them in, over the charcoal, with water-colour lamp-black, this time a true sixteenth of an inch wide. Don't dust the charcoal off first, it makes the paint cling much better to the shiny cloth.

When this is done, there is a choice of three ways for cutting the glass. One is to make shaped pieces of cartridge-paper as patterns to cut each bit of glass by; another is to place the bits of glass, one by one, over the cut-line and cut freehand by the line you see through the glass. This latter process needs no description, but you cannot employ it for dark glasses because you cannot see the line through: for this you must employ one of the other methods.

How to Transfer the Cutting-line on to the Glass.—Take a bit of glass large enough to cut the piece you want; place it, face upwards, on the table; place the cut-line over it in its proper place, and then slip between them, without moving either, a piece of black "transfer paper": then, with a style or hard pencil, trace the cutting-line down on to the glass. This will not make a black mark visible on the glass, it will only make a *grease* mark, and that hardly visible, not enough to cut by; but take a soft dabber—a lump of cotton-wool tied up in a bit of old handkerchief—and with this, dipped in dry whitening or powdered white chalk, dab the glass all over; then blow the surface and you will see a clear white line where the whitening has stuck to the greasy line made by the transfer paper; and by this you can cut very comfortably.

But a third way is to cut the shape of each piece of glass out in cartridge-paper; and to do this you put the cut-line down over a sheet of "continuous-cartridge" or "cartoon" paper, as it is called, and press along all the lines with a style or hard pencil, so as to make a furrow on the paper beneath; then, after removing the

cut-line, you place a sheet of ordinary window-glass below the paper and cut out each piece, between the "furrows" leaving a *full* 1/16 of an inch. This sixteenth of an inch represents the "heart" or core of the future *lead*; it is the distance which the actual bits of glass lie one from the other in the window. You must use a very sharp penknife, and you will find that, cutting against *glass*, each shape will have quite a smooth edge; and round this you can cut with your diamond.

This method, which is far the most accurate and craftsmanly way of cutting glass, is best used with the actual diamond: in that case you feel the edge of the paper all the time with the diamond-spark; but in cutting with the wheel you must not rest against the edge of the paper; otherwise you will be sure to cut into it. Now, whichever of all these processes you employ, remember that there must be a *full* 1/16 of an inch left between each piece of glass and all its neighbours.

The reason why you leave this space between the pieces is that the core of the lead is about that or a little less in thickness: the closer the glass fits to this the better, but no part of the glass must go *nearer* to its neighbour than this, otherwise the work will be pressed outwards, and you will not be able to get the whole of the panel within its proper limits.

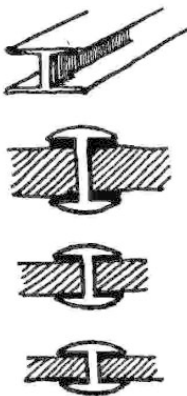


Fig. 34.

Fig. 34 is an illustration of various kinds and sizes of lead; showing some with the glass inserted in its place. By all means make your leads yourself, for many of those ready made are not lead at all, or not pure lead. Get the parings of sheet lead from a source you can trust, and cast them roughly in moulds as at fig. 35. Fig. 36 is the shears by which the strips may be cut; fig. 37 is the lead-mill or "vice" by which they are milled and run into their final shape; fig. 38 the "cheeks" or blocks through which the lead passes. The working of such an instrument is a thing that is understood in a few minutes with the instrument itself at hand, but it is cumbrous to explain in writing, and not worth while; since if you purchase such a thing, obviously the seller

will be there to explain its use. Briefly,—the handle turns two wheels with milled edges $1/16$ of an inch apart; which, at one motion, draw the lead between them, mill it, and force it between the two "cheeks" (fig. 38), which mould the outside of the lead in its passage. These combined movements, by a continuous pressure, squeeze out the strip of lead into about twice its length; correspondingly decreasing its thickness and finishing it as it goes.



Fig. 35.

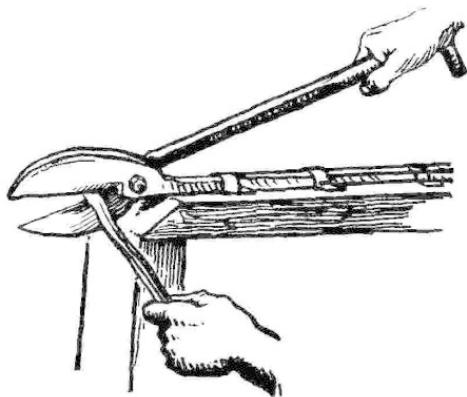


Fig. 36.

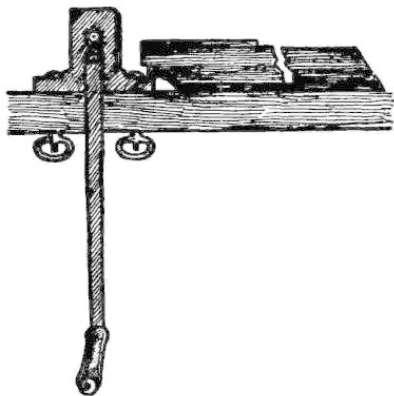


Fig. 37.

Some principles of good taste and common sense with regard to the cutting up of a Window; according to which the Cartoon and Design must be modified.—Never disguise the lead line. Cut the necessary parts first, as I said before; cut the optional parts *simply*; thinking most of craft-convenience, and not much of realism.

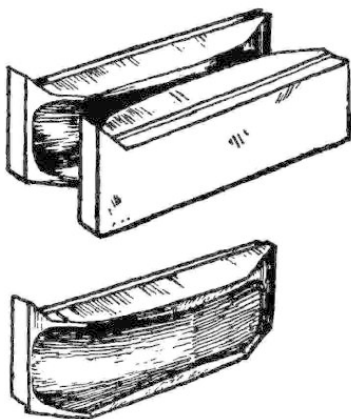


Fig. 38.

Do not, however, go to the extent of making two lead lines cross each other. Fig. 39 shows the two kinds of joint, A being the wrong one (as I hold), and B the right one; but, after all, this is partly a question of taste.

Do not cut borders and other minor details into measured

spaces; cut them hap-hazard.

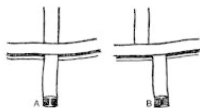


Fig. 39.

Do not cut leafage too much by the outlines of the groups of leaves—or wings by the outlines of the groups of feathers.

Do not outline with lead lines any forms of minor importance.

Do not allow the whole of any figure to cut out dark against light, or light against dark; but if the figure is ever so bright, let an inch or two of its outline tell out as a dark against a spot of still brighter light; and if it is ever so dark, be it red or blue as strong as may be, let an inch or two of its outline tell out against a still stronger dark in the background, if you have to paint it pitch-black to do so.

By this "countercharging" (as heralds say), your composition will melt together with a pleasing mystery; for you must always remember that a window is, after all, only a window, it is not the church, and nothing in it should stare out at you so that you cannot get away from it; windows should "dream," and should be so treated as to look like what they are, the apertures to admit the light; subjects painted on a thin and brittle film, hung in mid-air between the light and the dark.

CHAPTER VI

Painting (advanced)—Waxing-up—Cleanliness—
Further Methods of Painting—Stipple—Dry Stipple—
Film—Effects of Distance—Danger of Over-Painting—
Frying.

I have mentioned all these points of judgment and good taste we have just finished speaking of, because they are matters that must necessarily come before you at the time you are making the cartoon, the preliminary drawing of the window, and before you come to handle the glass at all.

But it is now necessary to tell you how the whole of the glass, when it is cut, must be fixed together, so that you can both see it and paint upon it as a whole picture. This is done as follows:—

First place the cut-line (for the making of which you have already had instructions) face upwards on the bench, and over it place a sheet of glass, as large at least as the piece you mean to paint. Thick window-glass, what glass-makers call "thirty-two ounce sheet"—that is, glass that weighs about thirty-two ounces to the square foot—will do well enough for very small subjects, but for anything over a few square feet, it is better to use thin plate-glass. This is expensive, but you do not want the best; what is called "patent plate" does quite well, and cheap plate-glass can often be got to suit you at the salvage stores, whither it is brought from fires.

Having laid your sheet of glass down upon the cut-line, place upon it all the bits of glass in their proper places; then take beeswax (and by all means let it be the best and purest you can get; get it at a chemist's, not at the oil-shop), and heat a few ounces of it in a saucepan, and *when all of it is melted*—not before, and as little after as may be—take any convenient tool, a penknife or a strip of glass, and, dipping it rapidly into the melted wax, convey it in little drops to the points where the various bits of glass meet each other, dropping a single drop of wax at each joint. It is no advantage to have any extra drops along the *sides* of the bits; if each *corner* is properly secured, that is all that is needed (fig. 40).

Some people use a little resin or tar with the wax to make it more brittle, so that when the painting is finished and the work is to be taken down again off the plate, the spots of wax will chip off more easily. I do not advise it. Boys in the shop who are just entering their apprenticeship get very skilful, and quite properly so, in doing this work; waxing up yard after yard of glass, and never dropping a spot of wax on the surface.

It is much to be commended: all things done in the arts should be done as well as they can be done, if only for the sake of character and training; but in this case it is a positive advantage that the work should be done thus cleanly, because if a spot of wax is dropped on the surface of the glass that is to be painted on, the spot must be carefully scraped off and every vestige of it removed with a wet duster dipped in a little grit of some kind—

pigment does well—otherwise the glass is greasy and the painting will not adhere.

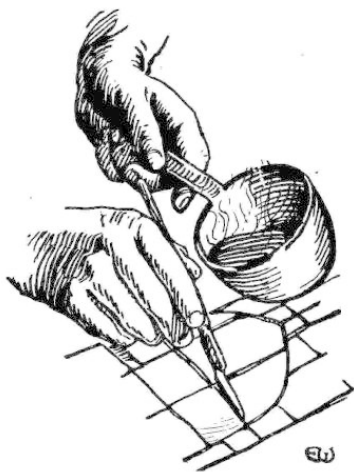


Fig. 40.

For the same reason the wax-saucepan should be kept very clean, and the wax frequently poured off, and all sediment thrown away. A bit of cotton-fluff off the duster is enough to drag a "lump" out on the end of the waxing-tool, which, before you have time to notice it, will be dribbling over the glass and perhaps spoiling it; for you must note that sometimes it is necessary to re-wax down *unfired* work, which a drop of wax the size of a pinhole, flirited off from the end of the tool, will utterly ruin.

How important, then, to be cleanly.

And in this matter of removing such spots from *fired* work, do please note that you should *use the knife and the duster alternately for each spot*. Do not scrape a batch of the spots off first and then go over the ground again with the duster—this can only save a second or two of time, and the merest fraction of trouble; and these are ill saved indeed at the cost of doing the work ill. And you are sure to do it so, for when the spot is scraped off it is very difficult to see where it was; you are sure to miss some, in going over the glass with a duster, and you will discover them again, to your cost and annoyance, when you matt over them for the second painting: and, just when you cannot afford to spare a single moment—in some critical process—they will come out like round o's in the middle of your shading, compelling you to break off your work and do now what should have been done before you began to paint.

But the best plan of all is to avoid the whole thing by doing the work cleanly from the first. And it is quite easy; for all you have to do is to carry the tool horizontally till it is over the spot where you want the wax, and then, by a tilt of the hand, slide the drop into its place.

Further Methods of Painting.—There are two chief methods of treating the matt—one is the "stipple," and the other the "film" or badgered matt.

The Stipple.—When you have put on your matt with the camel-hair brush, take a stippling brush (fig. 41) and stab the

mat all over with it while it is wet. A great variety of texture can be got in this way, for you may leave off the process at any moment; if you leave it off soon, the work will be soft and blurred, for, not being dry, the pigment will spread again as soon as you leave off: but, if you choose, you can go on stippling till the whole is dry, when the pigment will gather up into little sharp spots like pepper, and the glass between them will be almost clear. You must bear in mind that you cannot use scrubs over work like the last described, and cannot use them to much advantage over stipple at all. You can draw a needle through; but as a rule you do not want to take lights out of stipple, since you can complete the shading in the single process by stippling more or less according to the light and shade you want.



Fig. 41.

A very coarse form of the process is "dry" stippling, where you stipple straight on to the surface of the clear glass, with pigment taken up off the palette by the stippling brush itself: for coarse distant work this may be sometimes useful.

Now as to film. We have spoken of laying on an even matt and badgering it smooth; and you can use this with a certain amount of stipple also with very good effect; but you are to notice one great rule about these two processes, namely, that the same amount of pigment *obscures much more light used in film than used in stipple.*

Light *spreads* as it comes through openings; and a very little light let, in pinholes, through a very dark matt, will, at a distance, so assert itself as to prevail over the darkness of the matt.

It is really very little use going on to describe the way the colour acts in these various processes; for its behaviour varies with every degree of all of them. One may gradually acquire the skill to combine all the processes, in all their degrees, upon a single painting; and the only way in which you can test their relative value, either as texture or as light and shade, is to constantly practise each process in all its degrees, and see what results each has, both when seen near at hand and also when seen from a distance. It is useless to try and learn these things from written directions; you must make them your own, as precious secrets, by much practice and much experiment, though it will save you years of both to learn under a good master.

But this question of distance is a most important thing, and we must enlarge upon it a little and try to make it quite clear.

Glass-painting is not like any other painting in this respect.

Let us say that you see an oil-painting—a portrait—at the end of the large room in some big Exhibition. You stand near it and say, "Yes, that is the King" (or the Commander-in-Chief), "a good likeness; however do they do those patent-leather boots?" But after you have been down one side of the room and turn round at the other end to yawn, you catch sight of it again; and still you say, "Yes, it's a good likeness," and "really those boots are very clever!" But if it had been your own painting on *glass*, and sitting at your easel you had at last said, "Yes,—*now* it's like the drawing—*that's* the expression," you could by no means safely count on being able to say the same at all distances. You may say it at ten feet off, at twenty, and yet at thirty the shades may all gather together into black patches; the drawing of the eyelids and eyes may vanish in one general black blot, the half-tones on the cheeks may all go to nothing. These actual things, for instance, *will* be the result if the cheeks are stippled or scrubbed, and the shade round the eyes left as a *film*

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