

THE TECHNIQUE OF STAINED GLASS¹

By the late F. MAURICE DRAKE

Too much has been said and written about the technique of glass-painting, which really is a very simple business after all, to the exclusion of the claims of that most important person, the glazier. For stained glass windows are invariably made of glass, despite the endeavours of some of my brethren to disguise the fact, and the craftsman responsible for preparing that glass for the painter and making it up into windows after it has left his hands is that same glazier.

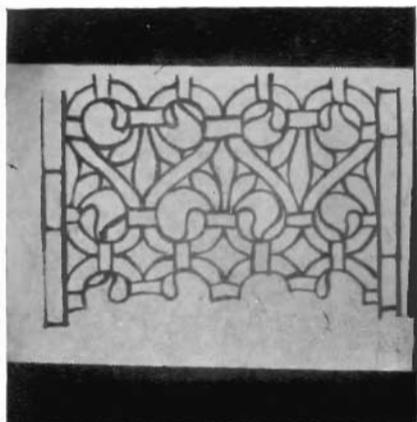
It has so chanced that the pleasant and comparatively easy work of painting glass has been appropriated to a more or less educated—certainly a more articulate—class of men, whilst the glazier, whose part it is to wrestle with a peculiarly intractable material, is as a rule better at doing his job than talking about it. So it has come to pass that when we speak of the technique of stained glass we are as a rule too prone to think of the painter at the easel rather than of his indispensable colleague at the bench. And to scheme a window with only the painter's work in mind, while disregarding the glazier and his lead-lines, is to fall again into the trap which caught and broke the glass-painters of the seventeenth and eighteenth centuries. To build a brick wall without mortar is perhaps not impossible, but to do it without any bricks is a very difficult task, and a skeleton of mortar joints without bricks between them is not a brick wall at all. To try and stain a window without glazing it would be about as profitable a task, and when done it likewise would not be stained glass in any sense of the word. It might be painted glass, and its probably muddy colouring would be just about as durable as the mortar skeleton of the wall which had no

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[By courtesy of Mr. Noel Heaton

I. FIGURE OF ST. TIMOTHY, CLUNY MUSEUM



2. BONLIEU : GLAZING WITH FALSE LEADS



[By courtesy of Mr. Noel Heaton

3. PANEL OF TOUR-DE-FORCE GLAZING
IN ANGERS MUSEUM
(size 65 cm. square)



[By courtesy of Mr. Noel Heaton

2. THE ASCENSION, LE MANS

bricks. For while the glazier, unaided by any paint, can make a stained glass window of sorts, the glass-painter ignorant of glazing cannot make a window of any sort at all.

My readers doubtless know that a stained glass window is constructed of many differently-shaped panes of coloured and white glass, cut and fixed together in grooved strips of lead, which as far as possible follow the outlines of the design. These shaped panes are cut out of sheets of glass and fitted together by the glazier before the painter touches them. They look rather like a modern jig-saw puzzle when on the bench, but whilst the puzzle is made more difficult to put together by being cut into separate pieces which avoid as far as possible the outlines of the finished picture, the glazier's panes are cut as closely as possible to correspond with the lines of the window design.

The separate unpainted pieces are stuck in their proper positions on a sheet of plate glass by little blobs of wax; though the painter has not yet touched it, several features of the design can be identified. A hand, the head of a pastoral staff, a pall, and a large white pane which, though entirely blank, yet hints by its shape at a halo and a mitred head. Although the window is admittedly not of great interest until the painter has done his work upon it, putting in features and drapery lines and so forth, it already contains the most important essential of stained glass, the colouring. With one exception, yellow, the whole of the colouring of a window is put in by the glazier with his diamond and not by the painter with his brush.

This being so, we may be inclined to ask, where does the painter come in at all? Why not let the glazier finish the job? Now provided that figure were on a sufficiently large scale, say about forty feet high instead of four or thereabouts, a skilled glazier could actually finish it after a bold strong fashion without any painter to help him, by the use of lead-lines for black outlines and shading it with varied thicknesses of glass. It could be made a very fine and effective thing in the hands of a skilled man. But very few buildings offer opportunities for work on that scale, and the glazier moreover, though a very important person, has, like the rest of us, to abide by the rules of his handicraft, and three of these are absolutely unbreakable

rules if good work is to be done. The first law of the lead-lines is that each line must arise from and be inserted into other leads, just as every muscle in the human body must arise from and be inserted into either bone or another muscle or ligament. No lead-line can have a free end any more than a muscle can have a loose end floating about idle in the human body. A lead-line cannot end in the middle of a pane of glass. Next, no matter how intricate the outlines of the design may be, every lead-line must follow a curve which can be cut in glass. It cannot for instance make a very acute angle, because the re-entrant acute angle cannot be cut in a pane of glass without considerable difficulty, and if it is so cut it will break at the first moment any strain is put upon it. And thirdly, a lead-line must be wide enough to contain two grooves to hold the panes of glass on either side of it.

The early story of stained glass is of a struggle against these three conditions. The first rule probably irked the glazier most. We cannot name even an approximate date for his first use of paint, to help him escape the necessity for carrying on a lead-line past the point where he needed it as an outline, to its junction with another lead. The earliest examples we have of stained glass have progressed far beyond these initial struggles, though they often show the painter still instinctively obeying a law he had succeeded in repealing.

Here is one of the earliest examples we have available for study; the half-figure of St. Timothy, formerly in the church of Neuweiler in Alsace and now in the Cluny museum (Pl. i, no. 1). Though an archaic thing in many respects, it has obviously travelled far beyond the point where the first attempts were made to escape the leads. There is confidence, for instance, in the treatment of the features of the saint, and the whole thing is the work of a practised and skilful hand and of no shy beginner.

Here is another early example, doubtless familiar to us all—the Ascension at Le Mans (Pl. ii). In spite of, or rather I should say because of, its celebrity and beauty it is not an example I care to put forward to illustrate the work of its period. It is the work of a great master, a wonderful and beautiful thing, and, as great masters have a way of breaking rank and doing things impossible to

ordinary men, this panel stands alone and so is not a fair or average example of the work of its period. Its creator was far in advance of his age.

Here, almost a century later, is far more primitive work, a panel from Becket's Crown at Canterbury (Pl. iii). Though it was made in the second half of the twelfth century, we see the glazier still newly enfranchised as it were to his new material, opaque pigment. Here are the free-ended outlines, and whole passages of drapery still outlined by lines of paint which might as well be leads, easy-flowing curves which start from and return to other lines just as true lead-lines are bound to do.

These heads from the same source (Pl. iv) show the same reluctance of the painter to use paint far from his supporting lead-lines. Save for the eyes and such free passages, nearly all the painting he has done could at a pinch be done by appliquéing pieces of flat lead and soldering them to the already existing lead-lines around the panes on which the leads are painted.

Here again (Pl. v) most of the essential outlines are still of lead, though the foliage of the trees shows an interesting variant of the bare free-ended outlines.

And only here, in this example of diaper from Canterbury (Pl. vi) does the glazier-painter really begin to strike out for himself and make a new departure, prophetic of a future of real glass-painter's technique. All over his background he has laid a flat coat of semi-opaque pigment, and then, before it was fired, has scratched away a pattern with the sharp end of his brush-handle. He has achieved two new things: things of the first importance, a half-tone to help out the hitherto absolutely opaque black outlines, so pointing out the way to achieve graduated shadows; and a delicate pattern of light on a dark background instead of a black pattern outlined on a light background, the utmost that had been even aspired to before this date. This is, I believe, the earliest instance of glass-painting technique as we glass-painters understand it at the present day, for the modern glass-painter, in common, I believe, with the niello-worker and those artists who produce landscapes and portraits of celebrities on the music-hall stage by wiping a black deposit from sooty enamel plaques with their finger-tips, works by

wiping out his lights from a laid coat of paint and not by painting on his shadows with a brush. It is true that something is done in the Le Mans Ascension where the black masses of hair have lines scratched on them with a stick. There are no half tones, and the work is master-work and in advance of its period, as already remarked.

Before we start on the story of the usurpation by the glass-painter of the glazier's functions I want to hark back for a moment to the laws of the lead-lines. The second of these, it may be remembered, was that the leads must follow such curves as could be cut in glass.

A well-known diagram from the late Lewis Day's book, *Windows*, shows an early attempted evasion of that rule (Pl. i, no. 2). This glazing, stated by Lewis Day to be fourteenth-century work, is at Bonlieu, and shows what modern glaziers call 'false leads.' The bottom lobe of each of these fleurs-de-lys has not been fairly cut from the glass. The curve of the lower outline was rather sharp and so presented some difficulty in cutting and the glazier has dodged that difficulty by cheating. He left out the lead entirely when glazing up the panel and afterwards made the difficult curve in a strip of flat lead and merely laid it on the face of the glass, soldering it at both ends to the real leads, thus obeying the first rule whilst breaking the second.

And here again is a most wonderful evasion—if it can be so called—of this second rule. Impossible as it may seem, this panel from the Musée de Saint-Jean at Angers is honest glazier's work (Pl. i, no. 3). But what a glazier! He has achieved what to any other man would be an impossibility. Strictly speaking he has broken no rule. The rule is that the leads must follow lines which can be cut in glass, and these lines are cut in glass. But no other man on earth would have made the attempt, and I do not think any other man on earth would have succeeded in it if he had. Look at the fleur-de-lys in the centre of the panel—an extraordinarily difficult piece of glass to cut, to begin with. Then take the pane around it: to cut a hole of that shape and fit another pane into it is well-nigh to achieve the impossible. But this man goes on to outdo himself in the most superhuman *tour-de-force* ever done in glass. Look at the four fleurs-de-lys pointing to the



[By courtesy of Mr. Noel Heaton

CANTERBURY CATHEDRAL CHURCH : MEDALLION OF BECKET WINDOW, NO. 6 ON NORTH SIDE OF QUIRE—
ROGER SMITH CURED OF BLINDNESS

The label on the right is actually 1 inch by 2 inches in size



[By courtesy of Mr. Noel Heaton

CANTERBURY CATHEDRAL CHURCH : FULL-SIZE DETAIL FROM FIFTH WINDOW ON
NORTH SIDE OF QUIRE

angles of the panel, and then at his crowning feat, the margins round them, each cut from a single pane of glass.

Now this thing is for all practical purposes impossible. It was done by the greatest master glazier that ever lived. It breaks a most important rule again and again, not by evasion, but by attempting and achieving the impossible. It is centuries later than the period we have had under discussion, and so illustrates nothing in the story of glass technique, and I show it only because of its intrinsic interest and because it shows a more important matter, the penalty for breaking rules, no matter how cleverly they may be broken. The more difficult a piece of glass is to cut the easier it is to break, and, as can be seen, this panel is broken and cracked in all directions. It will not bear handling, no matter how gently; with every ounce of wind pressure more panes must inevitably snap across, and even a change in temperature will damage it.

Having run over the rules by which the glazier must abide, we can turn again to the evolution of the technique of the stained glass window. I have made much of these lead-lines because we cannot too clearly understand that good stained glass must essentially be founded on good glazing. But the better the glazier the less obtrusive his lead-lines, and so the more danger there is that his good work may be overlooked. These Canterbury panels which we have seen date from about the late twelfth or early thirteenth century, and demonstrate very well the methods of expression the glass-painter of that period had at his disposal. His principal outlines are lead, helped out by a black opaque pigment. We must remember that when speaking of stained glass, blackness and opacity are synonymous. As a matter of fact some of these outlines are painted in a red pigment, the red being due to the oxide of iron it contains, but being opaque, this pigment is black when seen against the light.

The only variant from these absolutely black lines is hinted at in the diapered pattern on the last Canterbury piece we have seen, which is merely a thinly-laid smear of the same pigment, not quite heavy enough to be absolutely opaque. The glazier has but two methods of dealing with this material: either he paints black details on the glass with a brush, or he lays it on in an opaque or semi

opaque film and scratches his details out of this film with a sharp stick. All the colouring of his window is glazier's work, each passage of colour being cut in a separate piece of glass to the shape required by the design, so that the only painting done is a matter of rude monochrome, a stopping-out of the light, upon a mosaic of ready coloured glass.

So far as technique goes this state of affairs lasts for over a century. Until about the middle of the fourteenth century no new methods make their appearance. Design changes, and not always for the better. The gorgeous patterned fabrics which can be seen at their best at Chartres, and in a lesser degree at Canterbury, give way to huge single figures, and work generally is on a larger and clumsier scale. More white glass is used, admitting more light and perhaps better displaying the growing intricacy of the geometrical window traceries, but the methods employed in painting white glass and big figures alike are the same methods that the twelfth- and may be even the eleventh-century glazier had at his fingers' ends. No changes were made in technique in a hundred and fifty years. To my own thinking even the changes in design were retrograde. I cannot understand how any one can compare the huge clumsy figures of the beginning of the fourteenth century with the glory of jewels which is Chartres, and I half believe that, had it not been for some influences quite outside the humble lives of English glass-painters, stained glass in this country might have become a tawdry vulgar thing, and died of its own ugliness before the fifteenth century.

But the wars and generally disturbed state of France in the fourteenth century—Creçy, Poitiers, the plague, the Jacquerie—rendered it no place for glass-painting, and the French glass-painters probably emigrated in large numbers to England. They may have brought new methods with them, though of this we have no evidence, and I prefer to believe that it was the emulation between the new arrivals and the native English painters that was responsible for the extraordinary changes in the treatment of stained glass which are evident during the latter half of the fourteenth century. So extraordinary are these changes between the years 1340 and 1390 that stained glass underwent more

changes in those fifty years than in the three centuries before that date or in the five which have elapsed since.

The first and most revolutionary of these new departures was the discovery of yellow stain. Some one found out that silver applied to white glass and heated in the kiln turned the glass yellow. It is a true stain, not a yellow pigment; the glass itself turns yellow without in the least impairing its transparency. The thing was a revelation to the glass-painter. He has since even gone so far as to attribute the discovery to his patron saint, St. James of Ulm, who is said to have made it by dropping his sleeve-link on a tray of glass that was being taken to the kiln. A minor drawback to this pretty legend is the fact that St. James was not born before 1407 or 1410, and the stain was in use by the middle of the fourteenth century.

For the first time two actual colours could be painted on one pane of glass without the intervening lead-line. The immediate consequence was a greater delicacy of detail, and a corresponding decrease in the size of figures and subjects was made possible. About this time too the arches of windows were getting flatter in pitch, needing the perpendicular mullions to help maintain their weight. The effect, as everybody knows, was far too perpendicular. The windows were divided into long upright straps of lights and tracery, and, partly in revolt against this effect and partly, of course, for structural reasons, the architect began to tie the long perpendicular lines together by horizontal transoms, thus reducing the size of the subject panels. Other changes in method followed the need for yet more delicacy of treatment, greater skill being called for on the part of the glass-painter with each reduction in scale.

The next departure of importance, which may have preceded yellow stain chronologically, was the practice of abrasion. Ruby glass has always been what is known as a 'flushed glass'—a glass not coloured throughout its thickness, but on one side only, the remainder of each sheet being of white or very pale green, grey or yellow, according to the tint of red required. The reason for this is that ruby glass itself is of so dense a colour that if it were blown in sheets thick enough to stand handling it would be absolutely opaque, and so merely a black spot in the window. If made thin enough to show its proper colour it would be a

mere film no thicker than a sheet of paper, and so certain to break at the first touch. So from the earliest date it has always been made as I say, a film of ruby glass mounted on a thicker sheet of white or very pale-coloured glass.

The idea occurred to some glazier that if he ground off the ruby film in places he would have ruby and white on one piece of glass, and so another lead-line was saved. It was now possible first to grind off the ruby film and then to stain yellow some parts of the revealed white glass, thus getting three colours—ruby, white and yellow, all on one pane of glass.

The next obvious move was to make flashed glasses in other colours. A piece of blue from the ancient arms of France shows fleur-de-lys laboriously ground out from the blue side of the glass and then the resulting white has been stained yellow.

Yet another possibility was opened up. Blue flashed glass once abraded could be stained not only on the white passages but on the original blue portions of the sheet, producing quite a bright good green, and thus you have four colours—blue, white, yellow and green, all on the same pane. It was a very laborious business, of course, and nobody really likes work; so the glazier was not dispossessed of his job yet, and all went well. He progressed in skill and added another method to the stained glass repertory.

Another new trick, which we saw perfected in that wonderful piece of glazing from Angers, is a practice we call insertion. The leads round the fleurs-de-lys are not connected with other lead-lines, as the rule lays down. The glazier drilled oval holes in the blue field of the quartering and let each fleur-de-lys into this little hole. Insertion has the drawback common to all feats of skill in glass: it is very liable to break, and so was not often done. And finally yet another method of dodging lead-lines came into use. Theophilus seems to hint at it a century or so before, but his description is not clear, and I have never met with an example earlier than the fourteenth century, and then only one which is in the Metropolitan Museum at New York. This was the practice of annealing. Very small passages of colour, such for instance as the jewels in a mitre, were cut from coloured glass, laid on the pane to be brightened, and melted to it in the kiln.



[By courtesy of Mr. Noel Heaton

CANTERBURY CATHEDRAL CHURCH : MEDALLION OF BECKET WINDOW, NO. 6 ON NORTH SIDE OF QUIRE—
THE MIRACLE OF WALTER THE SOLDIER AND HIS HORSES



[By courtesy of Mr. Noel Heaton

CANTERBURY CATHEDRAL CHURCH : DETAIL OF BOTTOM RIGHT-HAND MEDALLION,
FOURTH WINDOW IN NORTH SIDE OF QUIRE

The drawback is that contact is very seldom complete. A drop of water may get behind the annealed jewel and the first frost splits it off the parent pane. But it was done, and perhaps oftener than the few examples now available would have us believe.

And finally the most important change of all in technique, more important even than the discovery of yellow stain, took place about the same time—the second half of the fourteenth century.

Previous to this period, shade was laid on and wiped smooth by the brush as smoothly as possible, just as the painter of every day lays on paint, whether on canvas or the wall of a house. We call the method smear shading.

But henceforth the shading colour, after being laid on with a brush, was stippled over before it was dry by the end of a flat-topped brush. The difference is enormous. The stippling makes a dappled surface, each hair of the stippling brush wiping a tiny hole, as it were, in the film of smeared shadow and admitting much more light. That method has been adhered to ever since.

Here is a piece of late fourteenth-century drapery all the folds of which have been shaded with this same stippled shadow (Pl. vii, no. 1).

And here a piece of drapery from a modern window painted about the year 1913, absolutely indistinguishable from the older piece in treatment (Pl. vii, no. 2).

Here is a modern head treated in exactly the same way (Pl. vii, no. 3).

And here another, far too heavily painted (Pl. vii, no. 4), in which the painter has helped out his stippled shadows by strong high lights wiped out with a stiff brush or scratched out by a stick.

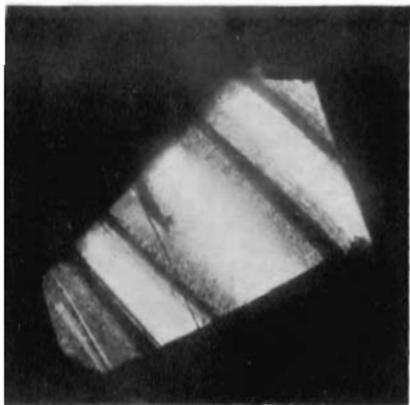
This, with one exception, exhausts the processes by which we have arrived at the modern window. The exception is enamel. The fifteenth-century glass-painter took over the fine legacy bequeathed to him by his fourteenth-century predecessor, and behaved like a well-bred man. He did finer and better work even than his forbears. He broke no rules, he used honest and laborious methods, and he did fine work, a model and example to us of the present day.

But his sixteenth-century descendant began to go

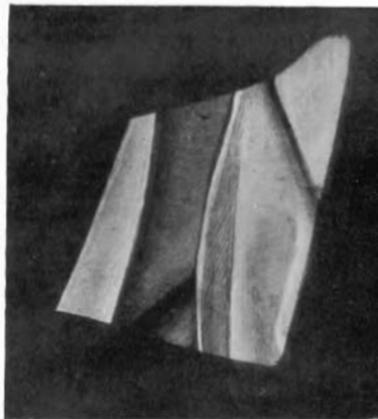
wrong from the start. Already able to get four colours on one pane—blue, green, white and yellow—he began to see how he could shirk the laborious processes of grinding the blue glass. He found that if he crushed a coloured glass very finely, and ground it finer yet to the consistency of cream, he could lay it on with a brush. Under heat the tiny crushed particles re-united and made a film of colour.

At last he had conquered the rule of the leads. He could make any colour, not as transparent as might be, but good enough to satisfy him. And from that date—say about 1510—the story of stained glass is a story of shirking. More and more enamel was used, and the glazier was more and more regarded as an inferior being. At first merely a touch or so of red would be used to emphasise lips and other such features. Then whole faces were painted red. Small passages such as heraldic bearings were done throughout in enamel and stain. Gradually the enamels invaded more and more of the window. Was a piece of glass difficult to cut? ‘Pooh! mere glazier’s work. Don’t cut it. Do it in enamel.’ Until at last you come to Sir Joshua Reynolds’ window at Oxford; and that was the end of stained glass worthy of the name.

Things got better quite early in the nineteenth century. Workmen were really trying to perfect themselves in their craft once more. They did awful windows, because the material at their disposal was awful; thin, smooth, gaudy sheet-glass, and nothing else. But they were good workmen in that material. Then came Charles Winston and showed the glass-makers what was the matter with their glass, and thenceforward what the fifteenth century did, we tried, and are trying to do.



1. STIPPLED SHADOW



2. MODERN STIPPLED DRAPERY



3. MODERN HEAD

To face page 90.



4. MODERN HEAD

PLATE VII.