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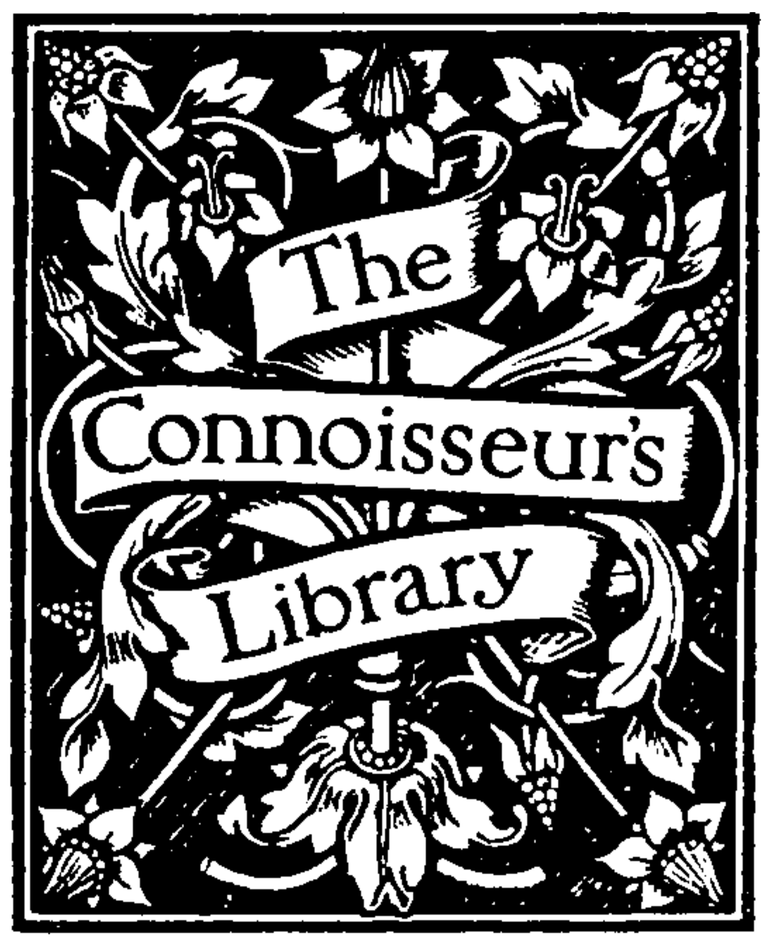
GLASS

BY

EDWARD DILLON, M.A.



NEW YORK: G. P. PUTNAM'S SONS
LONDON: METHUEN AND CO.
1907

202150

PREFACE

IT is now nearly thirty years since the late Mr. Nesbitt wrote the introduction to the catalogue of the glass at South Kensington. Some years previously the description of the glass in the Slade collection had been intrusted to the same gentleman. Since that time many works treating of special departments of the history of glass have been published in France, in Germany, and in Italy. Much fresh light has been thrown upon the primitive glass of the Egyptians; our knowledge of the glass of both the Near and the Far East has been revolutionised; abundant fresh material has been provided for the history of Byzantine glass, and the wanderings of the glass-workers from L'Altare and Murano have been traced in full detail. Mr. Hartshorne, in his *Old English Glasses*, has exhaustively told the story of our native glass from the documentary side, and has described with the minutest detail the wine-glasses of the eighteenth century. Apart, however, from the introductory chapters of the last work, I know of no attempt of recent years to give a general account of the history of glass—using that term in the narrower sense—as viewed from the artistic side.

We have at hand in the British Museum a collection of glass that has no rival elsewhere; only second to it is the collection at South Kensington. It is in these collections that the history of glass must be studied. I have from time to time in the following pages called attention to the most remarkable examples. I hope that what I have said may assist the student in threading his way through what is a rather complicated history.

GLASS

My best thanks are due to Mr. C. H. Read, who has charge of the glass in the British Museum, for the facilities that he has afforded me in the photographing of the examples in his department; not less to Mr. A. B. Skinner, director of the Victoria and Albert Museum, for similar facilities at South Kensington.

I am indebted to Professor Church for much valuable information and for some hitherto unpublished analyses of glass; to Lord Rothschild and to Mr. Vincent Robinson, C.I.E., for photographs of examples of glass in their collections; finally, to Signor Ongania, of Venice, for permission to reproduce from Passini's great work on the Treasury of St. Mark's some photographs of the glass there preserved.

E. D.

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(2) Wax cover to above, with seal of the Abbey to which it belonged. (*To face p.* 137.)

XXI. Do. do.

(1) Small cup with pap-shaped prunts.

(2) Cup with conical cover, containing relics.
(*To face p.* 137.)

XXII. SARACENIC GLASS. Pilgrim bottle; brownish, amber-coloured thick glass, enamelled and gilt. (H. about 8 in.) On the flattened back a rose-wheel design. Long preserved at Würzburg; said to come from Mesopotamia. *Circa* 1300 A.D. British Museum. (*To face p.* 153.)

XXIII. SARACENIC GLASS. Tall-necked bottle; decorated with enamelled and gilt medallions, Chinese phœnix, etc. (H. 17½ in.) The inscription has been read 'Glory to our Lord the Sultan, the wise, the just, the warrior King.' Bought in Cairo. *Circa* 1300 A.D. Victoria and Albert Museum (Myers Bequest). (*To face p.* 154.)

XXIV. SARACENIC GLASS. Victoria and Albert Museum.

(1) Small lamp of clear white glass, a little decayed

on surface. (H. 8¼ in.) Enamels of white, red, and yellow with gold, sparingly applied—horsemen with falcons; gold frieze on rim and foot. Stated to have come from a Christian monastery in Syria. Late thirteenth or early fourteenth century. Myers Bequest.

(2) Vessel for oil. Probably to be suspended in a large mosque lamp (lantern). (H. 6½ in.) Pale greenish-blue glass, with remains of the gilding that formerly covered it. (*To face p.* 156.)

XXV. SARACENIC GLASS. Beaker enamelled with frieze of three polo-players, between two bands with inscription in Arabic, both in praise of 'our Lord the Sultan' (without date or proper name). About 1300. The silver-gilt foot and cover are probably Augsburg work of the early sixteenth century. From a reproduction in water-colours of the original in the *Grüne Gewölbe*, Dresden. (*To face p.* 162.)

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XXVII. (1) DRINKING-CUP (Diam. 5½ in.) of honey-coloured glass. In centre, enamelled figure of 'the angel who serves the wine to the faithful.' Angel's wings and surrounding band, gold upon a lavender-blue ground. Persian in style, but according to M. Schefer, possibly made at Ermenas and enamelled at Aleppo. Probably fifteenth century. British Museum.

(2) HOLLOW SPHERE of honey-coloured enamelled glass. (Diam. 4 in.) Ornament of chain of mosque lamp. *Provenance* unknown, but probably from Northern Syria. British Museum. (*To face p.* 172.)

XXVIII. VENETIAN GLASS. The Aldrevandini Beaker. (H. 5⅛ in.) Thin clear glass with black specks, enamelled with three shields bearing the arms of South German towns: (1) Three stag-horns in fesse, azure; (2) argent, three keys in fesse, gules; (3) per fesse argent and sable, in chief a bar. Between, apple-green leaves outlined in white. Some enamelling also inside. Inscription in Gothic letters. About 1300 A.D. British Museum. (*To face p.* 179.)

XXIX. VENETIAN GLASS. The Berovieri Cup. (H. c. 8½ in.) *Coppa Nuziale* (marriage cup) of deep-blue glass, enamelled and gilt. The heads of bride and bridegroom in medallions. Between, (1) a procession of knights and ladies approaching a fountain; (2) bathing in fountain. Attributed to Angelo Berovieri. About 1440. Museo Civico, Venice. (*To face p.* 194.)

XXX. VENETIAN GLASS. (1) Lamp for suspension, enamelled with studs of 'white on coloured ground. (H. 11 in.) Shield with *stemma* of Tiepolo family. Early sixteenth century. Museo Civico, Venice.

(2) Stemless cup of thin clear glass. (H. 5½ in.) Decorated with scrolls, lions, and birds, in 'painted' enamel. About 1450. Dug up while excavating the foundations of the new Campanile. Museo Civico, Venice. (*To face p.* 199.)

XXXI. VENETIAN GLASS. Flower-vase. (H. 11 in.) Transparent, colourless glass, slightly greyish,

with tendency to deliquescence on surface: threading and studs of cobalt-blue. Probably sixteenth century. British Museum. (Slade, *ex* Bernal collection.) (*To face p.* 200.)

XXXII. VENETIAN GLASS. Spherical vase (H., with 'made-up' foot, 9½ in.) of opaque white glass, decorated with gilt scrolls and bosses and a pair of rudely drawn mermaids. Sixteenth century. British Museum. (Slade, *ex* D'Azeglio collection.) (*To face p.* 203.)

XXXIII. VENETIAN GLASS. Pilgrim's bottle. (H. 6½ in.) Design (Cupid fishing, and Venus and Anchises) painted in blue on opaque white (*lattimo*) ground. Early sixteenth century. Museo Civico, Venice. (*To face p.* 204.)

XXXIV. VENETIAN GLASS, enamelled and gilt. Early sixteenth century. British Museum.

(1) Plate of thin glass. (Diam. 7 in.) In centre a shield with oak tree, green and gold on blue ground. (? Rovere arms.) Round margin a ring of delicate pattern in powder gold. Early sixteenth century. (Slade collection.)

(2) Tazza of thin glass. (Diam. 6 in.) Coat of arms in lozenge in centre, surrounded by ring with flowers in oval medallions—apple-green, dull red, blue and yellow enamels. Powder gold band round margin. (Slade, *ex* Bernal collection.) (*To face p.* 214.)

XXXV. FRENCH GLASS OF RENAISSANCE. British Museum. (Slade collection.)

(1) Statuette of Louis XIII. or XIV. (H. 4¼ in.) Opaque white glass with coloured enamels. Probably made at Nevers. Seventeenth century.

(2) Statuette of man with muff. (H. of figure, 5 in.) Opaque white, porcelain-like glass, on a copper base. On stand of white Dresden china, partly gilt.

(3) Small burette (H. 5 in.) of dark greenish-blue transparent glass; the body and neck splashed with green, white, and red enamels. Gilt berry-like bosses on body. Probably sixteenth century. (*To face p.* 233.)

XXXVI. SPANISH GLASS. Victoria and Albert Museum.

(1) Vase of pale bottle-green glass; four handles with quilled edges. (H. 6½ in.) From the South of Spain. Sixteenth or seventeenth century.

(2) Jug of white transparent glass (H. 8½ in.), made at S. Ildefonso.

(3) Vase of transparent glass, slightly greenish. (H. 6 in.) Two handles with quilled edges. From the South of Spain. Sixteenth or seventeenth century. (*To face p.* 245.)

XXXVII. GERMAN GLASS. Roemer of green glass; berry prunts on waist; the foot built up of glass stringing. *Circa* 1600. Germanic Museum, Nuremberg. (*To face p.* 254.)

XXXVIII. GERMAN GLASS FURNACE. Sixteenth century. From Agricola, *De Re Metallica*, Basle, 1556. (*To face p.* 260.)

XXXIX. GERMAN GLASS. *Willkomm Humpen*, enamelled in colours with the *Reichs-adler*. On the wings, as recorded by an inscription on the back, the arms of the various members of the Holy Roman Empire. Dated 1656. Greenish glass; below margin, a ring of 'powdered' gold, between beading of white and blue enamel. British Museum (Henderson Bequest). (*To face p.* 264.)

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8¾ in.) The hollow knop of the moulded stem is decorated with prunts and encloses a sixpence of Queen Anne (dated 1707).

(2) Jacobite wine-glass with opaque twisted stem. (H. 7¾ in.) On the bowl is engraved a portrait of the Young Pretender, inscribed '*Cognoscunt me mei*'; at the back are the words *Premium Virtutis* under a crown.

(3) Jacobite wine-glass with air-twisted stem. Round the bowl are engraved the words 'Immortal Memory'; above, a band of vine-leaves, and below, fleurs-de-lis and roses. Presented by Mr. A. Hartshorne. (*To face p.* 327.)

XLV. ENGLISH FLINT GLASS. Victoria and Albert Museum.

(1) Standing cup and cover (H. 12 in.) on square, stepped foot. Carved in relief with gadroons descending spirally. End of eighteenth century. Presented by Mr. H. B. Lennard.

(2) Bowl standing on square base. (H. 8½ in.) The whole of the surface facetted; the under surface of the foot cut into square compartments. End of eighteenth century. Presented by Mr. H. B. Lennard. (*To face p.* 332.)

XLVI. PERSIAN GLASS. Tall-necked vase of colourless glass; body shaped in a mould; *appliqué* stringings on foot. Taken from a tomb at Baku. Vincent Robinson collection. (*To face p.* 338.)

XLVII. PERSIAN GLASS. Victoria and Albert Museum. Seventeenth or eighteenth century.

(1) Tall-necked, pear-shaped vase, the surface spirally ribbed, of deep blue transparent glass. (H. 11 in.)

(2) Cruet-shaped vase of clear white glass. (H. 9 in.) From the Richard collection.

(3) Perfume sprinkler, with curved neck and barnacle-shaped lip. Blue transparent glass, the surface spirally ribbed. (H. 12 in.)
(*To face p.* 340.)

XLVIII. INDIAN GLASS. Indian Museum. Vase or basin with wide-spreading lip. (H. $5\frac{3}{4}$ in.) Milky, semi-transparent glass; the ground gilt, surrounding white flowers, with pistils of red enamel. *Provenance* unknown. (Delhi district?)
(*To face p.* 343.)

XLIX. CHINESE GLASS. Victoria and Albert Museum.

(1) Bowl of mottled green glass with purple markings, imitating jade. (H. $2\frac{7}{8}$ in.) Eighteenth century. From the Bernal collection.

(2) Spindle-shaped vase of orange, 'tortoise-shell' glass. (H. $7\frac{1}{2}$ in.) The stopper of silver, inlaid with Chinese characters; the base European.

(3) Small tripod vase of mottled yellow glass, in form of incense-burner. (H. $3\frac{3}{4}$ in.) Eighteenth century. (*To face p.* 350.)

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KEY TO THE PRECEDING LIST

Egyptian, etc. Griffith, Layard, Petrie.

Greco-Roman and Roman. Deville, Froehner, Fowler, Minutoli, Naples Museum, Nesbitt, Pliny.

Early Christian, Byzantine, Anglo-Saxon, etc. Brent, Dalton, Garrucci, Heraclius, Passini, Read, Theophilus, Vopel.

Saracenic and Perso-Indian. Lane-Poole, Dobbs, Read, Schmoranz.

Venetian (Murano and Altare). Biringuccio, Bontemps, Bordoni, Busselin, Cecchetti, Fioravanti, Garzoni, Houdoy, Labarte, Lazari, Neri, Pinchart, Santi, Schuermans, Zanetti.

French and Spanish. Boutellier, Fillon, Fourcaud, Garnier, Gerspach, Pelletier, Riaño.

German. Agricola, Brinckmann, Von Czihak, Friedrich, Kunckel, Lobmeyr, Mathesius, Schebek.

English. Bate, Hallen, Hartshorne, Merret, Owen, Pellat.

Chinese. Bapst, Bushell, Hirth.

Technical. Appert, Blancourt, Bontemps, Bosc d'Antic, D'Holbach, Kunckel, Lobmeyr, Loysel, Merret, Neri, Peligot, Pellat, Porter, Powell, Ure.

General and historical. Brinckmann, Franks, Garnier, Gerspach, Havard, Labarte, Lacroix, Nesbitt, Sauzay.

GLASS

CHAPTER I

INTRODUCTION

GLASS is a substance in so many ways connected with the conveniences and amenities of our daily life, and the word calls up so many varied associations, that I must here at the very beginning make clear with what a comparatively small proportion of the manifold applications of the substance I have to deal.

In the first place, this is an art history, so that with methods of manufacture and practical uses we are only concerned so far as they may influence or help to explain points of artistic interest. Again, even on the artistic side, it is not with every branch of the varied applications of glass that we shall be occupied in this work. By an anomaly of the English language, whose vocabulary for matters connected with the arts is so strangely deficient, we have come to understand by the term 'glass,' when used without further explanation, what is called in the trade 'hollow ware,' the *verrerie* of the French; in other words—vessels of glass. The term may also be extended to include various minor applications of the material—beads, small ornaments, etc., what the French call *verroterie*. But the application of glass to windows, especially when coloured and stained glass is in question, to say nothing of work in mosaic, is usually, although not always, held to lie outside this narrower connotation of the word.

Now it happens that for us this restriction is in every

way convenient. For though the material basis is the same, it is evident that both the artist who works in mosaic and the designer of stained windows are concerned, each in his department, with artistic problems only incidentally connected with the material in which they work. In other words, the art element in both these crafts only becomes prominent at a stage when the actual preparation of the glass is completed. It is, however, certainly a pity that there is no English word which would not only clearly connote the class of objects with which I have here to deal, but which would at the same time distinctly comprise nothing beyond.

I have now explained the somewhat restricted and artificial sense of the word glass that I propose to accept in this work. But for a moment let us pass to the other extreme, and going beyond the ordinary connotation of the term include in it the glazes of pottery—the word 'glaze' is in its origin the same as glass—as well as the many forms of enamel. In all these cases we are dealing with substances of similar composition. They may all probably be traced back to a common origin, so that from an evolutionary point of view we have here an instance of the development of the complex and varied from the simple and single. Looking at the question in another way, the art of the enameller, using the term in a restricted sense, may be held to be subsidiary both to that of the potter and of the glass-worker; while many of the problems that arise in treating of the glazes of fictile wares—questions as to fusibility, or as to the colours employed and the changes of these colours during the firing—turn up again in the manufacture of glass. We shall see that experience gained in following the processes of one art may serve to throw light upon the difficulties and problems of the other.

Historically the connection between glass and pottery is not so close. In some degree the prevalence of one art has tended to oust the other, or to relegate it to an inferior position. The Greeks, who carried the potter's

art to such perfection, knew little about glass—it was long an exotic substance for them. The Romans, on the other hand, who in the first centuries of our era first fully appreciated and developed the capacities of glass, produced little pottery of artistic interest. In the sixteenth century, in Umbria and Tuscany, where the finest majolica was made, we hear nothing of the manufacture of glass, while on the other hand the fayence of Venice, at this time pre-occupied with her glass, was of subsidiary importance. If we turn to the home of porcelain, in China glass has always held a subordinate position, while in Japan it was until recent days practically unknown.

Were a comparison to be made between the development of the various minor arts, it would be difficult to find a wider contrast than that between the history of porcelain and that of glass. The knowledge of porcelain was confined for nearly a thousand years to China, the country where it was first made, and where it was slowly brought to perfection. Let loose, as it were, in the West early in the eighteenth century, it had then a short period of glory, but before the end of the century the art had already fallen upon evil days. The manufacture of glass, on the other hand, had long been carried on in Egypt, and perhaps in other Eastern lands, by a primitive process, although it only became an article of general use after the discovery of the blowing-iron. When and where this discovery was made we do not know—perhaps somewhere in Syria or Mesopotamia, in the third or second century before Christ. The art of blowing glass was known, no doubt, if not fully developed, at the time when the kingdoms of the Ptolemies and of the Seleucidæ fell under the rule of the Romans. By them it was before long brought to perfection and carried into every corner of the West, so that by the second or third century of our era the production of glass in Europe was probably greater than at any subsequent time, at least until quite recent days. Nor was the art of glass-making completely extinguished by 'the advance of the

barbarians.' Indeed, some of the Germanic tribes not impossibly brought with them a knowledge of the process not only of preparing but also of blowing glass, picked up on their journeyings through East Europe, or perhaps even learned in Western Asia. This was an instance of the passage to the North and West of the arts of civilisation, by what we may call the back-road of Europe, in opposition to the high-roads that led directly from Italy by way of the Rhone and the Rhine.

But in the West the manufacture, though continuously carried on in many spots, was after the fall of the Western Empire relegated to the woods,—for nearly a thousand years little glass was produced of any artistic interest. Indeed, but few examples of this forest or green glass of the Middle Ages have survived to our time. During all this long interval, in one direction only, in the West, was any advance made. Within this period falls the great development of stained glass: we must turn to the glorious windows of the cathedrals of France and other Western lands, to see what the glass-workers of the time were capable of producing. In the East, on the other hand, in the lands ruled from Constantinople or influenced by Byzantine civilisation, what we know of the glass of the early Middle Ages is almost confined to the mosaic coverings of the walls of the contemporary churches. But just as distinctly as the glass in the windows of the Gothic churches, this mosaic work, for the reason we have already given, falls outside our limits.

It was not till the end of the twelfth century that any important advance was made in our narrower department of 'hollow ware.' Among the many beautiful things made during that glorious season of artistic production that had its start about this time in Egypt (or perhaps, rather, in the lands between the Persian Gulf and the Mediterranean)—except it be the inlaid metal work—there is nothing that now interests us so much as the enamelled glass, the beautiful ware that culminated in the magnificent Cairene mosque lamps of the thirteenth

and fourteenth centuries. The art of enamelling on glass passed over to Venice in the fifteenth century, perhaps earlier, and there in the next century the manufacture of the famous *cristallo* was finally achieved, and complete mastery was obtained in the working of this pure white glass. A fresh start was now given to the industry in the north by means of the Venetian glass-workers, who were sought for in every country to teach their new methods.

In Germany alone did some of the traditions of the old forest-workers of 'green-glass' survive. By the end of the seventeenth century the German glass, in some respects to be regarded as a compromise between the old and new, had become the most important in Europe. For a hundred years the products of 'the mountain fringe of Bohemia' held the premier position, but towards the end of the eighteenth century this place was taken by the facetted flint-glass of England. It is certainly remarkable that it is only of quite recent years that any such prominent position could be claimed for France, which heretofore had been content to follow in the wake first of Venice and then of Germany and of England. At the present day, however, this at least may be said—that France is almost the only country where any really artistic work in glass, apart from the reproduction of old patterns and old methods, is being produced.

This hasty sketch of the history of glass-making will help us to understand why it is that in following the development of the art in so many lands, and for a period of more than three thousand years, there is no need to linger for any time except at a few of the more important *étapes*. Indeed such a procedure is forced upon us, for much of the road is quite barren, other parts are unexplored, while for whole stages we pass through prosaic districts where we find little of artistic merit to detain us.

The periods, then, of real importance in the history of glass, either from the *cultur-historisch* or from a purely artistic point of view, are separated by long intervals,

during which little of interest was produced. The primitive glass of Egypt, the varied productions of the first centuries of the Roman Empire, the enamelled glass of the Saracens, and the Venetian glass of the Renaissance —this exhausts all that we find either of commanding historic interest or of superlative artistic merit. What follows—the German and the Netherlandish glass of the seventeenth and eighteenth centuries—is still of some importance under both these heads. I can hardly say so much of the English glass of the eighteenth century; but this glass must not be neglected—it is English, and it is highly prized by many enthusiastic collectors.

It will be seen that there is a long gap between the first and second of our critical periods—between the beginning of the primitive Egyptian and the earliest Roman glass. This gap will be filled, in some measure, by some account of the rare surviving specimens of glass that can claim an Assyrian origin, of the glass pastes of the Mycenæan age, and of the few examples of glass that can be strictly classed as Greek of the classical age. So again of the second long hiatus—the interval of nearly a thousand years between the period of the Roman glass and that of the Saracens,—this may be partly filled by the few scanty pieces that have come down to us from Sassanian and Byzantine times. To this period belongs also the glass of the Germanic tribes of northern Europe, above all that of our Anglo-Saxon ancestors.

Some notice must also be taken of a few districts situated on bypaths, of the glass from countries that lie away from the main centres of production—these latter centres, I may note, until comparatively recent times are mostly to be found in close connection with the basin of the Mediterranean. To these outlying districts we must finally turn to examine the glass of Persia, of India, and above all the glass of China.

An interesting chapter, nay, a separate work, might

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the mass is gathered is hollow, the glass may be blown out into a vesicle or bulb, the starting-point from which an endless variety of objects, bottles, cups, tubes, or even flat sheets of glass, may be subsequently formed. Until advantage was taken of this remarkable property of glass —its capability, I mean, of being blown out into a hollow vesicle when in a viscid condition—the art of the glass-maker was in a primitive stage. We may compare the glass prepared without the aid of the blowing-tube—that of the ancient Egyptians, for instance—to the pottery made by hand before the invention of the potter's wheel.

In dealing with the practical side of our subject—the materials from which glass is made, how these materials are first fritted and then fused together, and how the fused mass is subsequently dealt with—the best plan will be to approach the questions in each case from the point of view of the time and country. But as, on the one hand, for classical times, our sources of information for these practical details are but scanty, and as, on the other, I am not concerned with the industrial developments of the nineteenth century, it will be well to postpone any fuller treatment of such matters until I come to speak of the glass of late Mediæval and Renaissance times. I shall then be able to make use of contemporary accounts which will throw light on the processes of manufacture.

A few preliminary notes on the chemical and physical properties of glass may, however, not be out of place.

Glass, Merret tells us, is 'a concrete of salt and sand or stones.' This, in modern scientific language, we should express by saying that it is a combination of silica with an alkali. But these substances alone are not enough. You cannot make a glass fit for practical use from a pure quartz sand with the addition of nothing else than a salt of potash or soda. Such a glass—a simple alkaline silicate—would indeed be transparent, but it would be difficult to work and very fragile. In all cases there is need of a second base, and this, to speak generally, should be either lime or oxide of lead. The latter base we may

for the present neglect; speaking generally, it is the presence of lime that gives the working qualities and the requisite toughness. These, then, are the essential materials for the preparation of glass. Other substances may be present; alumina, for example, or one or other of the oxides of iron, but as a rule the presence of these latter bases is not desired—the glass would be better without them.

Putting aside, then, for the present the glass in which lead is a constituent, as well as that in which the soda is replaced by potash, it is remarkable how little difference of composition we find in examples of glass of the most divergent origin. Let us compare the composition of a Roman 'lachrymatory' with that of a piece of modern English plate-glass. In a hundred parts we find—

	Silica.	Soda.	Lime.	Iron Oxide.	Alumina.
Roman lachrymatory,	71·5	16·5	8	1	2
English Plate-glass,	72	17	6	2	2

These examples are indeed two extreme terms of a long but continuous series. A sample of Saracenic glass of the fourteenth or of Venetian glass of the sixteenth century, would yield on analysis much the same result.[1]

This, then, may be regarded as the normal composition of such glass as I shall have to deal with in this history. The main question has generally been—How can the sand or silica, the premier element in glass, be best converted into a substance which shall in external aspect resemble as closely as possible the native rock crystal (itself pure silica), but which at the same time shall be not only fusible, but after fusing pass on cooling through a plastic condition when it may be expanded into a vesicle and otherwise worked up into various shapes? Long practical experience has shown that this can be best

[1] It would be quite beside the mark to search for a chemical formula to express such a combination of silica, soda, and lime. I have little doubt that one of the causes of this remarkable uniformity of composition is to be looked for in the very fact that such a mixture is *not a definite silicate*, and is therefore the less likely to assume a stony or crystalline structure on cooling.

effected by adding to the sand materials containing both soda and lime, and as far as possible nothing beyond these bases. A glass thus compounded we may take as our normal type, but, as I have said, the soda may in certain cases be replaced by potash and the lime by lead oxide.

Silica in any case is the essential element in glass, and in any normal glass there may be present from 60 to 75 per cent. If, however, the bases with which it is combined have a high combining number—and this is especially the case with lead—the percentage of silica may fall below the former figure. Thus, in a bottle glass with 12 per cent. of iron oxide and alumina [1] the proportion is reduced to 54 per cent., and in a flint glass with 43 per cent. of lead oxide there is only 45 per cent. of silica.

It was once the fashion among English writers on glass to classify the substance under the heads of crown-glass, bottle-glass, broad-glass, plate-glass, flint-glass, etc.; but such a classification, not very logical in itself, would be of no use to us.[2]

Glass, of course, varies in optical properties, in hardness, and in fusibility, but I do not think that any useful classification could be based directly on these properties. But there is one distinction of the greatest importance technically and geographically, and this is between the glass of maritime countries in which the alkali is soda, and that of inland and forest districts where the soda is replaced by potash. In the first group, by far the most important—I have indeed regarded such glass as the normal type—may, it would seem, be placed not only the 'primitive' glass of the Eastern Mediterranean, but probably all the glass of the Romans. To it

[1] The alumina here is probably not to be regarded as a base, but rather as taking the place of the silica. Hence the exceptionally low percentage of the latter.

[2] It had its origin in great measure in the arbitrary regulations laid down by the fiscal authorities at the beginning of the last century. This side of the subject is well treated in the article on glass in the original edition of the *Penny Cyclopædia*.

belongs also the glass of the Saracens and the greater part of the artistic glass of the Renaissance, including the Venetian glass, although in this last the soda is often in part replaced by an appreciable quantity of potash. The potash group, on the other hand, includes the old *voirre à fougère* of the French and the *wald-glas* of the Germans. In addition, almost the whole of the glass of higher quality made in later days in Germany and in the Bohemian borderlands belongs essentially to this last class. Finally, it may be mentioned that in the case of the abnormal family where the lime is replaced by oxide of lead, the alkali is invariably potash. Of this family our English flint-glass is the most important member.

With regard to the hardness of glass, Merret mentions as the thirteenth property possessed by that substance, 'that it only receives sculpture or cutting from a *Diamond* or *Emery* stone.' But such a statement would be likely to give an exaggerated idea of the hardness of glass. If we take the scale of hardness used by the mineralogist, it will be found that there are few kinds of glass that do not fall between the fifth and sixth divisions of that scale. In other words, it would be difficult to find a specimen of glass on which a crystal of apatite (phosphate of lime) would make any impression, whereas all glass in ordinary use is readily scratched by felspar. It is possible, however, that some kinds of Bohemian glass may equal the latter mineral in hardness; it is indeed a common statement that certain Bohemian or German 'combustion-tubes' will strike fire with steel. On the other hand, the presence of lead tends to make a soft glass; our cut flint is perceptibly softer than common window-glass, and perhaps the most important defect of the paste used to imitate precious stones—such paste may contain as much as 50 per cent. of lead oxide—is to be found in its comparative softness.

At the same time, the greater the amount of lead in a glass, the greater its dispersive power on the light that

passes through it. Hence the brilliancy and fire of flint-glass, and still more of artificial gems.

Apart from the varieties containing lead, samples of glass differ little in weight; the specific gravity may range between 2·4 and 2·8. That of flint-glass, on the other hand, varies from 3 to 3·8; indeed in some optical glasses containing a large percentage of lead, and again in the paste used for false jewellery, the specific gravity may be as high as 4·5 or even 5.

The high melting-point, or more definitely the high softening-point, of certain kinds of Bohemian and German glass, makes them invaluable in the laboratory of the chemist. On the other hand, the ready fusibility of glass containing lead was, as we shall see, one of the causes that promoted the adoption of such a glass in our furnaces.

Thus we find that the potash-lime glass of Bohemia, containing a high percentage of silica, excels in hardness and resistance to heat; on the other hand, the various kinds of glass containing lead are soft and easily fusible, and at the same time they combine a high specific gravity with a wide dispersive power. What we may call the maritime or soda-lime glass takes an intermediate place in all these respects. This is indeed an additional reason for regarding this great family of 'Mediterranean' glass as the normal type.

The two essential elements, then, required by the glass-maker are, in the first place, silica, and secondly an alkali, in each case as pure as possible, and in a convenient form for mixing and fusing together. I do not propose here to do more than indicate the source of these materials.

The silica has at all times been derived either from solid quartz, whether in the form of rock crystal or of the white pebbles from the beds of Alpine rivers, or more often from sand obtained either by excavation or from the seashore.

In the case of the alkali, the maritime people of the South extracted their soda, for the most part, from the ashes of certain plants growing in salt marshes near the

sea. Most of these maritime plants belong to the natural order of the Chenopodiaceæ, the goose-foot or spinach tribe, and we find among them various species of Salsola, Chenopodium, Salicornia, etc. These plants were all included in old days under the vague name of *kali*. The roughly lixiviated ashes exported from Spain were known in the trade as *barilla*; those from the Levant as *roquetta*.[1] In other instances the impure alkaline carbonates were found ready at hand—as in the case of the natron deposits not far from Cairo. In the North the principal source of soda was till recent days the *varech* or kelp, cast up on the west coast of France and of Scotland.

The inland folk, on the other hand, had to find the alkali for their glass in the ashes of plants. This 'pot-ash' was obtained by lixiviating the ashes of various trees and bushes—in Germany the ashes of beechwood, in France those of the bracken or *fougère*, were most in favour.

The quality of the glass depended in great measure upon the care taken in the preparation of the soda or potash. But the more impure ashes had this advantage: the amount of lime, to say nothing of the iron oxide and alumina, that they contained, rendered unnecessary in many cases the addition of any further basic material; even the comparatively pure Spanish barilla contained as much as seven per cent. of lime. In other cases that base had to be added, generally in the form of a more or less impure limestone.

Of the furnaces and of the various operations that come into play in the preparation of the glass I shall treat as the occasion arises in the following chapters. As, however, in this book we are—at least after the 'primitive glass' has been dealt with in the next chapter—almost exclusively concerned with vessels of 'hollow ware' made by a blowing process, it may be well to in-

[1] In the Museum at Kew may be seen specimens of Spanish barilla made from the *Halogeton sativa*, as well as large crude cakes of roquetta from Aden and Bagdad prepared from the *Suæda fruticosa* and the *Salsola kali* respectively.

dicate, in this introductory chapter, the nature of this process, and to give the names of the principal tools used. These implements—apart from quite modern improvements with which I am not concerned here—are of the simplest nature, and have undergone little change during the last five hundred years—perhaps I might say since the days of the Romans.

The molten glass is collected on the extremity of the blowing-iron to form a 'gathering.' This gathering, while still in a soft condition, is rolled upon the 'marver' into a cylindrical mass. By blowing down the tube this mass is now distended to form a hollow pear-shaped vesicle, for which it will be convenient to adopt the French term *paraison*. It is from this paraison that a start is made to form by a 'spinning' or 'flashing' process a sheet of broad or crown glass; again, the vesicle may be made to assume a cylindrical shape, and then opened out to form larger sheets of glass; or finally—and this is for us the most important—by holding the blowing-iron to which the bulb of glass is attached in a vertical position (or sometimes by swinging it over the workman's head), and then by shaping it by means of certain simple tools, the paraison is started on the course by which it will finally be converted into a bottle or into a bowl-shaped vessel. I will here only dwell on one point. It is evident that so long as the glass is attached to the blowing-iron, although a simple bulb-shaped vessel may be formed, there is so far no means of shaping or finishing the upper portion. Before this can be done the further extremity of the paraison must be attached by means of a small gathering of molten glass to a light tapering rod of iron, the 'punto' or 'pontil.' The vessel—for so the paraison may now be called—is at this stage removed from the blowing-iron. This is done by 'wetting it off' by means of a rod of moistened iron. The glass vessel, now attached by its base to the pontil, is reheated, and the further treatment taken in hand by a workman seated on a stool with long projecting arms,

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I shall have to speak in the next chapter, in one example it may be found that the smooth skin of the glass has for more than three thousand years remained absolutely intact, while in another specimen from a neighbouring tomb the glass not only on the surface, but far into the interior, has taken on a talc-like or porcelainous consistency, and the brilliant colours have for the most part disappeared.

There is no need to enter into the details of the chemical processes involved in this process of decay. Suffice to say that the action is one of the same nature as that which has played so important a part in the geological changes of the earth's surface, especially in the disintegration of the granitic rocks. It depends upon the power possessed by carbonic acid, in the presence of moisture, of decomposing the silicates of the alkalis. The soluble carbonate of soda or of potash thus formed is then quickly washed out from the surface of the glass. There remains, in the form either of iridescent scales or of an opaque pearly crust, a layer consisting not perhaps of pure silica, but of an acid silicate of lime, alumina, or lead as the case may be.

Now a piece of clear glass may appear to the eye to be devoid of internal structure. But the 'metal' has, we know, in every case been subjected during the manufacture to a complicated series of involutions and doublings, to say nothing of the subsequent inflation if the glass has been subjected to a blowing process. When decay sets in—something similar may at times be seen in the case of a piece of wrought iron—this complicated formation is in part revealed, for it is evident that upon it the lines taken by the decay are in a measure dependent. On blown glass especially, the disintegration of the surface tends to result in a scaly formation resembling that of the shell of an oyster. As a result of the decomposition of light in its passage through these fine superficial films, and of the partial reflection from the back of the scales at various depths, we get those unsurpassed iridescent effects that we associate

above all with the glass of the Romans. That these brilliant hues are dependent entirely upon the physical structure is well shown by the total disappearance of the colours when the surface of a piece of iridescent glass is moistened, as well as by their reappearance when the glass is again dried.

Lead of glass is much less liable to such changes, but where in such glass decay has once set in, the whole mass may be converted into a white horny substance.

In other cases the surface of a piece of clear white glass will become gradually filled with a series of minute intersecting fissures, which in time may penetrate the whole mass. When this change has been fully developed we get a true crackle-glass, not to be confounded with the frosted glass of Venice mentioned in Chapter XIII. This fissuring of the glass-mass in its various stages may be traced in many of the specimens of Venetian, Netherlandish, and English glass at South Kensington. When fully developed the effect is at times very beautiful.

The tints of coloured glass may, it would seem, change in the course of time. Colourless glass also, from which the greenish shades derived from protoxide of iron have been removed by the addition of binoxide of manganese, is above all liable to assume in the course of time a purple tint under the action of sunlight. Again, if sulphur be present in glass, as is the case where sulphate of soda has been employed as a source of the alkali, the soda salt may be reduced by any protoxide of iron that is present. The sulphide of sodium and the sesqui-oxide of iron thus gradually formed will both of them tend to give a yellowish tint to the glass.[1]

Changes of this nature may occasionally have come about in the stained glass of the windows of our Gothic churches—the flesh-tints, which we know were produced in early days by manganese, may in the course of time have become of a more pronounced purple hue.

[1] Good instances of both these changes may be observed in the windows and chandeliers of the Galerie des Glaces at Versailles.

CHAPTER II

THE PRIMITIVE GLASS OF THE EGYPTIANS AND SYRIANS

FROM a technical point of view the history of glass might be divided into three periods—periods, it is true, of very unequal length and relative importance.

The first of these, one more especially of archæological interest, would include all the glass made before the discovery of the process of forming a vesicle by blowing through a hollow tube. Nearly all the glass that finds its way into our collections would be classed in the second period; this would extend from the beginning of our era to the end of the eighteenth century. In the course of these long centuries, the work of the glass-maker has of course been influenced by the varying schools and fashions of different ages and countries, but technically there is no great advance to be noted in the work of the seventeenth and eighteenth centuries when compared with that of the early days of the Roman Empire; and this is still more true if we consider merely the materials employed, their preparation, and the methods of their fusion. But before the end of the eighteenth century a great change had set in. The manufacture of glass in England and France had become an important industry, and we enter upon the third or industrial period. With the general advance in mechanical processes that is so characteristic of the time, the old methods of the working of glass were swept aside, so that before the middle of the last century, whatever of interest was to be found in the manufacture and

in its results depended upon anything rather than upon the artistic qualities of the glass made.

Now, as I have said, the characteristic and dominant quality of glass is to be found in its capability of being blown into vessels of varying shape when in a viscous and semi-fluid state. All glass then, made at a time when advantage had not yet been taken of that essential property of the material, we may class together in a primitive group. This line of demarcation is as important, to return to a comparison I have already made, as that between hand-moulded pottery and that thrown on the potter's wheel. The objects made in the earlier period by primitive processes were mostly small, and their merit depended chiefly upon the brilliancy and the skilful juxtaposition of a few simple colours—they may for the most part be classed as *verroterie*.

It has long been acknowledged that it is from Egypt that our earliest specimens of glass have come. But until quite recently the greatest misconceptions have prevailed as to the age and the methods of preparation of Egyptian glass. Misled by an erroneous interpretation of what are probably representations of metallurgical processes, on the walls of Twelfth Dynasty tombs at Beni Hassan and elsewhere, it was inferred that the art of blowing glass was known to the Egyptians at least as long ago as the days of the Middle Empire; by others the art was carried back to a still earlier period. We now have almost full assurance that glass in a true sense was practically unknown to the Egyptians before the time of the Eighteenth Dynasty (say between 1600 and 1500 B.C.),[1] and that for at least a thousand years after that period all that was made was produced by a primitive process in

[1] I know at least of no example of a vessel or bead of glass of an earlier date. That the molten material of the glazes—known from the earliest period—may even in very early times have been rolled into slabs and subsequently cut up into pieces for inlay-work, would seem to be proved by a fragment of a wooden box, bearing the name of a king of the First Dynasty, found by M. Amélineau on the site of Abydos. This box (it is now in the Ashmolean Museum, where it was pointed out to me by Mr. Bell) is decorated with small triangular plaques of what is apparently a blue translucent glass, with an uneven but undecomposed surface.

which the blowing-iron found no part. We have, unfortunately, up to the present time absolutely no evidence to show in what country or at what date this new process —I mean the blowing of a vesicle of glass—first came into use. There is, as we shall see, some reason to look for it rather in Western Asia than in Egypt, but the important point to bear in mind is that it was only after the introduction of this process of blowing, first to Alexandria and then to the Rome of the early empire, that the employment of glass for objects of daily use became in any way general.

Glass, indeed, in these early days, whether in Egypt or in the Greek world of the Mycenæan age, was something very different from what we now understand by the term. We must 'think away' a great deal of the modern connotation of the word. We must, above all, think of the material in connection with the native precious or semi-precious stones that it more or less resembled, and which were used along with it for decorative purposes. We do not know the Egyptian name for glass, but probably, like the Greeks, they divided all the hard stony bodies used in the arts into such as were 'dug up'—natural products, that is, which they found ready at hand—and such as had been artificially prepared, and above all previously melted (the Λίθος ὀρωρυγμένη on the one hand, and the Λίθος χυτή on the other).

If, as I have said, there is little evidence for the existence of glass in Egypt before the Eighteenth Dynasty, it is quite otherwise with regard to a very similar substance, identical almost in chemical composition—one whose history can be traced much further back. On beads of clear rock crystal, dating from the First Dynasty, and it would seem from an even earlier period in some cases, we find a coating of turquoise blue transparent glaze[1]—the very glaze, in fact, that has given a

[1] It should be borne in mind that colourless rock crystal was at all times 'taboo' to the Egyptians, and this fact may partly account for the absence of clear white glass in Egypt.

prevailing tint to the vast series of smaller objects of Egyptian art that we see in the cases of our museums. A similar colour, I may observe, continued in favour in Mohammedan times, and indeed gives a dominant note to Oriental art in contrast to the ochry tints of yellow, red, and brown prevalent in the West.

The Egyptians soon learned to apply this blue glaze—essentially a silicate of soda and copper—to the surface of other natural stones, and above all to a fritty porous earthenware, the so-called Egyptian porcelain. Such an alkaline glaze, indeed, will only adhere to a porous base of this kind, with which it becomes united on firing, by a chemical reaction, or at least by the solution in it of some of the silicates of alumina and lime in the clay. This glaze differs essentially from those used on true porcelain—these last are almost of the same composition as the ground they cover—but, as in the case of the glazes on porcelain, so the materials of the Egyptian glazes were probably first incorporated together in a partially fused frit which was then ground and mixed with water to form a soup-like 'slip,' into which the object to be glazed was dipped. There have been brought from Egypt a few rare objects carved out of a blue frit (probably similar to that used in the preparation of glazes), for which a very early date has been claimed. But such a frit is no true glass.

The Egyptians had from the earliest periods been adepts in the carving of native minerals and rocks, and evidently found great pleasure in the strange markings and contrasts of colour found on their polished surfaces. Already in pre-dynastic times they availed themselves of their native granites, porphyries and conglomerates; from these materials they manufactured those large, carefully turned vases of which so many have lately been brought from Egypt. For smaller objects—jewellery, beads, and inlay of various descriptions—they had command of a wide scale of colours—reds and tawny yellows from jasper, purple from the amethyst, greens from root of emerald and from a special kind of felspar, and blue

from the turquoise and (at a very early period) from the *lapis lazuli.* But the stones to which they had recourse for their favourite blues and greens were rare, and they were therefore the more ready to find a cheaper substitute in glass. Again, in Egypt, no stone was in greater favour than the native alabaster,[1] with its bands and zig-zag lines of transparent crystals in an opaque base of a warm milky hue. But there was no play of colour in this latter substance, and its very softness restricted the uses to which it could be put. In glass they found a substance hard enough to allow of more delicate forms, and on it chevrons of yellow and white could be traced upon a nearly opaque ground of turquoise or dark blue. Some such origin in native stones we may perhaps find for the decorative motives of the little vases, variously known as *phialæ*, *unguentaria*, *alabastra*, which were in such favour not only with the Egyptians, but perhaps even more so among the inhabitants of the islands and coasts of the Mediterranean, during a period of at least a thousand years. It is indeed these little vases that are the most characteristic product of the first period of glass-making.

It is not too much to say that the little we know of the processes of these early Egyptian glass-makers is derived from notices on the subject scattered through the memoirs in which Dr. Flinders Petrie has described the results of his excavations, more especially from the report issued in 1894, on his discoveries at Tell-el-Amarna. In the introduction to the catalogue of the Egyptian Exhibition held at the Burlington Fine Arts Club in 1895, Dr. Petrie has summed up our knowledge on this subject. I will quote the description of the method by which, according to him, these alabastra were made.

'A metal rod of the size of the intended interior of the neck, and rather conical, was coated at the end with a ball of sand held together by cloth and string. This was

[1] In most cases, I think, the comparatively hard arragonite, the *carbonate*, and not the *sulphate* of lime that we know by that name.

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2

1

3

SMALL VASES OF "PRIMITIVE" GLASS

1. EGYPTIAN, NINETEENTH DYNASTY. 2. PROBABLY FROM GREEK ISLANDS. 3. ŒNOCHOE, FROM THE SLADE COLLECTION

covered with glass, probably by winding a thread of glass round it, as large beads of this age are thus made. The vase could then be reheated as often as needed for working by holding it in a furnace, the metal rod forming a handle, and the sand inside the vase preventing its collapse. Threads of coloured glass could then be wound round it and incorporated by rolling; the wavy pattern was produced by dragging the surface in different directions, the foot was pressed into shape by pincers, the brim was formed, and the handles were put on. Lastly, on cooling, the metal rod would contract and come loose from the neck, and after it was withdrawn the sand could be rubbed out from the body of the vase.'

The wavy decoration thus obtained was of two types: (i) formed simply by a succession of crescent-shape curves, or (ii) by means of a double drag, the pattern assumed a form like a frond of palm leaves, or still more like these leaves plaited into a basket. (Cf. Pl. II.)

The number of these little vases that can be definitely attributed to the Eighteenth Dynasty (say about the sixteenth or fifteenth century B.C.) is small, but it is worthy of note that for brilliancy of colour and for purity of the glassy paste, the early examples are unsurpassed in later times. This is certainly a remarkable fact, especially if we are to regard the art as a new one. I cannot enter here into the evidence that would seem to point to a foreign origin for this early Egyptian glass—it will be enough to mention the conquests of Thothmes III. in Syria, and the close relation of his successor, Akhenaten, the 'heretic king,' with Syria and Babylonia, as shown by his marriage, and by the famous Tell-el-Amarna tablets. As bearing on this question I may refer to certain paintings on a tomb of this age at Drag Aboul Neggah, near Thebes (reproduced in the *Revue Archéologique*, 1895, Pl. 15), which represent the unloading of a foreign trading-vessel. We can distinguish here the merchants offering certain objects of value to an Egyptian official; among these are certain striped vases which have been

doubtfully recognised as of glass. In the hieroglyphics accompanying wall paintings of this period we more than once find that vessels of rock crystal and *lapis lazuli* are mentioned, as well as blocks of uncut stones, and neither by the hieroglyphics used nor by the representation of the objects would it be easy to distinguish the latter material from lumps of glass. Again, Syrian workmen are known to have been employed at this time in Egypt, and nowhere would this be more likely than in the immediate neighbourhood of the palace of the king at Tell-el-Amarna, where the glass-works described by Dr. Petrie were situated.

All this, however, is mere conjecture, while as an argument for the native origin of Egyptian glass we have the indisputable fact that the manufacture was carried on in the new town established by Akhenaten at Tell-el-Amarna (*circa* 1450-1400 B.C.). This is made clear by the discoveries of Dr. Petrie in the winter of 1891-92. Among the waste-heaps of some important glass factories he has found enough material to put it beyond doubt that glass was there prepared from its raw constituents. First, with regard to the frits, the essential preliminary stage in the manufacture of glass: as I have said, some such half-fused material must have been long in use by the Egyptians in the preparation of their blue glazes. Complete freedom from iron was attained in this case (just as in after days by the Venetians) by the employment of crushed pebbles of white quartz as the source of the silica. These pebbles served also for the floor of the furnace, and they were doubtless more easily crushed after being thus used for some time. The fritting-pans, to judge from some large fragments of frit that turned up, were shallow bowls some ten inches across. These pans were, it would seem, supported for firing by cylindrical jars resembling the seggars of porcelain works. The shape and size of the crucibles in which the frit was subsequently melted may be inferred from some masses of glass found in the rubbish. These

masses had been allowed to cool in the melting-pot, and the presence of frothy and worthless matter at the top was a proof that the glass was not merely remelted in them, but prepared on the spot from the above-mentioned frit. The glass was left to solidify in the crucible, and when cold, the crucible, as well as the scum at the top, was chipped away, leaving a clear lump of good glass. Dr. Petrie thinks that this glass was not remelted as a whole for subsequent working, but that lumps of suitable size were chipped off, and these, being heated to softness, 'were then laid on a flat surface and rolled by a bar worked diagonally across them; . . . the marks of this diagonal rolling are seen on the finished rolls.' The rods thus produced were now drawn out to form a cane, or, if previously rolled flat, a thin ribbon. Beads were formed by winding these canes or threads of glass round a wire, or rather round a fine rod of hammered bronze, for wire-drawing was an invention of a much later date; such rods have indeed been found with the unfinished beads still on them. Similar canes of glass were doubtless worked in to the sides of the little vases to form the banded and chevron decoration which I have already described.

The silica for this glass was derived, as we have seen, from quartz pebbles, but we have no information as to the source of the other important constituent, the alkali. It is known, however, that the glass of the ancients was essentially a soda-glass, made for the most part in maritime regions. Again, the possibility of obtaining an abundant supply of fuel has always been an important element in the selection of localities for glass-works. Now in the neighbourhood of Thebes fuel must always have been scarce and dear, and it is uncertain whether there was any source of soda near at hand. We may perhaps regard the glass-works of Tell-el-Amarna as due in the main to the caprice of that eccentric sovereign Akhenaten. They were probably started at his orders to supply the demand for the new material then coming

into favour at his court. In so far as the making of glass ever became an industry in Egypt, we must look rather to the neighbourhood of the Delta for its development. There at least fuel would be more abundant, and there a supply of soda was at hand in the ashes of marine plants, even if the natron of the adjacent salt lakes was not yet used for the purpose.[1] But until a much later date, glass was always a somewhat rare substance in Egypt, and was, it would seem, never produced on a large scale.

I must now say something as to the source of the colours with which the Egyptians stained their glass. In the absence of any satisfactory analyses, we are strangely in the dark on this interesting question.[2] But everything points to the predominance of copper as a colouring material at an early period, so much so that we may perhaps consider—and this is a suggestion that has indeed been already made by a French writer—that the invention of glazes in the first place, and then that of glass, were offshoots of the metallurgy of copper, and that these industries may therefore be especially connected with the copper age. In any case, it was in all probability not, as in later days, a more or less transparent and colourless glass, but rather one of a pale or dark blue colour, that at the commencement formed the basis to which a decoration of other colours was added.

[1] There is, however, some reason to believe not only that the salt lakes of the Delta were exploited at a very early date, but that the natron, an impure carbonate of soda, may well have been exported thence by an old caravan route, perhaps even in pre-dynastic times.

[2] Professor Buckman, in a paper in the *Archæological Journal* so long ago as 1851, gives some valuable analyses of ancient glass, the main result of which is to show the absence of lead and the general use of copper as a source of blue, in pre-Roman times at least. In many of these older analyses, as in those made by Sir Humphry Davy, there always remains an element of doubt, not so much as to the accuracy of the chemist's work, but as to the *provenance* of the specimen that he is examining. Professor Buckman dwells upon the light that properly conducted analyses would throw upon the origin and classification of the glass of the ancients. He does not, unfortunately, distinguish the nature of the alkali, whether soda or potash, in his own analyses. Little work of this kind has been accomplished in the fifty years that have since elapsed.

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always present, giving an opaque enamel-like appearance to the Egyptian red—perhaps the colour was prepared directly from bronze. We often find this red paste oxidised on the surface; the coating of green carbonate then gives it the appearance of a richly patinated bronze, the blood-red body only showing when the specimen has been chipped. It is an interesting point that in early times the use of this red glass appears to have been confined to inlaid work—that is to say, it was never worked up with glass of other colours. This was, no doubt, for a practical reason: during the elaborate processes of patting, shaping, and reheating involved in the old system of working, the materials must have been exposed to a strong oxidising influence, and the basic red glass would thereby have lost its fine colour; it would also, perhaps, have injuriously affected the neighbouring colours. Some such difficulties in the working together of glasses of various colours may have influenced the Egyptians in adhering to their old system of inlays, employing, that is, small pieces, separately cast or cut out in the cold from slabs of glass of various colours. In such inlays the red paste was freely used from early times. On the other hand, I do not think that this fine copper red has ever been found on a glass vase of Egyptian *provenance*. On a few rare examples of later date (note especially two alabastra in the Slade collection, Nos. 15 and 35) we find indeed an opaque red combined with other colours, and in one case it forms the base (Plate II.). This red paste is of a peculiar spotty consistence, and I am inclined to think that the colouring matter in these examples is rather iron than copper. In later days the Egyptians made use of another tint, a fine orange. This colour, indeed, would seem to be the only addition to their palette during a period of more than fifteen hundred years.

The purple tint derived from oxide of manganese was known from very early times; the colour has been found in the glazes of the First Dynasty. It was, however, rarely used by the Egyptians for colouring glass. In some of

the little vases from the Greek islands and elsewhere it has, however, been employed to form a zigzag of the usual type upon an opaque white ground. If we so rarely find this amethyst purple combined with other colours, this is probably for a reason of a similar nature to that dwelt upon in the case of the copper red.

Next to the two shades of blue, the colour most frequently found on Egyptian glass is a yellow, at times of a full mustard tint, but more often of a paler hue. Feather-like curved chevrons of this colour, combined with turquoise and opaque white on a deep blue ground, constitute indeed the normal type of decoration in a whole series of these little vases. I can find no record of any analysis of this yellow colour, but we may well compare it with the fine yellow glazes of the Chinese where the colour is derived from a mixture of an ochry earth with an oxide of antimony. There is no doubt that this last metal was known to the Egyptians; it was used at an early period by the women to darken the outline of their eyes.[1]

What has been said of the colours used by the Egyptians applies equally to the whole series of this primitive glass, indeed to a large extent to the glass of the Romans as well. It will form, I hope, a solid introduction to the subject generally.

The little vases or *unguentaria*—by far the most important objects in this division of our subject—occur in Egypt in two forms. First, the true columnar kohl-pots, spreading out at the top in the form of a lotus capital. Secondly, globular jars with a pair of small handles: these jars are sometimes flattened at the sides so as to pass into the shape of a pilgrim's flask. In a

[1] Antimony has been found in the glaze of Assyrian bricks, as well as in the yellow enamel of mediæval Saracenic glass. The Egyptian name was *mestem*, whence the word *stibium* (antimony), but other minerals such as galena, hæmatite, and pyrolusite (oxide of manganese), have also been found in their kohl-pots; at one time indeed, during the early empire, a copper-green was in fashion for painting the angles of the eyes. I may mention that in the twisted rods—of a comparatively late date, however—that fitted into these kohl-pots, we have some of the earliest examples of a transparent white glass.

little vase of this latter form in the British Museum the paste is of a deep, somewhat translucent, brownish red (Plate II.), and this colour passes in other examples into a rich transparent honey-red or hyacinth tint. The colour in both cases is, I think, derived from iron.

Of quite exceptional interest is the little vase in the British Museum, bearing the *prænomen* of Thothmes III., painted in yellowish enamel round the shoulder. I say painted, for in this case the decoration is simply applied to the surface, and not incorporated into the glass, thus forestalling the later processes of enamelling upon glass. The vase in question is somewhat rudely formed; it is of an opaque paste of a remarkably fine turquoise hue, and the sides are decorated with three conventional trees also in yellow enamel. This vase has been regarded as the earliest dated specimen of true glass that is so far known to us.[1]

The British Museum has lately acquired a curious vessel of glass, five inches in height, somewhat of the shape of a Greek *crater*. The wavy, dragged decoration on a pale slaty ground calls to mind certain early vases of wood or stone *painted* with a similar design. This vase, together with a cup of azure blue transparent paste, comes probably from the tomb of Amenophis II. Another little vase in the same collection, of *aryballos* outline, has been shaped apparently by the lathe—so accurate is the form—from a mass of opaque turquoise paste of frit-like nature.[2]

It was in the tombs of Amenophis II. and III., in the Valley of the Kings, near Thebes, that the unique series of glass vases, now in the Cairo Museum, was found (excavations of 1898-99). On more than one of these is

[1] This, however, is not quite certain, for the *prænomen* of Thothmes III.—*Men-cheper-Ra*—was assumed, I am informed, by one of the priest kings of the Twenty-second Dynasty. Indeed, the technique in this case would point rather to a late than an early period.

[2] I had proposed to include this example and the two little vases previously described among my coloured illustrations. I have, however, not been able to obtain the requisite permission from the keeper of the Egyptian Department.

a cartouche, a rectangle of deep blue, containing the royal name, 'inlaid'[1] in several colours. One comparatively large vase (several of them are as much as eight inches in height) is decorated by three rosettes in low relief. The twelve petals are of blue, green, and red (the latter colour quite superficial) on a white ground. Still more remarkable is a vase with galloping horses and negroes; in this case the design is apparently inlaid on the interior, and only seen through the transparent body.

The little pots for cosmetics, in the shape of truncated cones, are usually made of a turquoise-glazed fayence. Those of glass are very rare: one in the British Museum is decorated on a nearly black base with splashes of white enamel; this enamel is now suffering from some kind of efflorescence and is falling off in scales. On another fragment in the Glass-Room we find yellow and white splashes on a black ground. This splashed ware is characteristic, I think, of the later dynasties — the twentieth and the twenty-first. We are reminded by it of a similar application of enamel colours to glass that was much in favour in France in the seventeenth century.

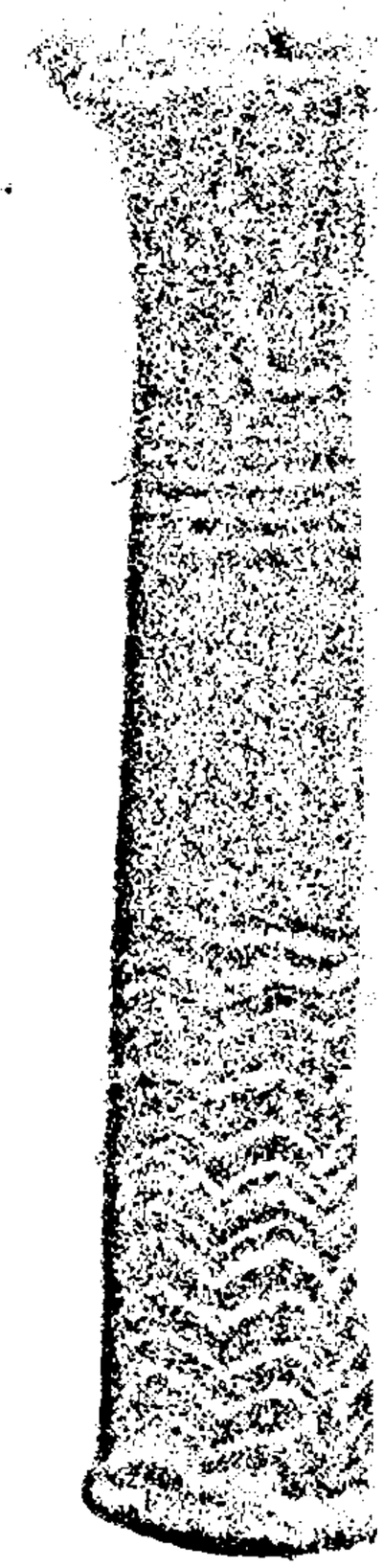
Apart from these little vases, the glass found in Egypt is confined to pieces for inlay and to beads or other small objects of *verroterie*. For the inlay the glass was rolled into slabs and cut out in the desired shape, the surface also being often carved in low relief: in later times the separate pieces were usually cast in open moulds. Beside the colours commonly used in the decoration of the vases, we find also an imitation of the pale green felspar, and the use of a red paste is, as I have said, more frequent. The individual pieces of the inlaid designs—they generally represent hieroglyphics, and are inserted into a basis of wood—are sometimes of a considerable size; some kneeling figures of a late period,

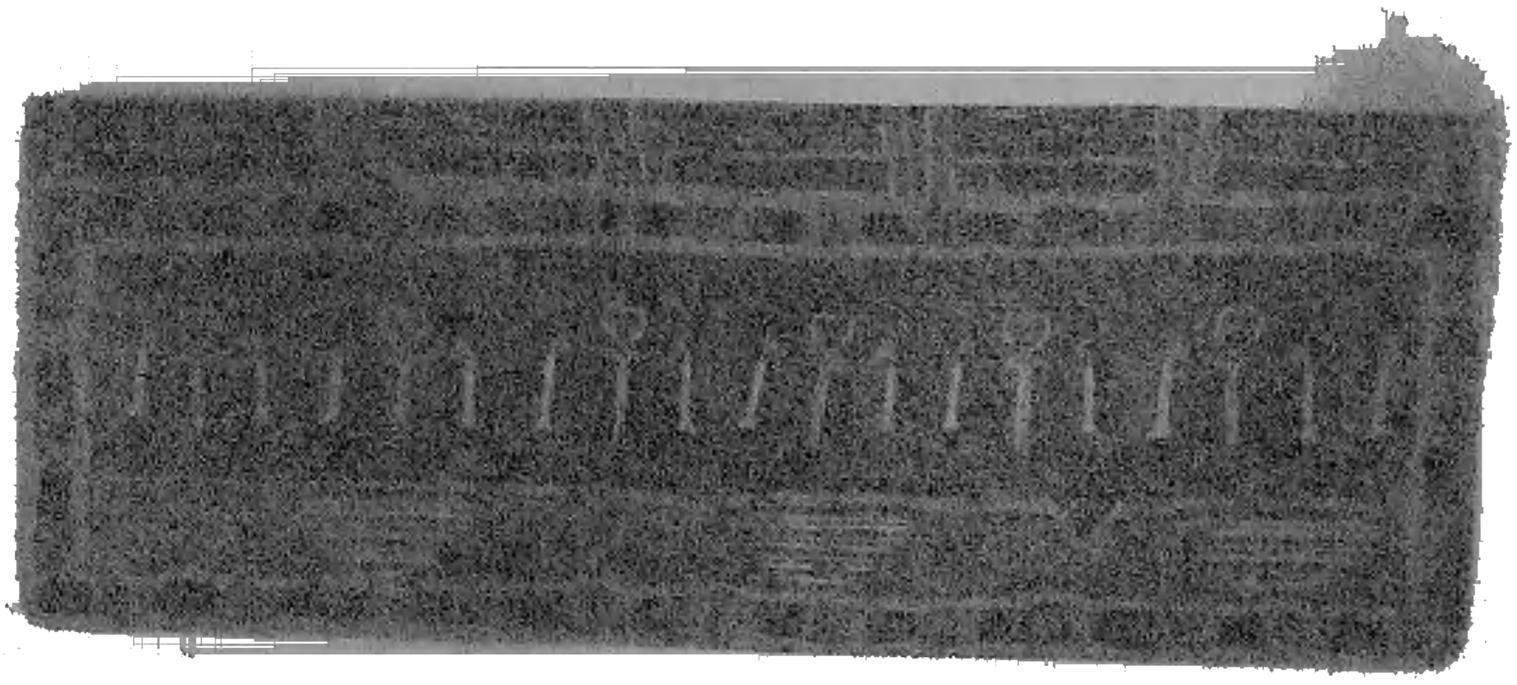
[1] This is the expression used in the official catalogue of the Museum, from which I borrow this description.

found near Tanis, are as much as four inches in height. Mr. Griffith found here, among the ruins of houses dating from early Ptolemaic times, some traces of glass-works, which allow us to supplement in a measure what we know of the manufacture in more remote periods. It may be remarked, however, that on the one hand no vases of the old chevron type were discovered—and this is true, I think, of all the finds of glass from later deposits in Egypt—nor on the other hand, as far as I am aware, have any specimens of blown glass been found even among Ptolemaic remains. At Tanis were found many small moulds of terra-cotta and limestone into which the molten glass was run—so, at least, says Mr. Griffith (*Egyptian Exploration Fund. Tell Nebeshah.* 1888). In earlier times, at any rate, the process seems rather to have been to press down into the moulds little pellets of glass in a pasty state.

In the Glass-Room at the British Museum may be seen an interesting collection of this later glass of Ptolemaic or perhaps Roman date, found at Denderah. There are many fragments of glass paste destined probably to be fitted into hollows cut in a wooden plaque, the intervening surface being covered with gilt *gesso*. Here, as at Tanis, the colours are practically the same as those found in the Eighteenth Dynasty glass, with the addition only of the orange-yellow tint to which I have already referred. It is in the centre of these wooden plaques that what are perhaps the largest pieces of Egyptian glass known to us are found. These are the scarabæi of opaque blue glass, at times so closely resembling *lapis lazuli* that their true nature has been in dispute. Even the white marblings and spots of the native stone are imitated; indeed, in one specimen in the collection of Mr. Hilton Price, the little grains of pyrites in the stone, so much admired by the ancients, have been imitated by *paillettes* of gold scattered in the paste. (Cf. the passage from Theophrastus quoted below, p. 35.)

But the Egyptians made use also of other processes





found near Tanis, are as much as four inches in height. Mr. Griffith found here, among the ruins of houses belonging from early Ptolemaic times, some traces of glass-[illegible], which allow us to supplement in a measure what we know of the manufacture in more remote periods. It may be remarked, however, that on the one hand no vases of the old chevron type were discovered—and this is true, I think, of all the finds of glass from later deposits in Egypt—nor on the other hand, so far as I am aware, have any specimens of those vases been found even among Ptolemaic remains. At Tanis were found many small moulds of terra-cotta and [illegible] with which the molten glass was run—so, at least, says Mr. Griffith (*Egyptian Exploration Fund. Tell Nebeshah*, 1888). In earlier times, at any rate, the process seems rather to have been to press down into the moulds little pellets of glass in a pasty state.

In the Glass-[illegible] of the British Museum may be seen an interesting collection of this later glass of Ptolemaic or perhaps Roman date, found at Denderah. There are many fragments of glass paste destined probably to be fitted into [illegible] cut in a wooden plaque, the intervening surface being covered with gilt *gesso*. Here, as at Tanis, the colours are practically the same as those found in the [illegible] Dynasty glass, with the addition only of the orange-yellow tint to which I have already referred. It is in the centre of these wooden plaques that what are perhaps the largest pieces of Egyptian glass known to us are found. These are the scarabei of opaque blue glass, so closely resembling *lapis lazuli* that their true nature has been in dispute. Even the white marbling and spots of the native stone are imitated; indeed, in a specimen in the collection of Mr. Hilton Price, the little grains of pyrites in the stone, so much admired by the ancients, have been imitated by *paillettes* of gold scattered in the paste. (Cf. the passage from Theophrastus quoted below, p. 35.)

But the Egyptians made use also of other pastes

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partaking of the nature both of inlay and mosaic. Taking advantage of the fact that pieces of glass when softened by heat adhere to one another—they are in fact in this condition as 'sticky' as partially melted sugar—they formed a mosaic of small rods of glass; these were heated to a plastic condition, and if desired drawn out to reduce the dimension of the design; when cold, transverse sections were cut, on each of which the pattern appeared. In other cases the design was excavated on the surface of the glass, the coloured paste pressed into the hollows when in a soft condition, and the whole plaque finally reheated so as to form a homogeneous mass. Some such process, at least, must have been adopted in the preparation of the large slabs, generally with a ground of deep blue glass, of which a fine series may be seen in the Egyptian department of the British Museum. Elaborate work of this kind dates for the most part from Ptolemaic and even Roman times. Similar processes we shall come across again, in the case of the *millefiori* glass and the inlaid wall-plates of the Romans.

It is but a comparatively small number of the little glass vases with chevron patterns in our collections that have come from Egypt; up to the present time, however, no trace of their manufacture has been found in any other country; and although we cannot attribute so early a date as the Eighteenth Dynasty of Egypt to any of the little glass jugs and *amphoræ* found in Greek and Etruscan tombs, this 'Mediterranean' glass is in every respect subsidiary to the Egyptian series.

Glass in the Mycenæan Age

It would, indeed, be quite beside the mark to make a separate division for the glass of the Greeks, who for one reason or another appear never to have found much attraction in the material. This would at least seem to have been the case in Greece itself during the great

centuries of Greek art, for nearly all the specimens of glass that we have from tombs of that time have been brought from more or less outlying lands, from Southern Italy, Sardinia or Etruria, above all from the islands of Rhodes and Cyprus, where the older culture long survived, and where Phœnician and Egyptian influences were strong.

Such a statement, however, would not hold for the so-called Mycenæan Age. At that time glass was indeed a rare material brought by Phœnician merchants from Egypt, perhaps from Syria also. In some cases this imported glass may have been remelted and worked up again; it was certainly highly prized.[1] Perhaps the most striking instance of the application of glass to decorative purposes in Greece itself at this period, is to be found in the famous frieze discovered by Schliemann in the vestibule of the men's hall at Tiryns. The pattern, carved in low relief upon the alabaster slabs, was heightened by studs of blue glass fixed into these slabs at intervals. Some of the roundels of this glass, forming the centre of rosettes, are as much as three-quarters of an inch in diameter. We have the authority of Virchow for stating that this is a soda-lime glass, coloured by copper—an analysis showed no trace of cobalt. On the other hand, cobalt has been found by German chemists in beads of an otherwise similar composition from Mycenæ and from the bee-hive tombs of Attica.

Now the question has arisen: Is this glass inlay to be identified with the *kyanos* which, as Homer tells us, formed the frieze or cornice (θριγκός) round the bronze walls in the palace of Alkinoos? Helbig, writing before the discovery of the frieze at Tiryns, maintained that the poet's *kyanos* was of a glassy nature. He tells us (*Das Homerische Epos*, pp. 79 *seq.*, quoted in Schliemann's *Tiryns*)—'This kyanos must be identified not with blue

[1] Glass-workers' moulds have been found at Mycenæ, and it has been claimed for this glass that it was *made* as well as melted on the spot. But that, I think, is unlikely.

steel, but with (1st) the later Σαπφειρός—*lapis lazuli*; (2nd) with the blue colour obtained by pulverising this stone, and finally with the artificial imitation of this stone or of ultramarine. The classical passage is in Theophrastus (*On Stones*, § 55). This author distinguishes between the natural (αὐτοφυής) and the artificial (σκευαστός) *kyanos*. That by the first *lapis lazuli* is intended appears from an another passage (§ 39), where the gold dust distinctive of the *lapis lazuli* is cited as the peculiarity of the natural *kyanos*. . . . Theophrastus continues—"There are three kinds of kyanos, the Egyptian, the Scythian, and the Cyprian. The best for the darker colour is the Egyptian, for the lighter, the Scythian. The Egyptian is artificially prepared, and those that write about the kings tell us which king first, to imitate natural kyanos, melted the prepared kyanos (Κυάνος χυτός), and they allege that, among other things, from Phœnicia came a tribute of kyanos, partly natural and partly burnt (τοῦ μὲν ἀπυροῦ τοῦ δὲ πεπυρωμένου)."' Helbig goes on to identify the unfired kyanos with the copper ore of Cyprus—the blue carbonate which the Phœnicians brought to the Pharaohs, and which was the main source of copper for the Eastern Mediterranean.[1]

At Mycenæ itself little glass has been found—some minute tubular beads, decomposed externally but with a core of blue glass (pronounced by Landerer to contain lead and cobalt), and a few beads of clear glass. In the bee-hive tombs of Attica, especially at Spata, were found a number of small objects of glass, cast, says M. Tsountas, in moulds of granite and basalt which have been discovered on the spot. Indeed in all these tombs, next to the beads, the commonest examples of glass are the little rosettes and plaques cast in a mould with a design in low relief; these rosettes are often pierced with holes and were probably sewn on to the dresses of the women. The surface, and sometimes the whole body, is decomposed,

[1] All this bears out what I have said above upon the relation of the earliest glass to the metallurgy of copper, and the probability that the earliest glass was a blue glass (p. 26).

presenting a white silvery glimmer, and this appearance Landerer considers to be characteristic of the presence of lead in the glass. At Vaphio we hear of fragments of glass 'goblets' being found, decorated with spirals of black, chestnut, and yellow (Tsountas and Manatt, *The Mycenæan Age*, 1897). If these are to be identified with our chevron vases, it is, as far as I know, the only mention of their occurrence on the mainland of Greece at this time.

But it is from the Greco-Phœnician tombs of Cyprus and Rhodes that the greatest quantity of this primitive glass (chiefly in the form of *unguentaria*) has been obtained; again from Greco-Etruscan tombs in Tuscany, from what may be called Greco-Oscan tombs in Southern Italy, and even from Greco-Scythian tombs in Southern Russia—from, in fact, nearly all the lands visited by Phœnician traders. How widely spread was the acquaintance with these little vases we may infer from the imitations of the chevron pattern on coloured pottery found in Melos. A similar decoration has been found on Lydian pottery from tumuli near Sardis, and even, it is claimed, upon prehistoric pottery brought from the Nilghery Hills in Southern India.

These little vases now take characteristic Greek shapes. The columnar kohl-pots are replaced by alabastra, very similar in form. Even more common in later tombs are the little *amphoræ*, sometimes pointed at the base, at others ending in a rounded knob; a jug-shaped form like the Greek *oinochoe* is also common. In some cases—in specimens of Egyptian origin very frequently—the surface of the glass is entirely unchanged. But when the decay of the surface has once set in, we generally find that the decomposition has eaten deeply into the substance of the glass (see above, p. 16). In such cases it often happens that the blue colour has been entirely removed, and the vase has assumed the appearance of a dull, whitish pottery.

I will now briefly mention a few abnormal types of

decoration. On some little amphoræ from Southern Italy the chevrons are of a manganese purple on a white translucent ground—this colour appears never to be combined with the more frequent blues and yellows. I have already noted that the use of red is very rare; where it appears, the technique of the vase appears to be different—the surface has probably been ground or turned on a lathe. A beautiful alabastron in the Slade collection, with red ground decorated with turquoise and yellow chevrons, should be specially noticed. (See also Pl. II., 2.)

How much these little vases were valued appears from the stands of gold (decorated with applied spirals of an early type) on which they were sometimes placed in the tombs. M. Reinach mentions some instances from Crimean tombs, where chevron vases of the usual type have been found attached by a fine chain of gold to the bracelet worn by the deceased (Tolstoi and Kondakof, *Antiquités de la Russie Méridionale*, 1891). The little bottles that we see in the hand of the recumbent effigy on Phœnician sarcophagi, are probably to be identified with our glass vases; we have an instance of this on the well-known female figure in the Palermo Museum (figured by Perrot and Chipiez and elsewhere).

Later Survivals of the Primitive Glass

There are in the British Museum some little glass amphoræ from Camirus and Ialysus in Rhodes, and others from Amathia and Salamis in Cyprus, on which the chevron bands are not incorporated into the glass base, but laid on the surface as in later enamelled ware. The chevrons in such cases cannot have been 'dragged' by the old ingenious plan; they must have been elaborately applied one by one. We may recognise probably in such cases the survival of an old method of decoration after the technical process by which it was produced had been lost. The glass itself, too, is of a late type—transparent and hastily formed. I think that the date of some

of these 'scamped' chevron vases may be later than is generally thought.

The beads and other objects of *verroterie* from the Cyprian and Rhodian tombs differ much from those found in the Mycenæan sepulchres of Continental Greece. There are in the British Museum some large beads of perfectly clear glass from Ialysus in Rhodes[1]; these are probably of Asiatic origin. We must also range with this 'primitive' glass the large beads—if beads they are to be called—in the form of satyr-like masks, so widely spread through Mediterranean lands (Pl. xv., 1), as well as those of irregular shape that so closely resemble the old 'bull's eye' sweetmeats, built up of interlacing bands of various colours. Indeed the technique of the manufacture of these beads was probably very similar to that of those handmade 'lollipops,' for in spite of its lower fusing-point, and of its solubility in water, there are many points of resemblance between sugar in a state of semi-fusion and glass in a similar condition.[2]

What little I have to say of the rare specimens of glass of a more advanced type found in Greek tombs, I will postpone to the next chapter.

The Primitive Glass of Western Asia

The civilisation of the inhabitants of the Euphrates valley reaches probably as far back as that of the Egyptians. Its influence has extended at various times from the Balkan peninsula to the borders of India, including Persia on the one hand, and on the other the kingdoms that grew up in Syria, and among the primitive races of Asia Minor. Now, if we are to judge by the contents of our museums, all these lands, at least up to the time of

[1] It is a remarkable fact that somewhat similar beads, of clear, colourless, facetted glass, evidently of great age, have lately been brought from West Africa. (See a paper by Mr. C. H. Read in *Man*, May 1905.)

[2] Such a comparison may indeed be made in the case of the bulk of the 'primitive' glass of which we treat in this chapter, and may help to accentuate the difference between it and the blown glass of later days.

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ago by the late Sir Henry Layard in the ruins of Kouyunjik. This little vessel, after many vicissitudes, has found its way into the British Museum. It is three and a quarter inches in height, and is formed of a glass that is perfectly white and nearly transparent; it still remains, indeed, our earliest example of such glass. The date is fixed to the latter part of the seventh century B.C., by an inscription cut in cuneiform characters containing the name of Sargon, together with his titles as king of Assyria; on it is also engraved the figure of a lion. Layard speaks of this vase as being shaped and hollowed on a turner's lathe after being '*blown in one solid piece*' (*Nineveh and Babylon*, 1853)—a curious expression for one who interested himself so much in the manufacture of glass! We may, perhaps, regard it as having been carved like an object of rock crystal out of a solid piece of glass. We know of nothing like it from Egypt, but then the Egyptians had no love for transparent, colourless materials; from an early time, as we have seen, they had covered their beads of rock crystal with a blue glaze (cf. p. 20). Here I may add that the other specimens of glass discovered by Layard at Nineveh have no claim to so early a date. Among them, however, were two bowls of great interest, formed of a *vetro di trina* or 'lace glass,' with very fine meshes. These are now in the Assyrian Department of the British Museum. Some almost identical bowls from the late Greek tombs of Canosa, in Southern Italy, may be seen in the Glass-Room in the same Museum.

The Assyrians and the Babylonians before them were, we know, from an early date past masters in the manufacture of coloured glazes. The turquoise blue glaze of their pottery and wall tiles has been handed down in these lands apparently without a break, through Persian and Sassanian times to their later Arab masters. In the Louvre are some slabs of a translucent glass of a fine turquoise tint, about three inches square, and three-quarters of an inch in thickness, which were found in

Babylonia, associated apparently with objects of great age. Such masses of glass paste were perhaps manufactured as articles of commerce to be employed afterwards in the preparation of glazes.[1]

Apart from these examples, the glass brought from Western Asia is of the usual later Phœnician or Roman type—'lachrymatories' and bowls mostly of greenish glass. It is not till we come to Sassanian times that we can find any distinctive features, and the rare specimens dating from that period will best be treated in a later chapter along with the contemporary Byzantine glass. I may mention finally that there are one or two passages in our Greek classics that may point to the use of glass by the Persians in the fifth century B.C. For instance, among other hardships suffered by the Athenian embassy to the great king—so we are told ironically by Aristophanes in his *Acharnians*—they were forced to drink from vessels of gold and from *cups of glass*, or, may be, of rock crystal (ἐξ ὑαλίνων ἐκπωμάτων).

We know of no glass other than that of Roman type from the Bible lands, using that expression in the narrower sense, nor in the whole literature of the Hebrews is there, as far as I know, any definite reference to glass. The word *Zechuchoth*, which occurs in a passage of Job (xxviii. 17), is translated in the Vulgate by *vitrum*, but like the Greek ὕαλος, it may as well refer to rock crystal, or any other hard transparent substance. There is, however, a passage in Jeremiah (ii. 22) which is really of more interest to us. It begins, 'For though thou wash thee with nitre and take thee much soap.' From this passage we learn at least that the natron of the salt lakes was in early days applied to practical ends. This was one step to its application to the manufacture

[1] Some fragments of a conical vessel of clear thin glass, evidently formed by the blowing-tube, have lately been found by M. de Morgan at Susa. They are said to bear a cuneiform inscription of the time of the Achæmenidæ. These fragments are now in the Louvre, but considerable doubt exists as to the nature of the markings. The glass certainly resembles suspiciously that used by the Arabs for their small hanging lamps.

of glass. Since then the soap-boiler has often been the ally of the glass-maker.

I have thought it well to bring together these few facts and theories bearing upon the early knowledge and use of glass in Western Asia, for could its early existence in these lands be once definitely established, we should be better able to fill up a gap in our history, and it would perhaps be then possible to solve that obscure problem—*When and where was the great step taken and the blowing-tube first made use of for the production of a vesicle or paraison of glass?*

At the present day, in some of the villages around Hebron, glass is still made by very primitive processes. Thence come the many-coloured bangles of glass, dear to the Arab women of Palestine and Egypt; some of these have found their way into collections of Egyptian antiquities, so closely do they resemble the old wares. This glass is carried by Arab and Jewish pedlars as far, it is said, as the Soudan. Here, indeed, we have an industry that may well be regarded as a survival from very early days.[1] On the other hand, some two thousand years ago, as we learn from the evidence of the tombs, blown glass of an advanced type, colourless and transparent, was a common article in daily use, not only on the Syrian coast, but at Nazareth and other Galilean towns (see below, Chap. IV.); and yet, as far as I know, there is not a single allusion to glass or glass-making in any of our four Gospels.[2]

[1] See Chapter XXI. for some further account of this glass.

[2] On the other hand, in the First Epistle to the Corinthians and in the Epistle of James, there are references to mirrors that may have been of glass. Again, in Revelation we find 'a sea of glass like unto crystal' (iv. 6), and what is more important, glass in other passages (xxi. 18 and 21) is referred to as 'pure' and 'transparent' (the words in the original being ὕαλος, καθαρός, and διαφανής). In view of the question, discussed below, of the date when clear glass came into general use, this contrast between the Gospels and the, on the whole, later books is of some interest.

CHAPTER III

THE LATER GREEK GLASS AND THE MOULDED AND CAST GLASS OF THE ROMAN EMPIRE

SO far, all the glass with which we have come in contact has belonged without exception to one family; small objects, generally brightly coloured—beads, ornaments of various kinds and shapes, and, above all, little vases decorated with chevron bands; all these things belong rather to what in a general way may be classed as jewellery, objects of personal decoration. Of the one essential application of glass, as we understand the term, we have not so far found a single undoubted example—its application, I mean, to vessels intended to hold wine or water. This was to come a little later, and to come with a rush, as it were; for by the first century of our era, glass had already taken a position at least as important as at any subsequent time in our history.

I am speaking of glass, of course, in the narrow sense of the word, especially as a receptacle for liquids, for wine in the first place. From this time onward this is the predominant service to which the material has been put, and, indeed, at no time was its relation to wine-drinking more intimate than among the Romans of the early empire.

It is certainly strange that in spite of our comparatively intimate acquaintance with the ways of life of the Greeks during the time that intervened between the conquests of Alexander and the period of their absorption in the Roman Empire, we should be in possession of no evidence, documentary or material, that would throw light on this, for us, most important

of all questions: Where was it, and at what time, that the great discovery was made—the art of blowing glass? For it was thanks to this discovery that the material came for the first time to take an important place among the art products and even the industries of the day. This is a point that cannot be too often or too strongly impressed upon the reader.

The glass vessels of the ancients rarely bear any inscription, and there is little, as a rule, in the decoration that can give occupation to the antiquary. Classical glass has therefore been comparatively neglected, except when of superlative merit; the record of its *provenance* has generally been lost: in continental museums it has either found a back place on the shelves of the Greek and Roman collections, or it has been handed over *en masse* to other departments. We thus find crowded together in the same case delicately turned bowls from Greek tombs, cinerary urns from Gaul or Britain, and examples of the rudely carved and engraved glass of the third and fourth centuries.

Such little evidence as there is, especially a few passages in Roman writers, would point to Alexandria, above all other towns, as the principal home of the glass industry in the first centuries before our era. We know, however, of no find of blown glass in Egypt, previous to later Roman or Coptic times. The Ptolemaic glass found at Tanis and elsewhere differs, as we have seen, little from the old type; and even at what is probably a later period we have found the same old type of glass in use at Denderah for inlaying (see above, p. 32). It was not the Egyptians themselves that favoured the new process —by them the new glass was doubtless rejected as something exotic and unholy. The Greeks, on the other hand, seem never to have taken any interest in the material—the 'fused stone,' as they called it, was at the best but a poor substitute for the native minerals that it imitated.

Perhaps after all there is an element of truth in the prevalent Roman tradition, and we should not be far

1

2

3

1. FLASK WITH "PEACOCK" DESIGN
GRECO-ROMAN

2. BOWL, FINISHED ON LATHE, SHOWING IRIDESCENCE
GRECO-ROMAN

3. BOWL OF THIN GLASS, BLOWN INTO MOULD
ROMAN

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wrong in giving the credit for the introduction of the new system of manufacture to the glass-makers of Sidon or of some other of the Phœnician coast towns.

I have already pointed out that the Greeks had at first no separate word for glass. Herodotus speaks of ear-ornaments made of 'melted stone' (λίθινα χυτά). Plato, in the *Timæus*, thinks it necessary to explain that he uses the word ὕαλος in the same sense. In the treasure-lists of temples, of the early part of the fourth century, where the same word is used, the reference is apparently to vessels of glass. We hear, too, of seals of glass (σφραγῖδες ὑάλιναι) in similar inscriptions of the same date. The word ὕαλον ultimately became the equivalent of the Latin *vitrum*.

In any case, it is from Greek tombs of the Hellenistic period that we obtain our earliest specimens of glass, other than the small articles of *verroterie* that formed the exclusive subject-matter of the last chapter. There have been preserved a few rare bowls of transparent glass, sometimes quite colourless, or more often stained with blue or with a honey-like tint resembling that of the hyacinth or the sard. These bowls are distinguished by the purity of their outline; they have apparently been finished on a lathe, but whether the glass was originally simply cast, or, as is possible, *blown into* a mould, it is impossible to say. The only ornament consists in one or more incised lines near the margin. A few of these bowls have been obtained in Athens, others come from tombs in the south of Italy,—we have unfortunately no means of fixing the date in either case. It is rather from the refinement of their curves and the restraint in the decoration that we are led to class them as pre-Roman.

But it is from the glass found in the tombs of Canosa that we can form the best idea of what the Greeks of Ptolemaic times were capable in this direction, and we are fortunate in having in London a remarkable series of glass vessels from these tombs. Canusium was one of the few cities of Apulia that preserved much of its Greek

culture as well as the partial use of the Greek language well into the time of the Roman Empire. The beautiful specimens in the Glass-Room in the British Museum, some of them so thoroughly Hellenic in character, are referred to the first century of our era, but in general character and feeling, as well as in their shapes, they reflect the art of an earlier period. A bowl of pure white glass—the sharp outlines, especially of the solid handles, show that it was finished by a cutting tool—is of a form (the σκύφος of the Greeks) well known both in pottery and metal ware. The two graceful bowls, decorated in gold with an exquisite design of acanthus leaves, combined with a small plant with tendrils, both radiating from a central flower, even in their present condition, perhaps surpass in beauty any other known example of ancient glass. From the technical side, the marvellous skill with which the two shells of glass of which these bowls are built up, are fitted together, should be carefully noted. It will be observed that the inner shell projects considerably beyond the outer one, and that the latter at the line of junction has been apparently levelled down by subsequent grinding. How far the two layers have been soldered together by subsequent firing, it would be difficult to say. Between the two shells, the gold leaf that forms the base of the decoration has been applied. We are reminded (but *longo intervallo*, not only artistically but technically also) both of the so-called cemetery glass of later date, and of the 'doubled glasses' made in the eighteenth century in Bohemia.

Scarcely less remarkable are the other examples of glass from Canosa exhibited in the same case. Here may be seen two bowls built up with coils of little rods, each rod containing an opaque white string in the centre of a clear base; these, as I have mentioned, are identical with the bowls, now in the Assyrian Department, brought back by Layard from Nineveh. In addition to these varied types of glass there were found in the same tombs some large dishes of *millefiori* ware,

and finally a large flat bowl of white glass with a somewhat rude pattern cut with the wheel, and with a row of spurs projecting from near the edge. This, as will be seen further on, is a method of decoration more common at a time of artistic decline, in the third and fourth centuries.

Quite Greek in character are the strange little unguent pots that come from Cyprus. On the cup-like overlapping lid of one in the British Museum may be seen outlined in black, apparently between two layers of glass, a little cupid bearing a bunch of grapes. Although many of these little pots have lately been found in Cyprus, it is only in a few cases that the design on the lid, so truly Greek in style, has been preserved.

There is some reason to believe that when the use of the blowing-tube was first introduced it was applied as a supplement to a moulding process. The hollow vesicle of glass—the *paraison*, to use the old French word—was blown into a more or less hemispherical mould, and the irregularities of the resulting bowl were then removed by grinding on a wheel. At any rate, during what we may call the Alexandrian period, a bowl of simple outline, whether shallow or deep, is the characteristic form. In the case of certain dishes in the shape of a boat, the wheel has played a still more important part.

For the personal adornment of their women the Greeks continued to make a variety of small objects of glass, more or less on the old lines. We find, too, intaglios engraved on glass of various and often most exquisite tints at least as early as the fourth century B.C. In the preparation of these pastes the greatest attention was paid to the exact imitation of precious stones. At a somewhat later date, in the second century B.C., cameos in high relief cast in glass pastes of various colours came into vogue. The 'mother' design was modelled in clay, and upon this matrix the mould in which the glass was to be cast was formed. These early glass cameos are compared by the late Dr. Murray to the circular, moulded

reliefs on the black pottery of this period, and he points out that they apparently preceded the large reliefs engraved on stones of the onyx family which were so much in favour a little later (*Greek Archæology*, p. 160). It must be borne in mind that neither in the case of cameo or intaglio could the paste copy be made directly from the original stone. The paste gem, thus moulded, was often carefully finished by hand.

Early Roman Glass

In the absence of any continuous series of glass vessels that can be classed as Greek, it would seem somewhat of a contradiction to say that the artistic glass of the Romans was founded upon examples distinctly Greek in outline and decoration. And yet there can be no doubt that in the earlier period, at any rate, the source of inspiration of the Roman glass-maker was the same as that of the contemporary potter or bronze-worker. At the time when objects of glass were first brought to Italy in the ships of the Greek traders, we may be certain that the places where this glass was made—whether these be sought at Alexandria or at one or more of the cities of the Phœnician coast—had been completely Hellenised. Again, the new material found its way in through towns which, if not Greek speaking, were thoroughly Greek in culture, through Cumæ—in the neighbourhood of this city glass was probably first made in Italy—and through the semi-Greek towns of Apulia. But in one important respect this Greek glass differed from the contemporary bronze and pottery. It was to the Greeks a new art with few old traditions, and these not of Hellenic origin. In the first century before Christ the industry was only beginning to be of any importance. It thus came about that in a greater degree than perhaps any other branch of ancient art, the manufacture of glass may be regarded as an art essentially Roman. This fact may help to account for the extreme poverty of the material for its history and

methods of manufacture to be found in Roman writers. There were in this case no Greek authorities for these writers to fall back upon. Compare the meagre and confused narrative of Pliny in the brief section that he devotes to glass with his detailed, and in a measure scholarly, accounts in other departments of the arts where he could borrow from earlier Greek technical treatises.

The glass that we know as Roman was made for a period of about four hundred years. It was manufactured at one time or another in nearly every country into which the Romans penetrated, from Syria and Mesopotamia on the one hand, to Spain and Britain on the other. It has even been found in the tombs of tribes that the Romans never subdued, as in Denmark and Sweden. There is scarcely an application of glass known in Europe in the eighteenth century that was not known also to the Romans, and they were masters of the various processes by which glass may be decorated.

Millefiori Glass

M. Froehner, in his introduction to the catalogue of the Charvet collection, has divided Roman glass into as many as fifteen classes. Some of these divisions are perhaps rather arbitrary, and very little success has attended any attempt made by him or by other writers on the subject to classify the vast material on a geographical basis, still less to trace the history of its development.

There is, however, one division of classical glass—we can hardly call it Roman, although most of the finer specimens may be traced back to Rome or to the tombs of Central and Southern Italy—which forms in some degree a transition from our primitive family to the true blown glass of imperial times. This is the so-called Millefiori Glass. We have, doubtless, in this a development of the 'fused mosaics' of the Egyptians, worked out on a larger scale, and employed for other objects than flat slabs and fragments for inlay.

In the millefiori bowls of Greco-Roman times we can distinguish two predominant types: the madrepore design in the first place, which closely imitates the pattern on a polished slab of coralline limestone, with the addition that the ground is of a deep translucent green or of a purple of subdued tone. In this class may be placed such exceptional pieces as the bowl from Crete, in the British Museum; here we have rosettes of yellow, green, and red upon an opaque ground of a rich blue. The second type is equally characteristic, but more difficult to describe. Short, loosely rolled scrolls of an opaque white float in a more or less transparent base, interspersed with a few quadrangular masses of gilt glass. It would be difficult to say what natural substance is imitated in this case—perhaps some kind of fossiliferous *lumachella* marble, which may have been in vogue at one time at Alexandria. We may be quite sure that the Roman glass-workers would not have failed to imitate the famous Murrhine vases, which seem to have been originally carved from a natural stone, and it is among the millefiori glasses that such imitations may probably be looked for.

These millefiori bowls are evidently built up with more or less spirally arranged fragments of glass mosaic,[1] the individual pieces having been probably cut from a cane of glass, itself formed by a combination of minute rods, as in the case of the Egyptian 'fused mosaics.' These pieces were arranged in the mould in a coil, starting from the centre, but how far, if at all, during the subsequent partial fusion, they were subjected to any blowing operation, is a moot point. In any case, the final effect is the result of an elaborate process of cutting on the wheel and subsequent polishing.

In this millefiori glass the sections of the canes are arranged with a studied irregularity (so as, in a measure,

[1] This arrangement in spiral coils is very characteristic of the glass of this period, though it is generally only to be seen on close examination. We have noticed it in the case of the 'lace-glass' from Canosa. It may give us some clue as to the method of manufacture.

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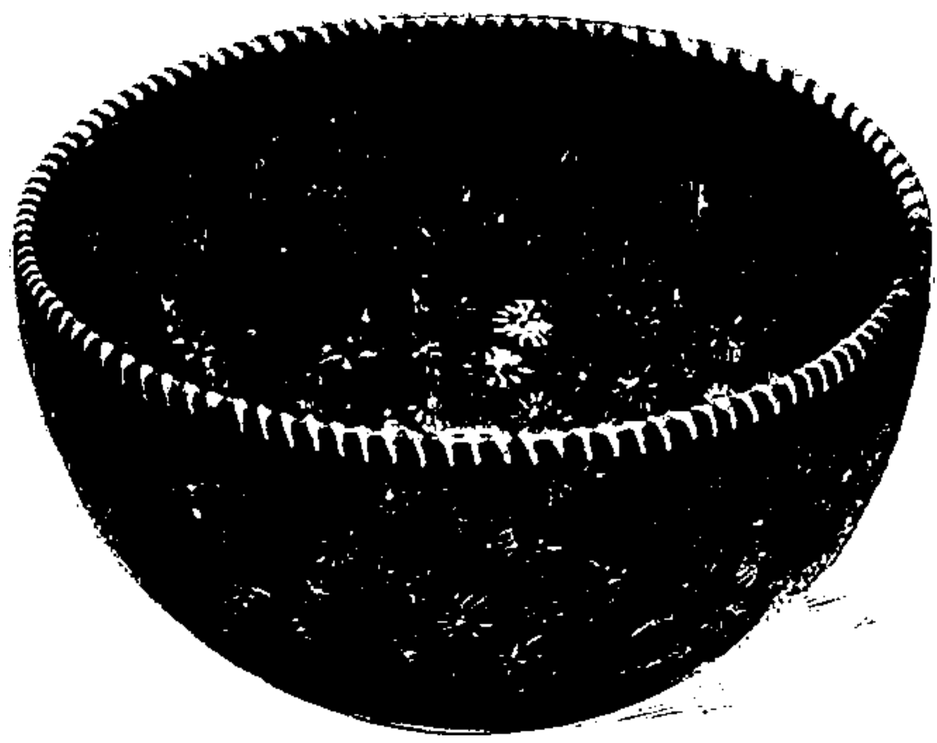

ROMAN MILLEFIORI GLASS BOWLS, IMITATING NATIVE STONES

to mask the spiral arrangement), and a further variety is given by setting up many of them obliquely to the surface. On the other hand we can seldom, perhaps never, find any trace of the distortion, which would inevitably be caused by the subsequent use of the blowing-tube. In other cases, the individual fragments may be built up of irregular longitudinal bands, so as to give the general effect of an agate breccia, as in a fine bowl at South Kensington. When the contorted bands are continuous we have another important type, founded apparently upon the endless varieties of banded agate and other native stones that have been formed by slow deposition in the hollows of rocks. One variety imitates amethystine quartz, but here, as elsewhere, rich combinations of colour, which can have no prototype among natural stones, are often introduced. We have an exceptionally beautiful example of this in certain cigar-shaped alabastra, said to have come from Sidon. Meandering bands of emerald green, powdered with gold, are divided by lines of white and deep blue. Good examples of this 'peacock' decoration may be found in the British Museum, at South Kensington, and in the Gréau collection.[1] Allied to these, and still more rare, are the little globular bottles with bands of green and gold, of which there are exquisite specimens in both our great Museums.

In the Etruscan Museum of Gregory XVI. in the Vatican, the millefiori glass is well represented by a series of bowls from Greek and Etruscan tombs. There is a choice collection of fragments of millefiori and banded glass in the British Museum,[2] and a still larger one in the Industrial Museum at Vienna.

[1] This collection, which contains many fine examples of ancient glass, has been bought *en bloc* by Mr. Pierpont Morgan, and is likely to follow the still more famous Charvet collection (so carefully described in M. Froehner's great work), and to find its way to America.

[2] The basis of this collection was formed by Mr. Nesbitt many years ago; it was presented to the Museum, in 1887, by his brother-in-law, the late Sir A. W. Franks. Mr. Nesbitt was the compiler of the catalogues both of the Slade collection (privately printed, 1871) and of the glass at South Kensington (1878)—magnificently illustrated works, but now in a measure out of date.

A broken fragment of glass will indeed often tell us more than a complete vase. We can, for example, see from it whether the pattern passes continuously through the whole thickness of the glass, or whether it has been inlaid, or perhaps pressed into the surface when hot. In one case we have a process that reminds us of mosaic work; in the other there is some approach to a *champlevé* enamel, only with a base of glass instead of metal. In some rare examples we find the glass inlay surrounded by a fine ribbon of gold, suggesting the *cloisonné* enamels of the Byzantine jeweller. There is a minute example of this delicate work in the Slade collection (*Catalogue*, Pl. III. No. 4).

Colours of Roman Glass

It is evident that the Romans had at their command a full gamut of colours, both transparent and opaque, obtained from iron, copper, manganese, and antimony—the same metals, in fact, as the Egyptians made use of. But their deep transparent blue they probably obtained, in most cases, from cobalt, a metal unknown to the latter people.[1] There was one great deficiency, however, in their palette. They were never able to obtain a transparent red. The ruby red derived from copper or from gold was known to the early mediæval alchemists, but no undoubted instance of the use of this valuable colour has been observed in glass of the classical period.[2] The nearest approach to a transparent red is to be found in the honey and brown-red tints resembling the sard and the hyacinth; colours such as these are derived chiefly from iron, and may pass, on the one hand, into a pale yellow, and on the other into various shades of olive-green. The opaque red glass containing a large percent-

[1] The evidence, however, on this point is very conflicting.

[2] The pale rosy tint seen in a few rare specimens of classical glass, as in some pieces lately brought from Egypt, I should rather attribute to a skilful use of manganese.

age of the basic oxide of copper and also some oxide of tin,[1] was much admired by the Romans; it was probably the *vitrum hæmatinon* of Pliny. In the Gréau collection is a head of Neptune in this material, of considerable artistic merit; to this head the oxidation of the surface has given the appearance of a finely patinated bronze.

Wall Decoration of Glass

Before going on to speak of the blown glass of the Romans, it will be well to say something of another application of glass that found favour among them at one time. This consisted in the decoration of the surface of walls, and in a few rare cases of pavements, by slabs of glass of various colours.[2] We may, perhaps, trace a double origin for this use of the material. On the one hand, it but carried out more fully the decoration of wall surfaces by rosettes and other patterns, both of glass and of glazed pottery, a plan often adopted by the Egyptians. This style was imitated with the little plaques of glass inlay, of which so many fragments have been found among the vineyards in the neighbourhood of Rome.[3] On the other hand, slabs of glass were used to imitate the veneer of porphyry and other marbles, so much in use in Rome in the first and second centuries. The two favourite stones, the red Egyptian porphyry with white spots and the green *Serpentino* from the Taygetus range with large, whitish crystals of felspar, were admirably imitated in slabs of glass often of large size; of these many important specimens may be seen in the British Museum. This

[1] The presence of tin in this glass which I have already mentioned in speaking of its Egyptian prototype (p. 27), has been confirmed by analyses made at Sèvres by M. Salvétat. I do not know whether the researches of this chemist into the composition of the glass of the ancients have ever been published.

[2] In the Roman floor mosaics the tesseræ are almost invariably of stone, but occasionally fragments of glass are found, as in the famous 'Mosaic of the Philosophers' in the museum at Cologne. Here the ground is built up of a smeltz-like greenish glass.

[3] We may compare this use of glass with the *kyanos* studs of the Mycenæan period, or again with the blue glass inlaid between the volutes of the capitals in the temple of Minerva Polias at Athens, described long ago by Hamilton.

method of decoration must have been introduced at Rome at a comparatively early date, if we are to accept the usual interpretation of the passage where Pliny describes the application of glass to the exterior of the theatre built by Scaurus at the beginning of the first century before Christ.

The best known examples of this glass veneering come from the ruins of a building some four miles to the north of Rome, generally known as the Villa of Lucius Verus; there are many fine pieces from this source in our museums. In private houses this veneering of glass was above all in favour for the bath-chamber. '*Vitro absconditur camera*,' says Seneca, instancing this practice as a sign of the advancing luxury of the age.

In the earlier methods each slab or tile is built up of pieces of glass of geometrical outline; in rarer cases the adjacent pieces have been fused together or again pressed into a base of glass by a plan similar to that formerly used in Egypt. But when the individual pieces of glass have been cut into shapes and then fitted together to form the design, we have the *opus sectile* of the Romans. We are here dealing with something nearly approaching in character to a true mosaic, and therefore outside the limits we have given ourselves. But it is impossible to pass over without mention the marvellous examples of this class of work which covered the walls of the basilica erected at Rome by Junius Bassus, consul in the year 317. Although this building no longer exists, important remains of the *opus sectile* which once covered its walls are preserved in a private palace at Rome, and some smaller compartments may be seen in the Church of St. Antonio Abbate on the Esquiline. These have been described in a paper read by the late Mr. Nesbitt before the Society of Antiquaries (*Archæologia*, vol. xlv.; see especially the coloured plate XVIII.). The main subjects, indeed, and the ground are executed chiefly in coloured marbles, but for us the most interesting part is the band representing embroidery below the large picture of Hylas

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Saqqarah; others of watch-glass shape, set in frames of lead, have been found in Roman tombs at Ratisbon.

Moulded Glass

Two quite distinct applications of glass fall under this head. When the glass paste, in a fluid or semi-fluid condition, is pressed into a mould, we have a simple process for making either imitations of cameos and intaglios cut in precious stones, or again small articles of *verroterie* in no way differing from those produced by the peoples of the Eastern Mediterranean from an early period. Most of the work executed in this way in Roman times has little claim to artistic merit or originality. Masks and busts thus prepared were afterwards applied to the decoration of other objects—furniture, or even metal ware[1]—or they were fused on to the sides of vessels of blown glass.

Much attention was given to the imitation of precious stones. In the British Museum is a remarkable series of medallions and plaques in a paste made in imitation of *lapis lazuli*, the *sapphirus* of the ancients. The colouring matter in this case would appear to be the famous Egyptian blue, which was certainly known to the Romans (see p. 27). In one example at least we can see that the coloured paste only formed a coating upon a base of ordinary glass, and this would point to the former being a material of some value. The large plaque of this blue paste, inscribed Bono Eventui, seems to have been finished with the tool, but we cannot look upon it as throughout a work of the sculptor. Heads of the Medusa or of Jupiter, viewed in full front so as to fill the roundel, are the commonest type. The dark paste in which some small portrait heads in the British Museum are cast is probably an imitation of the rare black sard.

I have now to speak of another class of moulded glass, of what is, in fact, a true 'hollow ware,' made by

[1] Mr. Kennard has a plaque of clear white glass, some six inches in length, with the bust of a faun in high relief. This plaque is pierced on either side, as if for fixing upon some object of furniture.

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blowing a vesicle of glass into a mould. This is the first time that we unmistakably come across the use of the blowing-tube. In the case of glass it is practically impossible to use a mould in the shaping of a hollow vessel without some such method of forcing the viscid material into its place by pressure from the inside. I think, therefore, that it is not unlikely that it was in connection with some system of moulding that the blowing-tube was first introduced. Thus combined, the process calls for less manipulative skill than is required in the shaping of the free *paraison* by the glass-blower.

Moulded 'hollow ware' was produced at a comparatively early date in the East. Unfortunately we have no means of determining whether the glass-blowers of Sidon were acquainted with the process before the first century B.C. By that date, at least, the little flasks, *unguentaria* or what not, blown into moulds, had completely displaced the primitive chevron bottles that had so long been in favour. These moulded flasks are shaped in imitation of various fruits—dates, bunches of grapes, pomegranates—again the double scallop shell was a favourite pattern; more rarely we find the head of a man or a woman, especially of a negro. The glass is of various colours, but a rich honey tint is the commonest.

Another frequent type, especially to be connected with the towns of the Phœnician coast, is to be found in the little bottles, generally with eight panels round the body, on which are impressed various implements connected with the sacrifice, or at other times Bacchic emblems or musical instruments. In one or two cases the reliefs on these flasks have been thought to have reference to the Jewish worship. These little octagonal bottles have been found in various parts of the eastern basin of the Mediterranean, as well as on the north shores of the Black Sea. The glass of which they are made tends to decompose to a white porcelain-like mass, without further injury to the surface, a fact which would point to its containing a certain amount of lead and perhaps of tin.

Here, for the first time in the history of glass, we come across the name of the manufacturer—we can hardly say the artist. It is, indeed, as might be expected, to the moulded ware that we are indebted for the most important of the scanty inscriptions that have been found on Roman glass; of these I shall have something to say on a future page. Such inscriptions in relief are above all prominent on the only other type of moulded glass which I can find space to mention. I refer to the cylindrical cups of thin greenish glass, which were apparently given as prizes for victory in various contests, or which perhaps merely served as mementoes of the occasion. Among the most interesting of this class is a series of glasses of which the best examples have been found in England; these are surrounded by double or triple zones, showing in relief chariot-races or combats of gladiators. All are of late date, and are of no merit as works of art. On one, exceptionally perfect, found near Colchester, and now in the British Museum, above the two bands of reliefs showing the rival chariots rounding the critical point at the extremity of the *spina*, the inscription CRESCENS AVE—HIERAX VALE would seem to celebrate the victory of the first-named charioteer, but it may perhaps only express the hopes of Crescens' backer.

The moulded hollow glass of the Romans often calls to mind the red Samian pottery decorated with reliefs, to which it is, however, as a whole inferior in artistic merit. The material does not lend itself well to elaborate designs, and one misses the crisp outlines given to glass by the cutting-tool. There is generally an air as of a cheap and second-hand copy, which gives a very modern aspect to many of these moulded pieces, and this is above all the case when the glass is transparent.[1]

[1] We may regard the little ovoid vase in the British Museum, made by blowing a thin vesicle of deep blue glass into a casing of silver, pierced by oval apertures, as an example of moulded glass where the mould has not been removed. If the silver casing were stripped off, we should have a good imitation of 'prunted' glass; not that this is to be taken as a model of the way in which these prunts were made (see below, p. 110).

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the neighbourhood of Nazareth, but the majority were probably found nearer to the coast, not far from Sidon and Tyre. The forms are on the whole classical, but Oriental influences may be seen in some cases, as in the double *unguentaria* which resemble certain Egyptian kohl-pots (Plate VII.). The apparent abundance of this Syrian glass, and the clear, nearly colourless material, point to a time rather after than before our era.

We know that soon after the middle of the first century, all the various forms and applications that we associate with the blown glass of the Romans were in general use in Italy. The proof of this lies in the vast collection of ancient glass in the museum at Naples. There were some years ago in this collection more than eight thousand pieces of glass, and it is constantly being added to. By far the greater part of this glass comes from Pompeii. Now that town was destroyed in the year 79 A.D., and it had sixteen years previously suffered so seriously from an earthquake that little glass can have survived; we are thus able to fix within exceptionally narrow limits the date of most of the glass discovered in the ruins. Apart from a few elaborate examples extracted from the tombs—some of these may well be of an earlier date—we find a vast series of vessels adapted to various domestic purposes, but more especially to uses connected with the storing and drinking of wine. These are for the most part made of a transparent and often colourless blown glass. By this time, then, the art of the glass-blower must have been fully developed in Southern Italy. The Pompeian glass has been well preserved by the thick bed of dry ashes, and has suffered little from surface decomposition.

From a few scattered references in Roman writers we can in a measure trace the rapid change in the position of glass at Rome, say between the latter days of the Republic and the end of the reign of Augustus. Cicero mentions glass as an article of merchandise brought from Egypt, together with paper and linen. Strabo, writing

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under the rule of Augustus, says that at Rome every day new processes were invented for colouring glass and for simplifying its manufacture, so that 'a successful imitation of crystal may now be made so cheaply that a drinking-glass with its stand can be sold for a copper coin' (xvi. 25).

It is not, however, from Italy, or even from Mediterranean lands, that the greater part of the Roman glass in our collections comes, and this is especially the case if we confine ourselves to the 'hollow ware'—the true blown glass with which we are at present concerned. Already in Pliny's time the new industry had spread to Spain and Gaul, where, before long, favoured no doubt by the cheapness of the fuel and of the raw materials, important centres of manufacture must have sprung up. We learn from Strabo that not long before his time the Britons obtained what little glass they used—this was confined, indeed, to articles of *verroterie*—from the Continent. But though we have no direct evidence on this point, there can be little doubt but that glass-works were established at least by the second century in the southern parts of England, and that, to give one example, the large globular and quadrangular urns of greenish glass were made at glass-works not far from the tombs in which they are found.

Indeed, the bulk of this northern glass is of a sepulchral character. The large size and the graceful shapes of the well-known cinerary urns argue a complete mastery of the technical processes, and point to works on an extensive scale where large glass pots must have been in use. These spherical urns owe their preservation for the most part to the fact that they were enclosed in 'coffins' of lead or stone. The somewhat prosaic and ungainly square bottles that often replace them must have been blown into a mould of some kind.

Little or no trace of local influence can be found in the shapes or the material of the glass made in the second, third, and fourth centuries in Gaul, in Britain,

or on the Rhine. In the Glass-Room in the British Museum, the large vessels of blown glass are chiefly of Gallic origin; the most important come from a collection made many years ago in the south-east of France. They may be compared with the Roman glass found in Britain exhibited in the Central Saloon. On the whole, these large glass urns are characteristic of the northern and western provinces. While they appear to be unknown in Greece and in the East, in the Roman columbaria they form a very small proportion of the urns ranged in the niches and along the shelves.

The gigantic cinerary urns from Kentish cemeteries are only rivalled in size by some of the Pompeian glass at Naples. Among the glass from cemeteries in Southern Britain in the British Museum are many jugs and bottles of quaint and original form, and others which for grace and purity of outline it would be difficult to rival elsewhere (Plate IX.). Notice especially the handles, and above all the insertion of the lower end of these handles into the side of the vessel. It is the neglect of attention to this point that so often gives an impression of weakness to the handles of modern ware, whether of pottery or of glass. But here the ribbed handle terminates in spreading lines that clasp the flank of the jug like the claws of a bird of prey; I do not know of any happier or simpler application of the viscous material. At times the central rib of the handle is prolonged into a wing-like flange descending nearly to the base of the vase, or may be ending in a long trail of glass worked by the *pucella* into quills or teeth.

A greater variety of forms is naturally found in glass made for domestic use than in specimens destined for the tomb. It is this variety that gives a special interest to the collection at Naples. M. Froehner has described nearly thirty different forms of glass vessels (*Collection Charvet*, pp. 76-80), and has attempted to apply to each of them the distinctive classical name, both Greek and Latin. But many of these terms are rather names of

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articles of glass exported to the Celtic tribes of these districts, but nothing is known as to their place of origin. In other cases such ribs or stringings, bending round the body in a more or less gentle spiral, form a very happy scheme of ornament.

The decoration by trailed stringings—necessarily a rapid process, by which happy effects are sometimes attained almost by accident—may be regarded as a genuinely vitreous process. It is often combined with fringes and toothings impressed—on the margin of the handles above all—by the rapid and skilful use of the pincers. The commonest, and probably the oldest, application is as a more or less closely coiled stringing round the neck of the bottle or jug; this is convenient for handling, and gives the appearance at least of additional strength. The stringings on the later forms tend to hang loose upon the surface, sometimes taking the form of hastily written characters.[1]

The cords and threadings may often be of a different colour from the vessel upon which they are applied—they may be reduced to knots or mere drops applied here and there. In such cases we have an apparent approach to decoration by enamel. But the form of ornament that we are now dealing with is applied directly to the soft *paraison* or to the still unfinished vessel, and the glass of which the stringings are formed is probably of the same composition as that on which it is superimposed.

So of the splashed or mottled ware. We have here real splashes of a liquid material applied to the *paraison* while still on the blowing-tube. When the neck was subsequently shaped, these circular markings were drawn out into ellipsoid forms, showing that this part of the vessel was made at a later period. It is instructive to compare this result of the work of the blowing-tube

[1] How far the so-called *diatretum* work is based upon such *appliqué* or added portions of glass is a much disputed point. Mr. Nesbitt appears to have regarded all such work as so formed (*Catalogue, Slade Collection*, pp. xiv.-xv.), and the imitations now made at Murano are certainly built up in this way; not so, however, some of the genuine ancient pieces, I think. (See below, p. 71.)

with the patterns on the millefiori bowls. In these latter patterns we find no trace of subsequent distortion—a proof that the glass of which they form part has never passed through the stage of a *paraison* or vesicle.[1]

Enamelling on Glass

I now for the first time have to treat of the decoration of glass by enamel painting. It may be as well here to explain that in a true enamel, as the term is used in ceramic and vitreous art, the coloured decoration is applied to the glassy surface (either glaze or glass body) in the form of a pigment worked up with water or other liquid. Such enamel paints are composed, in later times at least, of a base of silicate of lead (the flux), coloured by various metallic oxides. It is essential that these enamels should be more fusible than the body on which they are painted, so that when subjected to the heat of the muffle-fire they may be completely fused, while the glass or glaze on which they rest is not more than superficially softened. Such enamel decoration, whether on porcelain or on glass, may vary from a mere wash of colour on the one hand, of which it is sometimes difficult to say whether it has ever been subjected to the heat of the muffle-fire, to a true vitreous covering on the other, where the various colours stand out in relief like so many jewels.

I may say at once that the Romans, as far as we know, never attained to any great success in this method of decoration. Its full development was reserved for the Saracens of the thirteenth and fourteenth centuries. This is indeed the one important advance made in the artistic manipulation of glass since 'the palmy days of Rome.'

Not but that the Romans, and probably to some extent the Phœnicians and the Alexandrian Greeks before them, did not draw and paint upon their glass; but if

[1] The Egyptians, too, as we have seen, sometimes decorated their glass with similar splashes, but we never find that these are distorted.

we may judge from the rare and fragmentary examples that have survived, they were unable to obtain much decorative effect by this means; again, the very poverty and the paint-like quality of such enamels as they used, have doubtless in many cases led to their total disappearance from the surface of the glass.[1] The painting on the cup-like lids of the little bowls from Cyprus I have already mentioned. On a few fragments of thin glass from Egypt, draped figures have been painted in opaque colours. Perhaps the nearest approach to an effective use of enamel colours may be seen on two little cups found in graves of the fourth century at Varpelev, in Denmark. These Scandinavian tombs have yielded many interesting pieces of glass, as well as some bronze vessels—possibly booty brought home from marauding expeditions. The designs on these cups (they are illustrated in the *Proceedings of the Copenhagen Antiquarian Society*, 1861) are thus described by Mr. Nesbitt: 'On the larger one are a lion and a bull, on the lesser two birds with grapes. . . . The colours are vitrified and slightly in relief—green, blue, and brown may be distinguished.' (*Slade Catalogue*, p. xvi. See also some account of glass from these and other Scandinavian tombs in Montelius and Reinach, *Les temps préhistoriques en Suède.*)

But the most important and the best preserved example of enamelling on glass is to be found in a small bowl, probably of the third or fourth century, preserved in the treasury of St. Mark at Venice. To this important collection I shall have more than once to return.[2] The little bowl in question—something over three inches in height—is of a translucent glass of a winy or purplish colour. The seven larger medallions that surround the body are filled with mythological subjects

[1] There are many allusions to the painting of glass, in some cases merely by varnishes, in the early mediæval treatises on glass (see Chap. VII.). Some of these recipes, as we shall see, may have been handed down from classical times.

[2] The contents have been described by the late Canonico Passini, in a magnificent work published by Ongania of Venice, in which nearly every piece of importance is reproduced in colour or by photography.

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of the series, we have seen that the glass bowls that are associated with Alexandrian-Greek and early Roman times are mostly finished by a cutting-tool on some kind of lathe. In the case of the bowl of white glass from Canosa in the British Museum, closely imitating in form the well-known *scyphos* of the Greek potter, the handles are apparently carved out of a solid mass (cf. p. 46); a very similar bowl in the Charvet collection, said to have come from Cumæ, is illustrated by Froehner. Still more interesting is the large shallow bowl or dish of white glass in our national collection; this is again from a tomb at Canosa. A ring of some twenty spurs, each about half an inch in height, arises from the outer margin; these spurs are carved apparently out of the solid glass. A large rosette cut in low relief, representing a full-blown lotus flower, covers nearly the whole of the surface. With this work we may compare the rosettes, much more rudely carved, it is true, on the base of some very similar bowls of late date from the Rhine country.

Of quite a different character is the carving on those earlier vessels of which we may take the well-known Portland vase as a type. Here the delicate sculpture in low relief takes us back to the cameos of the Hellenistic Greeks, which, as we have seen, were often executed in a glass paste. But few specimens of work of this kind have come down to us—some half-dozen in all—and of these only two are perfect. The body of these vases is formed by two or more superimposed layers of glass, of which the outer one, generally of an opaque white, is ground away by the wheel of the engraver, leaving a design in low relief upon a basis of blue or other colour.

The most famous example of this class is, without doubt, the Barberini or Portland vase, a two-handled urn found towards the end of the sixteenth century in a marble sarcophagus at the Monte del Grano, a lofty tumulus some three miles to the south-east of Rome. Whether the tomb from which the urn was extracted was

that of the Emperor Alexander Severus, who was killed in the year 225, is not of much consequence, for the vase itself is certainly of an earlier date. The figures in this case stand out upon a dark blue ground—we need not dwell upon the interpretation of the subject. As Wedgwood long ago pointed out, a rich and almost pictorial effect is given by cutting down the white layer in places nearly, but not quite, to the blue base which then shows through a film of the slightly translucent white paste—an effect, by the way, that is almost lost in the imitations of this vase made in the opaque Wedgwood ware. A curious point about this vase is the fact that the decoration is continued over the circular base on which it stands. This medallion-like space is filled by the bust of a youth with a Phrygian cap wrapped in voluminous drapery. There is some doubt, however, whether this medallion is of so early a date as the rest of the vase.[1]

Almost identical with the Portland vase in technique and material is the amphora of onyx glass, carved as a cameo in low relief, which was found in 1837 in a tomb on the Strada dei Sepolcri at Pompeii. In this case we have a limit—a *terminus ad quem*—for the date, the middle, that is to say, of the first century of our era. But the work may well be of a somewhat earlier time than this. The decoration is distinctly Alexandrian in character. Notice especially the band at the lower part with the sheep feeding under trees—in this we are at once carried back to the pastoral poetry of Sicily. It will be observed that the vintage scenes with the little naked 'putti' are placed under the handles, while the place of honour is reserved for the beautiful design of vine-branches, masks, and birds. The highly developed

[1] This part is stated to be a distinct piece cemented on to the bottom of the vessel. So at least says Mr. Apsley Pellatt in his *Curiosities of Glass-making*, writing, I think, before the vase was broken.

In the same book will be found a careful account of the process of 'casing' as now practised. It was probably by some such plan, in the case of the Portland vase, that the *paraison* of blue glass was blown into the previously prepared vessel of opaque white.

technical skill required, especially in the preliminary blowing and 'casing' of the glass, is, however, an argument against throwing back too far the date of vases of this class.

Some fragments of another vase of a similar character were found at Pompeii at a later date; the pieces after passing through various hands are now in the British Museum, where they have been united to form (with extensive gaps) an *œnochoë* or jug, known as the Auldjo vase, from the former owner of most of the fragments; in this case the decoration of the parts preserved consists chiefly of vine and ivy leaves. There are at Naples many fragments of onyx glass equal in beauty and skill of execution to these well-known vases. Among these, the half of a patera decorated, on a dark blue ground, with a mask surrounded by the leaves of the Oriental plane, is of exceptional merit. In other cases the parts in relief seem to have been cast separately and fixed on to the surface, a technical process of quite another nature.

In all these examples the work of the artist follows closely on the lines of the carver of cameos—especially of those cameos where advantage is taken of the parallel layers of the natural stone, as in the case of the sardonyx and of the niccolo; it is for this reason that I have described the material of our Barberini and similar vases as onyx glass. But there was another and purer variety of quartz that was coming more and more into favour during the third and fourth centuries. From this time onward all through the early Middle Ages, if we are to judge from the treasures preserved in Christian churches, to nothing was more value attached than to vases and cups of rock crystal, often of imposing dimensions, carved in shallow or deep relief. When once the process of making a clear colourless glass was mastered, this natural crystal could be very closely imitated in a material which was more easily worked. The carvings on the great majority of the examples of rock crystal that have come down to us—for example, the vases in the Louvre from

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unmistakably to the use of a cutting-tool, nor is there, I think, any trace of soldering at the base of the rods. We must turn again to the marvellous collection of late classical and mediæval objects that has been so long preserved in the treasury of St. Mark's at Venice for the most complete specimen of this undercut glass. Here will be found a *situla*, or bucket-shaped vessel, of slightly greenish glass, about eleven inches in height (Plate XIV.). On the upper zone is a hunting scene with two horsemen, treated with a certain energy that calls to mind some of the Byzantine and even Sassanian work of the fourth and fifth centuries. Below we have a raised network, or rather grating—for the motive seems to be taken from a grille of iron or bronze—formed of four rows, each built up of fifteen tangential circles bound together at the points of contact. About half of these circles are more or less broken, and neither on the ground nor on the supporting rods thus disclosed was I able on close examination to discover any of those marks of a cutting-tool so prominent on the British Museum fragment. Indeed it is very possible that this late example may be built up of separately cast pieces soldered on to the base.

The famous cup of *diatretum* glass found near Strassburg was destroyed during the bombardment of that city in 1870; it bore an imperfect inscription in raised letters, which has been interpreted as referring to the Emperor Maximianus Herculius, the partner of Constantine in the empire, who put an end to his life in 310. In this case a network of red glass and an inscription of green glass were superimposed upon a nearly colourless ground. So in another cup preserved in the Palazzo Trivulzio at Milan, the inscription BIBE VIVAS MULTOS ANNOS is again in green glass, but the network is here blue. Where the detached decoration is of a different colour from the base, the original vase must have been of an onyx glass formed by a 'casing' process and of considerable thickness, unless, indeed, we are to regard the lettering and the network in such cases as

BOWL OF OLIVE-GREEN GLASS, ON METAL STAND

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formed separately and attached to the base by the little rods. Perhaps the finest example of a *vas diatretum* is the bowl found in a stone sarcophagus at Worms, of which the fragments are now divided between the museums of Bonn and Mainz. In the former museum may also be seen a tall amphora-shaped vase (some twenty inches in height), with Bacchic scenes carved in low relief, which was found in the same coffin.

The oviform bowl belonging to Lord Rothschild is carved in an olive-green glass, which appears of a deep red by transmitted light. It is surrounded by five figures in what is practically complete relief; the subject represented appears to be the 'Madness of Lycurgus.' The arms and the draperies of these figures are connected to the base by little rods as in the previous examples, but to judge from certain cavities in the interior corresponding to the principal external *bossages*, the glass was originally cast in a mould.[1]

The often-quoted expression of Martial, '*Surrentinæ leve toreumata rotæ*,' written before the end of the first century, can hardly refer to this undercut work, which seems to be all of a much later date, nor is it even certain that the words refer to objects carved in glass rather than in rock crystal and agate. The word *toreumata* is used in connection with silver and even of earthenware. So the *calices* and *toreumata Nili* of the same writer (xi. 12) seem from the context to be rather carved in some precious stone. The following lines, however, are headed 'Calices Vitrei':

> 'Adspicis ingenium Nili, quibus addere plura
> Dum cupit, ah quoties perdidit auctor opus!'
>
> MARTIAL, xiv. 113.

[1] By the courtesy of Lord Rothschild I have had an opportunity of examining this wonderful cup. It is undoubtedly carved from one piece of glass. The spirited execution would seem to point to a date hardly much later than the beginning of the third century. The internal depressions were made perhaps with the object of lighting up the external figures. The glass by transmitted light is of a fiery red, tending to purple, but the figure of Lycurgus is exceptionally of a fine amethystine tint. I think that in both cases the colour is probably due to a skilful use of manganese.

In some other references to glass in Martial's *Epigrams* it is mentioned as a cheap material, and contrasted with gold or rock crystal.

As a rule, however, this late Roman glass was cut in very low relief. The design was often given by the juxtaposition of a number of ovoid depressions and furrows scooped in a perfunctory fashion by means of a lapidary's wheel of some size.[1] At times this wheel was applied so as to make a rough burr on the surface; on the other hand but little use was made of the simple engraved line that we find on the German glass of the seventeenth century.

The designs on this later engraved glass are almost without exception of the most wretched description; any interest they may have is archæological, and dependent upon the subject treated. Many pieces, especially in the form of shallow bowls, have been found in tombs of the third and fourth centuries in the Rhine district, especially around Cologne. Some of these bear inscriptions in often very faulty Greek, but I do not think that this is a reason for inferring that they are not of local manufacture.[2] On one cup from Cologne the creation of man by Prometheus is represented, but the majority of the subjects are of a more or less Bacchanalian or even of an erotic character. It has been attempted to connect these with the *tabernæ*, the roadside inns—places of no good repute in those days—and even to find representations of these hostelries in certain tall and evidently secular buildings engraved on them.

Still more curious are the spherical ampullæ on which a panoramic landscape is roughly scratched; in every case the scene represented is the coast-line from the bay of Baiæ to Pozzuoli, the names of the various temples and palaces being indicated by inscriptions. (See Froehner, p. 96.)

[1] The abrading material employed along with the wheel was probably in most cases corundum or emery (the *adamas* of the ancients) in a powdered form; not the diamond, which was excessively rare, nor the emerald, as is sometimes stated. This last stone is not only much rarer than corundum, but it is also not so hard.

[2] Compare what is said below on p. 82 of Greek-speaking Syrian artisans.

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every reason to believe that there were few important changes in the construction of the furnaces, or in the preparation of the materials, during the time that intervened between, say, the fourth century of our era and the period in the Middle Ages with regard to which we have further sources of information. That is to say, we may regard the comparatively adequate account of the manufacture of glass given by the monk Theophilus, and by the pseudo-Heraclius,[1] as on the whole applicable to Roman times. Even at the present day at Murano, and doubtless at other glass-works little affected by modern industrial processes, much of the old method of working and many of the old terms remain almost unchanged. To give but one example:—when the workman is preparing the half-liquid gathering or ball of glass at the end of his blowing-tube, previous to inflating it with his breath to form the *paraison* or vesicle, he trundles the viscous mass upon a slab of iron which rests on the ground beside his furnace. This iron slab is known as the 'marver'—there are similar names for it in other European languages—and it is always understood that the plate in question was formerly made of marble. So, no doubt, it may have been at some remote period, but we find that the pseudo-Heraclius, describing in the twelfth century or thereabouts the manufacture of glass, speaks of this same plate as '*tabula ferri quæ marmor vocatur*.' Perhaps we should have to go back to the stone slab on which the Egyptian glass was rolled to find the origin of this 'marver.'[2]

We must now see what can be made out of the somewhat rambling account of the origin and manufacture of glass given by Pliny at the end of his thirty-sixth book (cap. 44-47). Pliny regarded glass as a Syrian invention. For many centuries, he tells us, the sole source of the

[1] For some account of what these writers tell us about glass, see below, Chap. VII.

[2] Theophilus, however, writing a century earlier than the pseudo-Heraclius, appears to speak of the marver as a slab of stone (see below, Chap. VII.).

principal constituent was a small tract of sand thrown up by the sea at a spot on the Phœnician coast near the town of Ptolemais, where the river Belus[1] flows into the Mediterranean. With this sand the natives mixed the *nitrum*, imported oversea in cakes,[2] and thereby for the first time formed glass. According to Pliny, these Phœnicians were astute and ingenious craftsmen, and they, in time, took to adding to their glass-pots the '*magnes lapis*, which, it is asserted, draws to it the melted glass like iron.' This is a statement most characteristic of Pliny. The *magnes lapis*—magnetic iron-ore or loadstone—is the last substance in the world any one would think of adding to glass. But we know that the ancients knew of two kinds of black stone, for one of which they used the masculine form *magnes*—this was the loadstone—for the other the female form *magnesia*;[3] and this *magnesia*, at any rate at a somewhat later period, can be undoubtedly identified with the black oxide of manganese (MnO_2), a substance known of old as the 'soap of glass,' from its power of removing the green colour derived from iron. Now we have seen that pure white glass, 'cleansed' probably by this method, had only comparatively lately been introduced into Italy, and some confused account of the new discovery had probably reached Pliny's ears. 'In the same way,' he continues, 'they took to adding to the fused mass shining pebbles, then shells and sandy concretions (*fossiles arenæ*).' In these 'fossils' we may, perhaps, recognise the source from which was obtained the lime, an essential constituent of glass. Passing over some obscure references to the nitre of Ophir and the copper of Cyprus, Pliny goes on to say

[1] The sand of this river as a material for the manufacture of glass is already mentioned by Theophrastus, a pupil of Aristotle.

[2] *Glebas nitri.* This is doubtless the natron (impure carbonate of soda) exported from the Egyptian natron lakes, which have been worked from a very early period—a substance that must not be confused with our nitre (nitrate of potash); as I have said, the glass of the ancients is essentially a soda glass. The natron was probably first exported for the use of the soap-makers.

[3] This again must not be confused with the white earth, which we now know under that name, a substance unknown to the ancients.

that the whole is melted 'like bronze,' in closely grouped furnaces, and that a blackish mass of fatty aspect is obtained. This we must regard as a preliminary frit, for we are told that the mass is melted again in the glass-house, where the requisite colouring matter is added to it. 'So the work was carried on of old in the famous glass-works of Sidon. . . . At times the glass was shaped by blowing, or again it was abraded by the wheel, or carved in the manner of silver. . . . Such was the ancient way of making glass. At the present day in Italy also, by the mouth of the river Vulturnus, for a space of six miles between Cumæ and Literum, a white and most soft sand is collected, which is pounded both in mortar and mill; it is then mixed with three parts of nitrum,[1] by weight or by measure, and after melting is transferred to other furnaces. In these the substance, now known as *ammonitrum*, is melted and then cast into cakes. These cakes are again fused to obtain pure glass and cakes of white glass.'

Pliny, in this confused account, where we have apparently materials from different sources imperfectly welded together, appears to contrast an older method of manufacture, practised formerly at Sidon, whose glass-works he seems to refer to as things of the past, with the newer processes now in use in Italy. It will be noted that in both cases a preliminary frit was prepared, although the term *ammonitrum*, a word of Greek origin, is applied to this frit in the latter case only.

'Already,' says Pliny, 'the new art of melting sand with soda (literally "of tempering sand") has spread through Gaul and Spain.' He then goes on to tell, but with an expression of incredulity quite unusual with him, the story of the discovery of a malleable glass. According to this tale (in its earliest form), Tiberius ordered the workshop of the man who so tempered glass that it became flexible, to be pulled down, lest the value of bronze,

[1] By this is probably meant three parts in twelve or ten, *i.e.* 25 or 30 per cent. of the whole.

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information about the arrangement of the furnaces. These glass houses were, however, well known to the beggars and loungers of the time—we hear of them as places of resort in cold weather for those who had no other way of warming themselves. In the Greek Anthology (No. 323), of all places in the world, there is a fragment by one Mesomedes, a contemporary and favourite of Hadrian, giving an account of a visit to a glass-house. Just at the point where the little poem breaks off, the workman is described as placing the molten mass between the blades of the pincers or shears.

Strabo tells us that when he was at Alexandria—he was there, we know, in the early part of the reign of Augustus (*circa* 24 B.C.)—he was assured by the glass-workers (ὑαλουργοί) that their 'many-coloured and sumptuous glass' could not be made without the addition of a certain glassy earth which was only found in Egypt, a story which points to the jealousy of foreign competition on the part of these craftsmen. So on the Phœnician coast he hears from some of the wonderful qualities of the Sidonian sand, while others tell him that one sand is as good as another. Strabo goes on to speak of the improvements made 'quite lately' in the clear crystal glass of which the manufacture had not long since been established at Rome. Compare with this the account of Pliny; in view of his certainly rather vague statements, we should hardly have looked for this *cristallo* in Italy at so early a date.

But it is neither from Italy nor from the countries bordering the Eastern Mediterranean that the most important supply of Roman glass has been obtained. Putting aside objects of quite local *provenance*, it will be found that in the museums of England, France, and Germany, by far the larger part of the glass exhibited—and this is above all the case with the blown glass—has been found within the limits of the ancient Gallia. Spain, contrary to what we might have expected, has yielded little Roman glass of any artistic merit, partly

perhaps for want of systematic search. But there are few districts in France or in the west of Germany where the exploration of Roman cemeteries has not yielded a plentiful crop. If we travel northward from the estuary of the Rhone by way of Arles and Nismes to Avignon, Valence, and Lyons, then across by the country on either side of the Jura to the valley of the Rhine, and follow that river by Strassburg to Cologne, we pass for the whole way through a district especially rich in Roman glass. And this is what might well be looked for. The third and fourth centuries—a little earlier or a little later, according to locality—are above all the great centuries for the prevalent use of glass, and it was during this period that the central tract of country that included the two great metropolitan cities of Arles and Trèves began to take the prominent place that it maintained throughout the early Middle Ages.

Even our English glass of this time, so much of which comes from districts to the north and the south of the estuary of the Thames, may be brought commercially at least into connection with the wealthy provinces of Northern and Eastern Gaul. It was from these provinces that glass was first imported, and from them, no doubt, the glass-workers passed over to Britain.

In the case of the rich collection of Roman glass in the British Museum, the backbone, as it were, is formed by the specimens excavated from tombs in the neighbourhood of the lower Rhone valley—from Vaison, near Vaucluse (the Comarmond collection), from Apt, and from Alais. At Arles, in that district of tombs, the Aliscamps, which furnished Dante with a well-known image, beneath the Christian sarcophagi (in these, too, not a little glass has been found), the earlier Roman tombs lie on the bed-rock. From these tombs numberless urns of glass, in cases of lead or stone, have been taken, as well as many examples of glass of rare and exceptional shapes—among others what is apparently an alembic for use in distillation. Some of these vessels

contain a red liquid which may *represent* at least the wine with which they were originally filled (Froehner, p. 109). In this town of Arles, too, in the suburb of Trinquetailles, there were probably extensive glass-works, as we may infer from the quantity of vitrified paste there found (Quicherat, *Revue Archéologique*, xxviii.).

To pass to the Roman cemeteries of Lyons: in the museum of that town are some curious masses of blue frit taken lately from a tomb on the Fourvière, which call to mind the fritted cobalt or smalt exported in modern times from the Saxon mines. We have in the British Museum many pieces of glass from older explorations at the adjacent suburb of St. Irénée. There is in the Lyons Museum a sepulchral stele of much interest found in this very district; it is to the memory of a certain Julius Alexander, a citizen of Carthage, a craftsman in the art of glass (*opifici artis vitreæ*). This Punic glass-blower left behind him children and grandchildren, who doubtless followed his trade. We must not infer too much from a single instance; we know, however, from other sources,[1] that there was a large influx into Gaul at this time of Semitic people, chiefly of a humble status, craftsmen and small merchants, and that they found their way in above all by the valley of the Rhone. These ubiquitous traders are generally referred to as Syrians, and I think it likely that the glass trade, not only in the south of Gaul but further afield, may have been in great measure in the hands of Orientals of this class. This would be especially true of the manufacture and hawking about of small objects of *verroterie*,[2] and again of glass pastes containing lead. But perhaps also the preparation of the more ambitious and artistic kinds of glass was in the same hands, leaving only the common ware to the native

[1] Among others, from the early history of the Christian Church in these parts.

[2] At Rome, too, there is some reason to think that the working of glass—the minor departments of that art, at least—was long in the hands of Syrian or other Semitic immigrants. Martial's itinerant hawker from the Transtevere, who bartered his sulphur matches for broken glass, we may perhaps think of as a Jew (Book I., *Epigram.* 42).

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bluish glass. 4. The period of the greatest development was about 200 A.D. Many kinds of decoration were in fashion, as zig-zag threadings on coloured glass. 5. After 250 A.D. This was the time of the glass with the *Frontinus* stamp.[1] The prevailing tint is a strong green, no longer bluish; the decoration is given chiefly by engraving and cutting; Christian subjects begin to appear. To this period also belongs glass decorated with coloured medallions of glass paste.

I give this scheme of classification under all reserve; the interlarding of a period of white glass between two stages of 'green glass' may perhaps be open to criticism, but at all events it is a step in the right direction. It must be borne in mind that this Rhenish glass belongs to the same Romano-Celtic family as that found in France, but, as in the latter country, the Celtic element is scarcely perceptible. The art was an entirely new one, and there was no earlier tradition to influence the work as in the case of the contemporary pottery, armour, or sculpture.

It so happens that the Roman glass of Gaul has been most carefully studied in a district far away from the route that we have been following. In Western France the researches of M. Benjamin Fillon (*L'Art de la terre chez les Poitevins*, 1864, and other works) have brought to light the remains of old glass-works. These appear to have been generally situated far from the main centres, and they were often associated with potteries. It would even seem that glass was at one time more in favour and perhaps cheaper than earthenware. A curious point is the number of localities in Poitou and La Vendée which bear names such as La Verrerie and Verrière; at as many as seven places with names of this class, M. Fillon claims to have found the remains of Gallo-Roman glass-works. These do not appear to have been established before the time of Trajan, and it is to the age of the Antonines in the second century that the more important examples of glass are to be attributed. Of somewhat

[1] See p. 88.

later date than this, however, are the fifty pieces of white glass from the villa and tomb of a *femme-artiste* at St. Médard-des-Prés. This was M. Fillon's most important find; some of the vases contained various coloured substances and resins, and they were closed by stoppers of wood or by sheaths of bronze.[1]

The British Museum has lately acquired a large collection of Gallo-Roman glass formed by M. Moret. Among this glass—it comes chiefly from late Gallic cemeteries in the neighbourhood of Paris, as from Corbeil and Conflans (Confluentia), and also from the Rheims district—may be seen beakers with circular feet and wide-mouthed cups with rounded bases.[2] To one of these a fantastic decoration has been given by a contorted streak of blood-like tint in the midst of the glass—caused by the perhaps accidental presence of a fragment of copper-oxide; we have here at any rate one of the earliest instances of the use of this valuable pigment to obtain a transparent red. Notice, too, the large receptacle cast in the form of a fish; similar vessels have been found at Arles, and they have been brought into connection with the well-known Christian symbol of the ἰχθύς.

Roman Glass in Britain

There does not seem to be any example of a vessel of glass from a pre-Roman tomb in Britain. The little ribbed bowls that have been found in Celtic tombs further south did not apparently reach our country. The ὕαλα σκεύη and the λυγκούρια mentioned by Strabo in an involved passage as among the imports into Britain, we must interpret as *beads* of glass and amber. From that time until the eighth century, when the Venerable Bede

[1] Compare with these the bottle from Cologne in the British Museum containing a hardened mass of some yellow substance, and closed by a decayed cork partly covered by a corroded bronze capsule (*Slade Catalogue*, No. 275).

[2] Both these forms are found in Anglo-Saxon and Frankish graves. It will be remembered that in France there was no sudden break in the Roman culture on the appearance of the Germanic invaders, as was the case in England.

wrote his history, we have not a word of documentary evidence bearing upon the question of glass in our country. Nor have we any definite evidence, apart from a few lumps of glass that may have had their origin in an accidental fire, that any glass-works existed in England during this long interval,—no evidence, that is to say, apart from that based upon the large amount of Roman glass found in England and the size of many of the specimens. The English glass, however, in no way differs from that taken from Roman tombs in the north of France. I have mentioned already the most noticeable types—the large urns, both spherical and quadrangular, the graceful jugs and vases with ribbed handles, and the little bowls of thin moulded glass with scenes taken from the circus. It is perhaps remarkable that the art of the enameller on metal, which we know at this time had been brought to a great perfection in Britain,[1] appears in no way to have influenced the glass-blower, and it would seem that in Britain glass vessels have been rarely found together with specimens of champlevé enamel.[2]

Most of the finer examples of native Roman glass in our museums have been excavated from cemeteries adjacent to the lower Thames valley, around Colchester and other stations to the north, but above all on the southern bank, in the district lying between the mouth of the Medway and the Isle of Thanet. In this neighbourhood, in the flat land between Sittingbourne and Faversham, were situated what were probably the most extensive potteries of Britain, and it is hereabouts if anywhere in England that we might look for traces of glass-works of Roman date. As we go further west and further north, glass, large examples at any rate, becomes comparatively rare,

[1] Philostratus describes the process by which the 'barbarians of the ocean' spread colours upon heated bronze so as to form a hard enduring decoration. He was of the household of Julia Domna, and M. Froehner suggests that he may have heard of these enamels from one of the officers of the army of Septimius Severus.

[2] The famous enamelled bowl, however, found in a Roman tomb of the time of Hadrian, at Bartlow, Essex, was accompanied by a cinerary vase and other examples of glass. See *Archæologia*, vol. xxvi.

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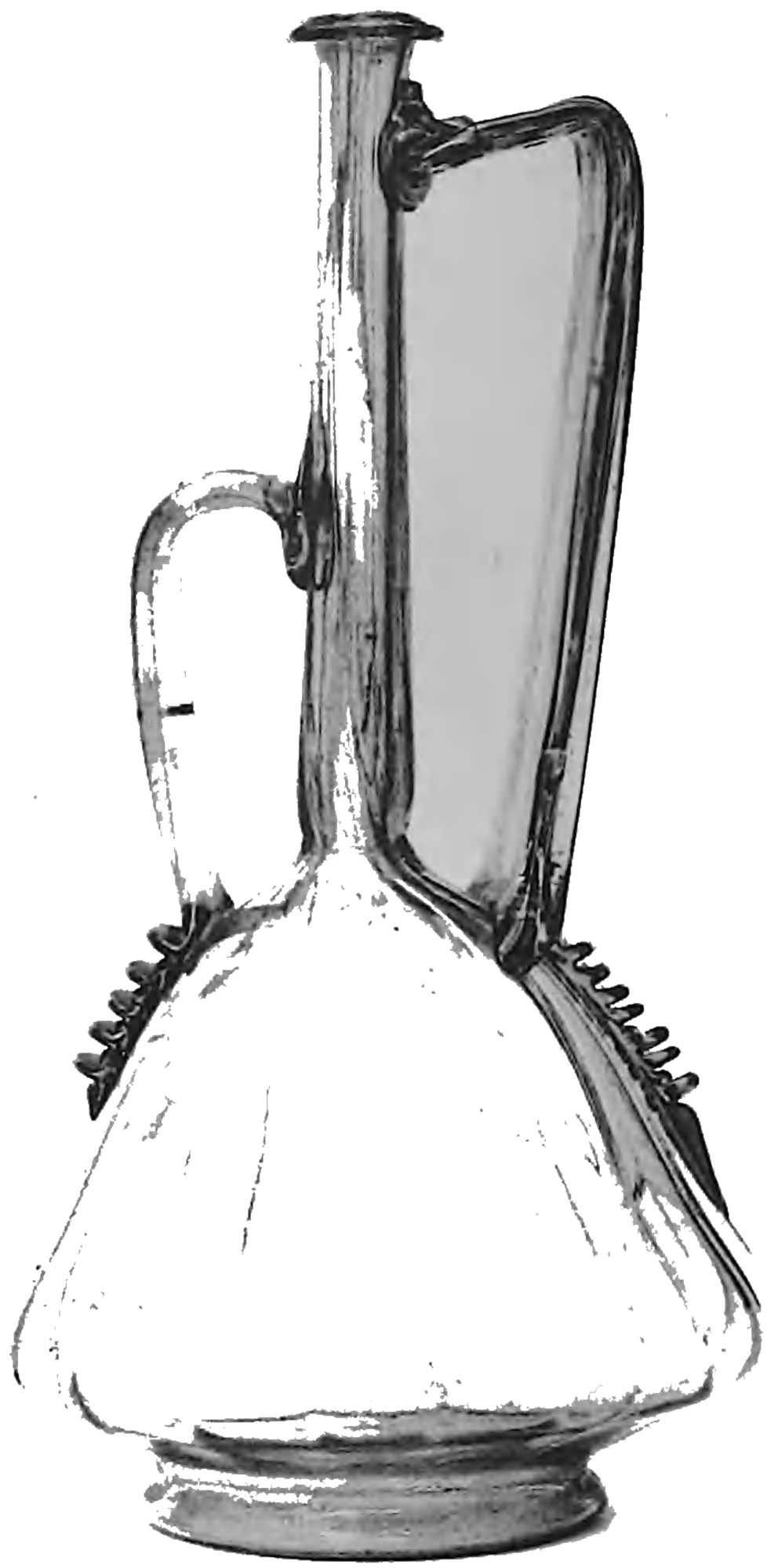

ROMAN GLASS FROM BRITISH GRAVES

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to the owner of the works whose name is accompanied sometimes by the word *patrimonium*. But the inscription is often reduced to four letters placed in the angles—letters that have been a standing puzzle to antiquaries. Many pieces of glass bearing the stamp of Firmus, of Hilarus, or again of Hylas—contracted or in the genitive case—have been found not only in Italy (as in the neighbourhood of Perugia), but also in the Cologne district. On the other hand, the signature of Frontinus is above all frequent on a series of barrel-shaped glass vessels of a late date, which come from various places in the north of France, more especially from Picardy; but the signature is found in the Rhine country also. The firm seems to have been as important and its outturn as widespread as that of the Bonhomme family of Liége in the seventeenth century. Several examples of the Frontinus signature in various forms are given by M. Froehner.[1]

It is a curious fact that in no case, as far as I am aware, has the custom of the manufacturer adding his name to the glass made by him become general in later times. The practical difficulties in the case of blown glass may be a sufficient reason for this. Perhaps the most important exception may be found in the stamps of makers' names on wine-bottles of the seventeenth and eighteenth centuries.

Let me in one final word accentuate what seems to me the commanding point of interest in this rich and varied series—the glass of the Romans. We have in it the one branch of Roman art that was not dominated by Greek influence and traditions; it was an art which, although essentially developed under the Roman rule, had its origin in Semitic lands. As an industry I cannot help thinking that it spread along with that interpenetration of Hellenised Syrians that played so important a part in the propagation of Christianity and other Oriental cults through the west of Europe.

[1] The chapter dealing with these marks, together with that on the geographical distribution, forms the most valuable part of M. Froehner's already quoted work on ancient glass.

CHAPTER V

EARLY CHRISTIAN GLASS, BYZANTINE GLASS, AND THE GLASS OF THE MIDDLE AGES IN THE EAST AND THE WEST.

THE vague and indefinite use of the terms 'Byzantine Period' and 'Byzantine Art' has been the cause of much confusion in many branches of history, and nowhere more than in the history of architecture. Were I treating of the latter art I should prefer to use the term in its narrower sense, confining it within definite limits of time and space. With the minor arts, however — illuminated manuscripts, ivories, and metal ware—the case is different. Here the term Byzantine may often be conveniently applied to cover a very wide field: so in the case of glass, the rare specimens that come to us from widely scattered sources find, for a long period, a common centre, as it were, in Constantinople.

After the end of the third century the East begins once more to assert itself. The spread of the Christian religion, the transference of the capital of the empire to Constantinople, and again the advance of the barbaric tribes, were all important factors in this movement. As far as our northern lands are concerned, the importance of this last factor as an orientalising influence has perhaps not been sufficiently recognised. We think of this advance chiefly as a descent of Germanic tribes from the north upon Italy. But this last movement was only a side issue—the general progress was from East to West. We know now that for whatever culture these tribes brought with them at the time of their advance, they were at least as much indebted to the early civilisations of

Western Asia as to that of Greece and Rome. It was only with the fringe of this latter civilisation, and that comparatively lately, that they had come into contact. In a measure we may look upon the influence of what we call classical civilisation as merely a temporary interruption, a breaking in upon the old established route by which the peoples, and still more the produce, of the East reached Western Europe. This is what gives that Oriental *nuance*, often so difficult to define, to so much of our Western European art of the early Middle Ages,[1] up to the time when the Roman culture, under the lead of the Western Church, asserted itself once more.

So in the somewhat miscellaneous assortment of glass from many lands, and often of uncertain date, that we treat of in this chapter, it is this new wave of Oriental influence working upon the now decadent Roman types which gives in some measure a common note to objects otherwise so divergent.

In another way the spread of the new religion had an even more direct and practical bearing on our subject-matter. If between the fourth and thirteenth century—between the later Gallo-Roman glass and the enamelled glass of the Saracens—there is in our collections a gap representing nearly a thousand years, only sparingly filled up by a few rare examples, the immediate cause is to be found in the abandonment of the practice of cremation, and of the habit of burying objects of value with the deceased. Fortunately for us, however, there was at first one important exception to this rule, and to this exception we owe the survival of so many specimens of a family of glass which is essentially both Christian and Roman, a family which should therefore rightly find its place at the commencement of the present chapter.

The GILT GLASS OF THE CEMETERIES is, indeed,

[1] So when some of our leading archæologists saw at first in the discoveries of Schliemann at Mycenæ and Troy the work of wandering tribes of the fifth and sixth centuries, they were unconsciously arguing in favour of this often renewed Oriental influence.

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GILT GLASS OF THE CEMETERIES

strictly Roman, [illegible] in its artistic and technical relations [illegible] of this early Christian [illegible] of a foil of thin gold [illegible] by fusion. This is the [illegible] the decoration [illegible] two bowls from C[illegible] have already [illegible], and, indeed, in the [illegible] difficulties overcome, and still more in artistic [illegible] these bowls far excel any later work of this class. [illegible] the interest of these *vetri a fondi d'oro*, as [illegible] call them, depends rather upon the fact [illegible] constitute one of the earliest re[illegible] primitive Church, than upon any [illegible] merit they possess as examples of glass.[1]

It is now well known that nearly all [illegible] glass have formed the base of tazza-shaped [illegible] or of cups of conical form. Most of them have been extracted from the plaster in which they were [illegible] at the sides of the *loculi*, where in the passages [illegible] combs the corpses were deposited. There [illegible] of smaller medallions or studs, covered with [illegible] cular glass, which were inserted round the [illegible] glass cup; in a few rare examples, chiefly [illegible] the medallions remain in their original positi[illegible] cup (Pl. x.). These studs are sometimes of blue, and we are then reminded of a style of decora[illegible] in use in earlier times—blue bosses or ribs, *appliqu*[illegible] into the body of the bowl.

Apart from a few remarkable specimens found [illegible] old churches of Cologne, as at [illegible] and St. [illegible]us, these gilt glasses come [illegible]

[1] The glass from the catacombs has long attracted notice, [illegible] that many more or less clever forgeries, dating from the seventeenth [illegible] have to be reckoned with. These *fondi d'oro* are [illegible] illustrated [illegible] in the third volume of the Jesuit [illegible] *Storia* [illegible] (1876), as well as in an earlier work [illegible] The most scholarly treatment of the subject is to be found in the [illegible] of Dr. Hermann Vopel, *Die* [illegible] *Goldgläser* (1899). For an excellent summary of what is known on the subject, see also the catalogue of the early Christian Antiquities in the British Museum, by Mr. O. M. Dalton, and the same writer's paper in the *Archæologia* [illegible] (1901).

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sively from the catacombs of Rome. The Roman collections naturally contain the most numerous specimens; in the British Museum, however, may be seen an important and typical series, illustrating most of the points of interest.

In the preparation of these *vetri a fondi d'oro*, the gold leaf was laid down upon the glass with some gum or varnish; the superfluous gold was then scraped away, and the internal lines of the draperies accentuated with a sharp metallic point; a covering of glass was then superimposed. So far all are agreed; but as to the actual process by which the two sheets of glass were united, there is some difference of opinion. The problem had already appealed to Heraclius, the writer of some barbarous hexameters treating *De Coloribus et Artibus Romanorum*. Heraclius was probably a monk living at Rome, perhaps about the end of the tenth century. The fifth of his little didactic poems is inscribed '*De fialis auro decoratis*.' In this he tells us how he produced some small cups of pure glass, smeared them with gum with a brush, and then proceeded to lay down on them leaves of gold. On the gold leaf, when dry, he inscribed birds, men, lions, as it pleased his fancy. 'Finally,' says Heraclius, 'I fitted over the surface, glass rendered thin by a skilful blast of the fire; but when the glass had yielded equally to the heat, it united itself admirably to the phials as a thin sheet.'[1]

Theophilus, writing a few generations later, probably in Germany, knew nothing of this cemetery glass. He describes, however, the process by which the Byzantine Greeks made their gold mosaics by sprinkling a

[1] '. . . quo facto desuper ipsas
Armavi vitrum docto flatu tenuatum
Ignis; sed post quam pariter sensere calorem
Se vitrum fialis tenuatum junxit honeste.'

These lines, which describe the critical process by which the superficial layer of glass was applied, are unfortunately somewhat obscure. If I have translated them aright, the process did not differ much from that now adopted at Murano. Heraclius is here probably copying an older recipe.

layer of powdered glass over the gold leaf covering the surface of the tesseræ; this coating was then fused on. But this was an enameller's process, and the coating must have consisted of a somewhat fusible glass, perhaps containing lead. The Greeks employed, he tells us, a similar process in decorating their glass cups.

Signor Andrea Rioda, the art director of the *Impresa Venezia-Murano*, tells me that in the case of some clever imitations of the *fondi d'oro* made by his firm, the gold leaf was fixed upon a thickish sheet of glass, a thinner sheet was then placed over it, and the whole heated to the softening-point. A third method has been adopted in the preparation of some experimental imitations made by Mr. Westlake: that gentleman soldered together the two sheets of glass round the edges only, by means of a flux.

In the general treatment of the figure, and in the choice of the subject, we are reminded in the case of this cemetery glass of the reliefs upon contemporary Christian sarcophagi—that is to say of the more rudely executed of these reliefs. But among these *fondi d'oro* there is a small class of portrait heads, highly finished by means of a sort of *pointillé* or stipple process, which are of a somewhat superior artistic merit. In these circular medallions —miniatures, we might call them [1]—the large eyes, the small mouth, and a peculiar affable but sad and 'worn-out' expression, remind us of the portrait heads on late mummy cases brought from the Fayum. These highly finished miniatures are probably of somewhat earlier date than the typical glass from the catacombs.

We find occasionally in this cemetery glass a sparing use of coloured enamels, above all on the draperies.[2] In others the outlines, it would seem, were cut into the glass and filled up with coloured pastes, a process of great

[1] There is a good example, a bearded man, in the Glass Room at the British Museum. Some clever imitations were made in the eighteenth century.

[2] As examples of this, note the gladiator glass and the *Anatoli Gaudens* portrait from the Tyskiewitz collection. This last example, of quite exceptional merit, has been recently acquired by the British Museum.

technical interest; I have not, however, myself seen an example of such work.

A few rare pieces with Jewish symbols have been found, but not in any case, I think, from Jewish cemeteries. We see the scrolls of the law lying on the *aron*, and the seven-branched candlestick. I have already pointed out that at this time in Rome the working of glass was very probably to some extent in the hands of Jews and Judaising Christians.[1]

The cemetery glass dates, it would seem, from the fourth and from the first half of the fifth century, but some of the finer pieces may be a little older. The disasters of the fifth century and the rapid decline of Rome after the time of Honorius help to explain the total extinction of this *genre* soon after the latter period.

Apart from these gilt medallions, the examples of glass that may be classed as early Christian present no special feature. There is in the British Museum a series of cameo medallions, some of *hæmatinum* and others of sapphire-blue glass paste. In these the treatment of the figures—the Virgin and Child and St. George (or possibly St. Theodore) are the favourite subjects—is quite Byzantine in character. In the Vatican Museum, among many other such medallions, are some cast from the same moulds as our English examples. The little *pendeloques* of stamped glass remind one of the late Roman and Saracenic glass weights found in Egypt; they have formed probably parts of a necklace, or they may have been attached to drapery.

The early Christian engraved glass is of more importance, but it in no way differs in technique from that carved with pagan subjects; some of the vases may possibly have served as chalices for use in the service of the Eucharist. In the British Museum is a conical cup

[1] I am inclined to connect the cemetery glass as a whole with the Judaising Christians of the old narrow school, who had long been settled in Rome near to the Porta Capena and in the Transteverine quarters, not far, that is to say, from the principal cemeteries.

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little that can be definitely attributed to that city. For us, however, the interest of the Greek Empire lies in the fact that we have in it a common middle term with which to correlate the art of the Copts in Egypt, of the Sassanians in Persia, and at a later time, in some measure, that of the early Saracen dynasties and even of the Anglo-Saxons and the Franks in the north. At two widely separated periods the influence of Constantinople has been more directly felt. The first centres round Justinian in the sixth century; we are brought at that time into relation with the Copts and the Sassanian rulers of Persia. The other is the time of the great revival of Byzantine power in the tenth century, when, chiefly through alliances with the emperors of the Saxon house, the renewed art of the Greeks spread through Germany and even reached, not for the first time indeed, the shores of England.

The great work, no doubt, of the Byzantines in the domain of glass is to be found in the manufacture of the mosaics with which they lined the walls of their churches, and when we hear that glass was made at Thessalonica, and again that one of the gates of the capital was named after the adjacent glass-works, it is of this branch of the art that we must first think.[1] Byzantine artists travelled to Cordova on the one hand, and to Damascus on the other, to work in mosaic for Mohammedan masters; we find them, too, at Rome, at Ravenna, and at Aachen. No doubt these *musivi* took with them, at first at least, the materials with which they built up their pictures.

For the use of coloured glass in the windows of churches, we may probably find a similar origin. In Justinian's great church glass was not used for mosaics only; there were windows filled with stained glass, some of which may even now be in place. In the seventh century we hear of Greek workmen summoned to France for such work, just as from Merovingian France, as Bede

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tells us, Benedict Biscop obtained, a little later, skilled craftsmen to make the glass for his new church at Monk Wearmouth.

In the ode that Paul the Silentiary wrote for the opening ceremony at St. Sophia (563 A.D.), he speaks of silver discs, hanging from chains and pierced to receive vessels of 'fire-wrought' glass, shaped like the butt of a spear (οὐρίαχος) (Lethaby's *Santa Sophia*, p. 50 *seq.*).[1]

We have here in these lamps what is probably the first mention of a new use for our material—one which became before long, for a time, the dominant one. In the 'spear-butt' shaped lamps of St. Sophia we may see the prototypes of the conical oil-cups of the Saracens.

Glass, however, was never held in great honour in the ceremonies of the Christian Church. Chalices and patens of glass are indeed mentioned in the *Liber Pontificalis* as in use at the end of the second century: St. Jerome writes of 'the Lord's blood being borne in a vessel of glass,' and some early miracles have reference to the making good of glass that had been broken. Of a ninth-century saint we are told that his Eucharistic vessels were first of wood, then of glass, and finally of pewter! In later times the use of so fragile a material fell out of use, and was even forbidden by the Church.

In shape it would seem that these early chalices resembled the Greek *cantharus*. Of this form is what is perhaps the oldest example of a metal chalice that has survived—the cup found at Gourdon, now in the Bibliothèque Nationale. We have, or rather had, another example of this type in the golden chalice inlaid with jewels which was formerly preserved at Monza. In fact,

[1] A disc of this description, pierced to receive glass cups, is apparently an earlier form than the well-known corona, the *polycandela*, so long in use in Christian churches. The hanging disc, like so many things Roman and Byzantine, would seem to have survived among the Saracens; something like it may still be found in old Arab houses in Cairo. Elsewhere Paul, speaking of the single lights in St. Sophia, describes them as silver vessels, *like a balance-pan*—in the centre of each rests a cup of 'well burning oil.' This passage, I think, throws some light on certain 'balance-pan' dishes of rock crystal and glass, preserved in St. Mark's treasury at Venice (see below, p. 101).

this form is especially characteristic of early Byzantine art; we see such vases represented over and over again on marble reliefs and mosaics. Now in the British Museum there are two vases, distinctly of this *cantharus* shape; they are of blue, somewhat bubbly glass, with fluted body: one which is perfect was found at Amiens (Plate XII.); the other, from the Slade collection, has lost its handles. These vases may well date from the sixth century, and they may very probably have served as chalices.

Let us now turn to some of the rare specimens of early glass to be found in the treasuries of churches, chiefly in the north of Italy.

At Rome, in the church of St. Anastasia, is a bowl of opaque glass, with ornaments in relief, mounted on a metal foot. This claims to be the chalice used by St. Jerome.

More famous is the *sacro catino* preserved in the cathedral of St. Lorenzo at Genoa. There is no reason to doubt the story that this bowl fell to the share of a Genoese when the town of Cæsarea was sacked by the Crusaders in the year 1101. It seems to have suffered no diminution in sanctity from a want of uniformity in the tradition as to its earlier history.[1] The *sacro catino* is a shallow hexagonal bowl with feet and handles; the slight ornaments on the surface are finished with a tool.

[1] Its relation to the Queen of Sheba we may dismiss. The other two uses that have been assigned to this bowl may be reconciled, if we accept one of the earliest forms of the tradition of the Holy Graal. (I follow here the account given by the late Mr. Thomas Arnold in an article by him in the *Encyclopædia Britannica.*) According to this tradition, Joseph of Arimathea, at the time of the Crucifixion, proceeded first to the upper room where the Last Supper had been celebrated and found there the shallow bowl that had held the Paschal Lamb. Taking this vessel with him, and returning to the scene of the Crucifixion, he received in it drops of blood from the side of our Lord. The double service of the bowl is the essence of this tradition. Mr. Arnold, *à propos* of the traditionary connection of the Holy Graal with Glastonbury, quotes from Malmesbury a statement that in his day an altar called 'sapphirus,' which had been brought from Palestine to St. Davids, had been re-discovered. This may well have been a slab of glass similar to that still preserved at Reichenau. I have been unable to find any further reference to this 'sapphirus' altar.

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this form is especially characteristic of early Byzantine art; we see such vases represented over and over again on marble reliefs and mosaics. Now in the British Museum there are two vases, distinctly of this *cantharus* shape; they are of blue, somewhat bubbly glass, with fluted body: one which is perfect was found at Amiens (Plate XII.); the other, from the Slade collection, has lost its handles. These vases may well date from the sixth century, and they may very probably have served as chalices.

Let us now turn to some of the rare specimens of early glass to be found in the treasuries of churches, chiefly in the north of Italy.

At Rome, in the church of St. Anastasia, is a bowl of opaque glass, with ornaments in relief, mounted on a metal foot. This claims to be the chalice used by St. Jerome.

More famous is the *sacro catino* preserved in the cathedral of St. Lorenzo at Genoa. There is no reason to doubt the story that this bowl fell to the share of a Genoese when the town of Caesarea was sacked by the Crusaders in the year 1101. It seems to have suffered no diminution in sanctity from a want of uniformity in the tradition as to its earlier history.[1] The *sacro catino* is a shallow hexagonal bowl with feet and handles; the slight ornaments on the surface are finished with a tool.

[1] Its relation to the Grail of Arthur we may dismiss. The other two uses that have been assigned to it may be reconciled, if we accept one of the earliest forms of the tradition of the Holy Grail. (I follow here the account given by the late Mr. Thomas Arnold, as quoted by him in the *Encyclopædia Britannica*.) According to this tradition, Joseph of Arimathea, at the time of the Crucifixion, proceeded from the upper room where the Last Supper had been celebrated and found there the shallow bowl that had held the Paschal Lamb. Taking this vessel with him, and returning to the scene of the Crucifixion, he received in it drops of blood from the side of our Lord. The double service of the bowl is the essence of this tradition. Mr. Arnold, *à propos* of the traditionary connection of the Holy Graal with Glastonbury, quotes from Malmesbury a statement that in his day an altar called 'sapphirus,' which had been brought from Palestine to St. Davids, had been re-discovered. This may well have been a slab of glass similar to that still preserved at Reichenau. I have been unable to find any further reference to this 'sapphirus' altar.

VASE OF BLUE GLASS, PROBABLY A CHALICE

ABOUT FIFTH CENTURY, A.D.

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work[1] a complete list of the examples of glass that it contains.

I. Among a series of ten chalices of which the metal mountings bear inscriptions in Greek relating to the consecration of the holy wine, is a hemispherical cup of common glass, some 5 inches in height, studded with conical points, and another of clear glass with an arcading in low relief (xxxi. 76 and 77). In the same series is a bowl of green glass, decorated with four quaint animals rudely carved in low relief (xlv. 99).

II. Among a set of so-called chalices, without inscriptions or symbols, we find—1st, A vase of plain blown glass of greyish colour, 7½ inches in height; it is without ornament, but is richly mounted in filigree and jewels (l. 116). 2nd, A bowl of plain glass, some 6 inches in height; at the base is a series of circular button-like projections with a stud in the centre of each (xlii. 87). 3rd, A cup of clear glass (some 6 in. high); the surface is decorated by a series of shield-like projections similar to those on the last (xl. 79). 4th, Another cup of coarse glass (5 in. high) is not illustrated in Passini's work.

III. Among a series of so-called patens of various materials we find four of glass—1st, A plate-like paten of greenish glass (7 in. diam.), the outside incised with a number of small circular depressions (xlix. 109). 2nd, A paten of milky-white semi-transparent glass with shaped margin (9 in. diam.); not illustrated. 3rd, An unmounted shallow dish or bowl of plain glass (14 in. diam.) shaped like the pan of a balance; eight ringed discs, standing out in relief from the surface, surround a central circular shield; between are facetted, pointed projections[2] (lix. 110*a*) (Plate XI. 3). 4th, A smaller pan-like paten or

[1] *Il Tesoro di San Marco illustrato da Antonio Passini, Canonico della Marciana.* Published by Ferd. Ongania, Venice, 1886. As in both the text and the plates of this work the glass is mixed up with objects of rock crystal and other materials, I give a reference to the plates on which vessels of glass are reproduced.

[2] This dish should probably rather find a place among the hanging lamps of the next section. There are others of these so-called chalices and patens of which the original use is very problematical.

PLATE XIII

GLASS VESSEL CARVED IN LOW RELIEF AND MOUNTED
AS A 'FALSE' EWER

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hanging lamp similar to the above (10 in. diam.) is not illustrated.

IV. Lamps—1st, A vessel in the shape of a balance-pan, mounted as a lamp, and hung by three chains (liv. 125). We are reminded by this of the lamps that hung in St. Sophia, as described by Paul the Silentiary (p. 97). The decoration of discs and facetted points is almost identical with III. 3. The inscription in Greek on the silver rim may be rendered: '✠ Saint Pantaleone, help your slave Zachariah, Archbishop of Iberia! Amen!' This connection with Iberia (Georgia) is of the greatest interest as bearing upon the origin of this family of glass (Plate XI. 1). 2nd, A bucket-shaped lamp of plain glass hanging from three chains (hgt. 6 in.) (liv. 124). 3rd, An ellipsoid hanging lamp of common glass (chief diam. 8 in.). On the exterior, projecting in high relief, are carved shells, fishes, and other animals. From the silver rim project six cloisons which formerly held jewels; one alone remains, an oval paste of opaque blue. Above project eight little cylindrical sockets, as if to contain candles (liv. 123).

V. Amphora-shaped vessels—1st, A cylindrical vase of common glass, with rich mounting (total height, 20 in.) (xxxvi. 65). 2nd, A pear-shaped vase, set with a false metal spout to resemble an ampulla or cruet; the mounting is of Oriental character. The glass is carved with a design containing two long-horned rams among a conventional leaf pattern (the glass alone 4 in. high) (li. 115) (Plate XIII.). 3rd, An unmounted vase of common glass, with handles (10 in. diam.). 4th, An unmounted conical vase of common glass with conical neck, carved in low relief with three conventionalised four-legged monsters with tendril-like limbs and bodies (hgt. 5 in.) (xl. 80).[1]

VI. Situlæ, or bucket-shaped vases. 1st, A situla of clear glass of a violet tint. The design—somewhat rudely cut with a wheel—consists of a series of figures,

[1] This vase has been classed by Von Czihak with the so-called Hedwig glasses (see below, p. 115); the resemblance, however, to the German glasses is small.

with pastoral and Bacchic emblems. The decoration is similar in style to the engraved work found on some late Roman glass from the Rhine district (hgt. 8 in.) (liii. 121). 2nd, The famous situla that I have already described when treating of the *diatretum* glass (p. 72). The Canonico Passini thinks that the rings of glass have been fitted on subsequently, and that is the impression that I formed when examining the vase (hgt. 11 in.) (liii. 122). (Plate XIV.)

VII. The vase enamelled with classical medallions which has already been described in connection with the enamelled glass of the Romans (p. 66). Although, as I have said, the figures are purely classical in style, yet the scroll-work reminds one of the decoration on Coptic bowls and fragments brought from Egypt (xl. 78, and xli. 82).

VIII. There remains the turquoise basin, richly mounted in gold and gems, presented in 1472 by the Shah of Persia to the Signoria of Venice. The only ornament is a conventionalised hare carved in low relief on each of the five compartments that divide the sides. On the base is a brief dedication in Arabic to Allah. As to the material of this vase, all I can say is that it is *carved*; this is seen by the light reflected on the somewhat unctuous surface; it is therefore not porcelain or other ceramic ware, as some have thought. The slightly waxy lustre is in favour of its being a natural stone of the turquoise order. Some, however, have held this dish to be of a glass paste, on the ground of the minute bubbles on the translucent edge; but the existence of these bubbles is denied by others, and I myself failed to discover them (hgt. 11 in.) (liii. 122).

I have dwelt in some detail on this little-known Byzantine glass at St. Mark's, for it is, as a group, of unique interest for our history, throwing light on so many obscure problems.

We may obtain some slight hints as to the commoner kinds of glass in use by the Byzantine Greeks from the

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PLATE XIV

SITULA OF LATE ROMAN OR BYZANTINE GLASS

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Western churches, nor can we separate these vases from the even rarer objects carved in glass. The carving on the so-called Hedwig glasses is, as we shall see, executed in an allied if somewhat degenerate style; some of these glasses can be traced back to the borderlands of Poland.

Of the glass in use among the Persians and the other subjects of the Sassanian empire (which lasted from the end of the third to the beginning of the seventh century) we know practically nothing. Doubtless many examples of Sassanian glass have been turned up during the gigantic explorations around Nineveh, Babylon, and Susa, but till quite lately little attention has been paid to objects of so comparatively late a date. In the Louvre are some fragments of glass lately brought from Susa. One piece calls for mention here. This is a large fragment of thick clear glass which has formed the half of a shallow circular dish, about fourteen inches in diameter. There are some eight or nine shallow circular depressions cut out from the sides, with a stud rising in counter-relief from the centre of each. We are at once reminded of certain 'balance-pan' hanging lamps in the treasury at Venice—in fact, this fragment from Susa must have formed part of a vessel almost identical with these.

But our one undoubted example of Sassanian glass forms part of a bowl now in the Bibliothèque Nationale. This famous vessel was long preserved in the treasury of the Abbey of St. Denis; as in the case of an enamelled cup preserved at Chartres, it was claimed for it that it had been a present from Harun-ar-Rashid to Charlemagne. The body of this bowl consists of a framework of gold, the openings of which are filled with rosettes of rock crystal and glass. The central medallion of rock crystal is carved to represent a king seated on his throne; for this reason the vessel was formerly known as the 'Cup of Solomon.' The seated king has, however, now been identified as Khosroes II. (Kosrou Parviz),

one of the last of the Sassanian monarchs (590-628). The rosettes of glass and the lozenges between them are white, emerald-green, and purple, and the colours are still brilliant. M. de Longperier, who first identified the subject of the central medallion, has brought forward passages from early Arab writers in which mention is made of glass drinking-cups in use in the court of the Sassanian kings.

The question, however, of the origin of the enamelled glass of the Saracens—one of the most burning ones in the history of glass—receives no light from this quarter. Nor is the problem much advanced if we turn to Egypt to study the interesting middle period between the first introduction of Christianity and the Mohammedan conquest. It is only quite lately that the exploration of Coptic tombs has thrown some quite unexpected light on the culture of these long-neglected centuries. Not a little glass has been found, chiefly in fragments, and of these the date can only be inferred from the style of the decoration. The use of thin opaque 'painted' enamels, quite different from the brilliant jewel-like enamels of the Saracens, seems to have been much in vogue in Egypt at this time. What has been found is not very accessible so far, nor has much been done in the way of classification. A small collection, derived chiefly, I think, from the excavations at Achmin in Upper Egypt, has lately been purchased by the Victoria and Albert Museum (from M. Richard). The little bottles of various simple shapes call to mind those preserved in the treasuries of certain European churches (see above, p. 99). One slim spindle-shaped vessel reminds one a little of the vase with Greek inscription found in the South-Saxon cemetery near Worthing (p. 107). Among the fragments is one delicately painted in thin enamels in Egypto-Roman manner—we see a flying bird and the stalks and seed-vessels of the lotus; others are decorated with *entrelacs* of Byzantine character, also in a thin opaque enamel; but on the majority of these frag-

ments the subject and the design are thoroughly Saracenic. Some ribbed bowls (in shape identical with those from the later Celtic tombs of North Italy) have been added lately to the British Museum collection; they come from Upper Egypt; the scroll-like decoration in a manganese brown enamel is of distinctly Byzantine character. Though these ribbed bowls may possibly be of later date, they at any rate carry on the tradition of pre-Arab times.

Those who have visited the natron lakes of Lower Egypt (three days' journey to the south-west of Cairo), declare that there is evidence that the brine and the saline deposits have been worked more or less continuously from Roman times. The natron is still extracted from the lakes by the *fellahin* in the dry season. The impure sub-carbonate of soda forms a cake beneath the coating of common salt, and lies also upon the ground around. Near the village of Zakook fragments have been found that point to the existence of glass-works in former days —this is indeed probably the site of the town of Nitria. A French traveller of the eighteenth century speaks of seeing near here '*trois verreries abandonnées*' (*Voyages en Égypte par le Sieur Granger*, 1745). Indeed the ruins of three conical buildings are still to be seen; the stones are fused on the edges, and plentiful scoriæ of common green glass lie around. Some of the enamelled lamps of Saracenic style, now so much prized by collectors, may perhaps have come from monasteries in this neighbourhood. There are besides these a few lamps (as that from Siti Mariam, reproduced in the late Mr. Butler's *Coptic Churches of Egypt*) which are of quite a distinct character. These lamps are set round with blue bosses and little plaques; there is, however, no ground for attributing any great antiquity to such work.

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between the Rhine and the Ardennes. It is here, more especially in the middle valley of the Meuse, about Namur and Liége, that the most important finds have been made; the more elaborate examples, at any rate, of this Franko-Saxon [1] glass were possibly manufactured in this district.

Now the importance for us of this glass from pagan cemeteries lies in the fact that in it we have the latest important and independent group of glass of which anything is known, until we come to the Saracenic enamelled ware of the thirteenth century. In England, indeed, the gap extends to a much later period; but in the case of Western Germany there is some reason to believe that the Frankish fashions and traditions of glass-making were carried on without any break during the Middle Ages—that, in fact, in this early mediæval glass may be found a link between the glass of Roman times and that in use in the Rhine district up to the time when the influence of the Renaissance first asserted itself. In Southern and Western France, on the other hand, although the glass-workers may in places have carried on the old workings, what they made was of no artistic importance. We have in this case nothing equivalent to the outcome of the renewed interest taken in the material by the northern chieftains—the *verre à fougère* was a product of the woods and heaths.

The Oriental influence—the distinguishing feature in all the glass of which I have treated in the last chapter—is not so pronounced in the glass of the Franko-Saxon peoples as in their jewellery and metal-work. In these we find the mark of influences that had their source in the East at two if not three widely separated periods. As for the earliest of these, it is not only pre-Roman but probably pre-Hellenic: its relations are rather with Asiatic than classical lands. The brooches and buckles inlaid with garnets, and the quaint animal forms with which the metal designs are built up, take us back perhaps to

[1] I use the term Saxon here to include also the Angles and Jutes.

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an earlier Asiatic civilisation which is best represented in the Persia of Achæmenid times.[1] The second of these periods of Oriental influence is to be associated with the introduction of the Christian religion. Again, at a still later time some of the older Oriental motives crept in in a modified form with the pagan Danes and even with the Normans.

As far as glass is concerned, it is in the beads that we see most clearly the return to the older fashions. Of these Franko-Saxon beads the British Museum has a great store, not only from English graves but from those of the Franks and other Germanic tribes on the Continent. Now these beads differ entirely from those found in Celtic and Roman tombs. Of these last, the dominant type—and we must confine ourselves to this—is of a turquoise or deep blue, generally more or less transparent, and they are often longitudinally ribbed. In a collection of Germanic beads, on the other hand, the prevailing colours are red and yellow, of ochry tints; they are almost invariably quite opaque, and the patterns are mostly built up on the surface in a way that reminds us of the primitive glass of the Eastern Mediterranean (Plate xv. 3). A herring-bone pattern of fine lines is very characteristic, and the delicacy of the designs on some of the beads from Allemanic graves in Switzerland and elsewhere rivals that of the highly finished work of the Egyptians.

Of this early Germanic glass generally, we may say that the greatest interest lies in the types that depart most from the Roman glass which preceded it, and on which it is of course as a whole founded. In some cases the northern influence is only seen in a certain barbaric magnificence—as in the examples from Germanic graves in Italy, lately added to the collection in the Glass Room at the British Museum. Here we see for the first time the drinking-horn of the north; this fine specimen,

[1] In this widely spread class of jewellery, both true enamel and glass are conspicuous by their general absence.

trumpet-ended and fluted with long gadroons, is of a deep blue glass wound round with white threads. Of similar origin is the *rhyton*, of moulded glass of a rich amber colour, which lies beside it. It may be noted that this form too, in spite of its classical associations, was originally, as the name implies, derived from the horn of some animal. It is not impossible that these vessels were made by local Italian glass-workers to the order of the barbarians, on the occasion of the burial of one of their leaders.

These are, however, only local accidental finds. With the glass used by, or at least buried with the bodies of, our Anglo-Saxon ancestors during the two centuries that followed their arrival in England, we have a fairly intimate acquaintance; as I have said, it differs little from the contemporary or in some cases rather earlier Frankish glass of the Rhine, Moselle, and Meuse districts.

That glass was made in the south of Britain in Roman times there is every reason to believe, and we look in Kent for the most probable place for its manufacture, somewhere, perhaps, not far from the estuary of the Medway (cf. p. 86). It is the Kentish graves again that have yielded the largest quantity of Anglo-Saxon glass, as well as the greatest varieties of forms. It is noticeable, however, that specimens of what is the most remarkable and characteristic type of Anglo-Saxon glass have been found in many other parts of the country. I refer of course to the horns and conical cups decorated with long pendulous lobes or 'prunts.' These drinking-cups have been found, apart from the Kentish examples, in Durham, Gloucestershire, Hampshire, Cambridgeshire, and in the upper Thames valley. Individual prunts (these 'thorned bosses' are more substantial than the thin surrounding glass) have occasionally turned up in excavations in London and elsewhere. Abroad, precisely similar vessels have been taken from Frankish graves in the Rhine provinces. It is more remarkable that several cups so

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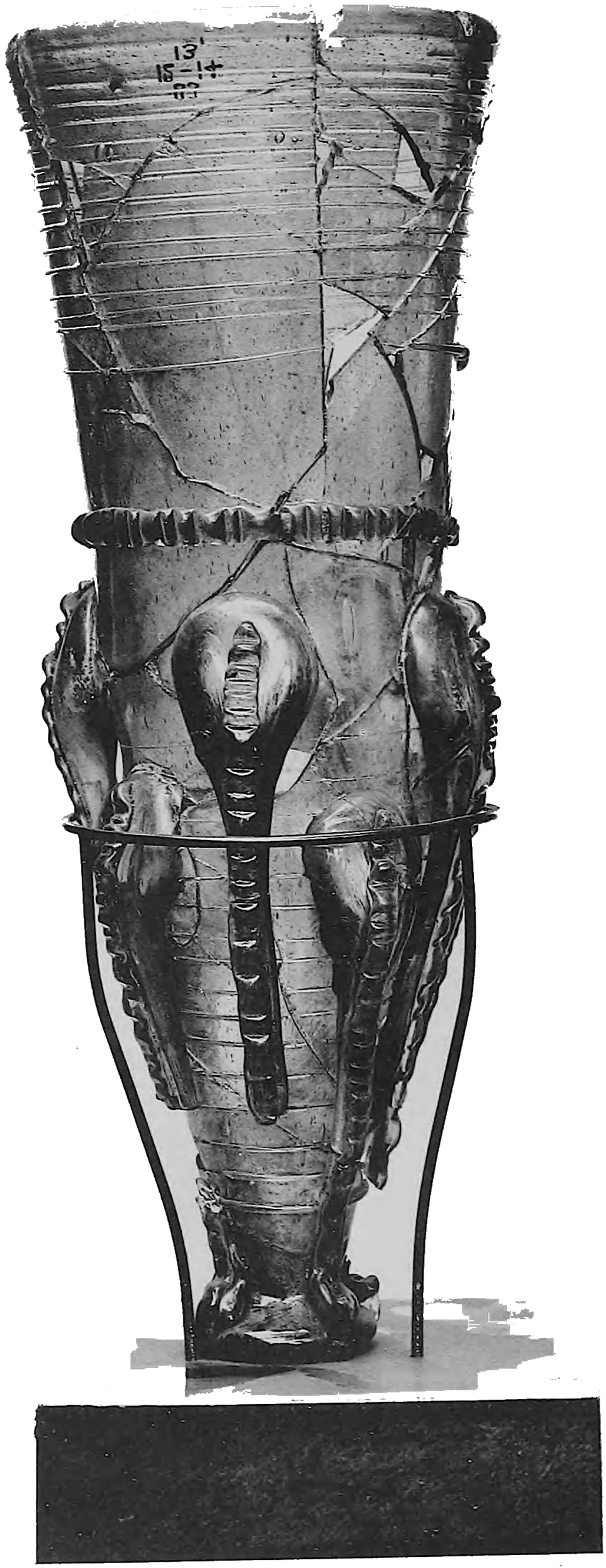

PRUNTED BEAKER, FROM ANGLO-SAXON BURIAL MOUND

ornamented have been found in Illyria, in the Narenta Valley. Mr. Arthur Evans traces these 'thorn-based beakers' to the graves of Ostrogothic chiefs, and thinks that their fragility might be taken as a proof of local manufacture (*Archæologia*, vol. xlviii. pp. 75-84). On the other hand, the high technical skill required in the blowing of such glasses has led most antiquaries to regard our English examples as of Continental origin, not improbably from the Rhine or Meuse country.

Mr. Hartshorne (*Old English Glasses*, p. 119) has attempted to reconstitute the steps by which these 'thorn-based beakers' were made. He thinks that after the vessel had been blown from a 'gathering,' lumps of molten glass were applied one by one to the sides. 'The hot liquid metal acting upon the thin cooled sides of the object caused it to give way successively at the points of attachment under renewed pressure by blowing. The concavities thus formed extended into the bodies of the prunts, the projecting points of which, being seized by the *pucella*, were rapidly drawn forward to a tail and attached to the outside of the glass lower down.' This, of course, was before the vessel had been removed from the blowing-iron, and Mr. Hartshorne finds in this fact a reason for the prunts in this early glass always drooping downwards, while the somewhat similar *stachelnuppen*, or 'blobs,' on sixteenth- and seventeenth-century German glasses, added as they were after the transference of the vessel to the *pontil*, invariably point upwards. 'The whole of the pendant lobes,' continues Mr. Hartshorne, 'having been thus put on and quilled and ornamented, as some examples show, the *pontil* was attached to the base, the blowing-iron wetted off the other end, and the closed bulb being softened at the mouth of the pot, presently became an open cup; the mouth of the glass was now sheared, widened, and finished, the stringing of the upper end of the vase usually forming part of the final operation.'

The tall conical cup of olive-green glass in the British

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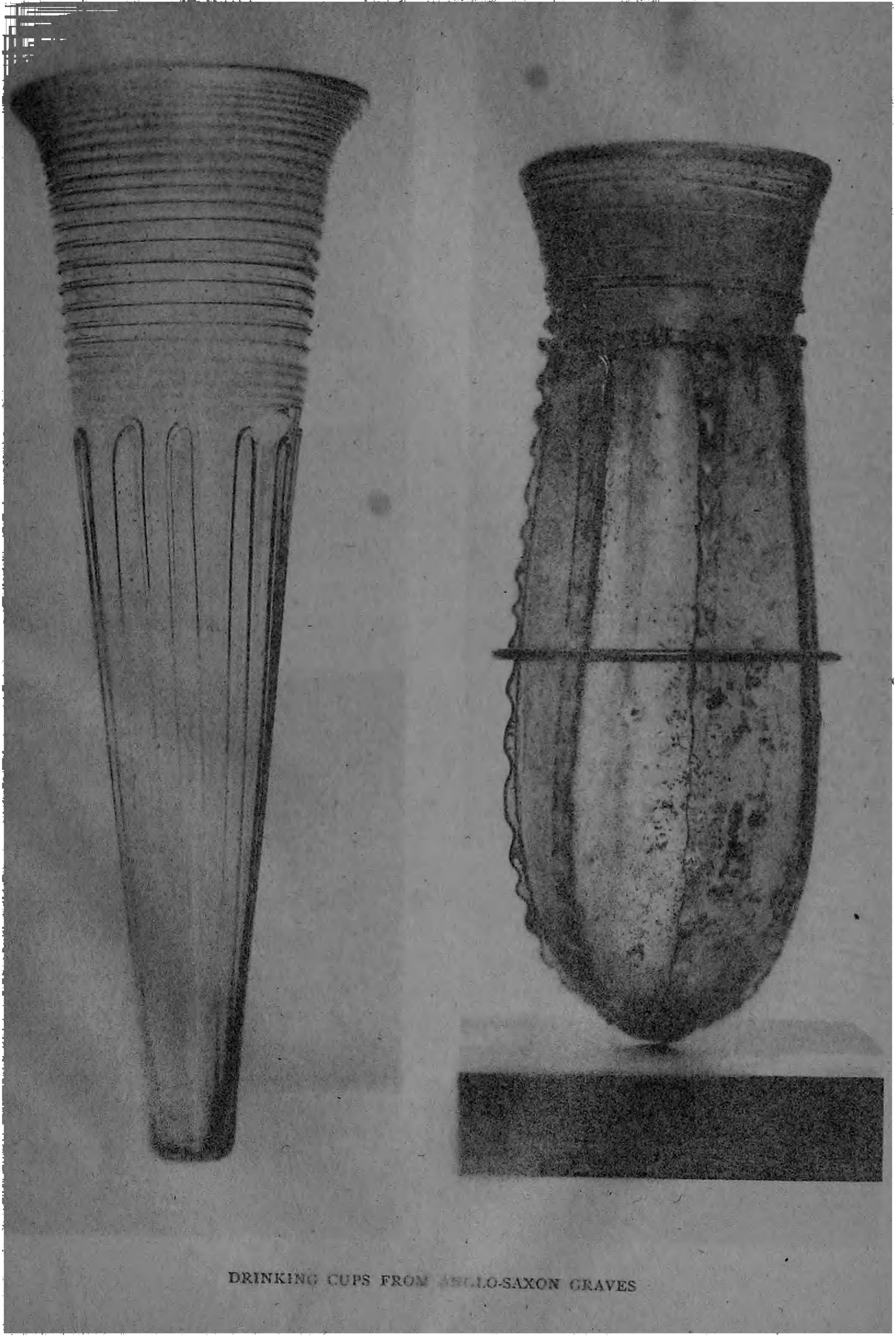
Museum, found a few years ago with so many fine specimens of Anglo-Saxon metal-work and inlaid jewellery, in a tumulus opened by Mr. Grenfell, at Taplow on the Thames, may be taken as an example in which these processes may be followed (Pl. XVI.). The quilling or toothing along the side of the prunts is very similar to that often seen at the point of attachment of the handle on Roman vases.[1]

Now these prunted beakers are of interest for two reasons. In the first place, we cannot find any Roman prototype for the long drooping tears of glass. Again, the fact of the wide distribution of almost identical pieces would point to the necessity of throwing back the date of origin for some considerable time. But at what point in their wanderings did these Germanic tribes acquire this remarkable skill in the handling of glass? The fact that these processes were known to the Ostrogoths in the fifth or sixth century makes an Oriental origin for this system of decoration not unlikely. In any case, this type of prunted surface seems to have had a special attraction for the Germanic peoples, for we can hardly doubt that from these old thorn-bossed beakers and horns, by continuous tradition, the *stachelnuppen* on the *krautstrunk* and the *roemer* of the sixteenth century were derived.

Much more numerous in the Anglo-Saxon tombs are—1st, the little bottles of simple form often stringed spirally round the neck (or in other cases the stringing may be applied to form rude gadroons and other patterns on the body); and 2nd, the small wide-mouthed and footless cups, often of bell-like section. These were held in the palm of the hand while drinking, as we may see in contemporary manuscripts and perhaps in the Bayeux tapestry.[2] They are true tumblers in the original sense

[1] I have seen, in the collection of Mr. Kennard, the lower part of a vase of thickish clear green glass, from an Anglo-Saxon tomb. On this the tails of the well-formed prunts *sweep downwards diagonally*; on the head of each is a rosette. Such a form one may perhaps connect with the '*hroden ealo woege*,' the 'twisted ale-cups' of Beowulf's poem (cf. Hartshorne, p. 24).

[2] Note in this tapestry, in more than one feast scene, the swaggering action



DRINKING CUPS FROM ANGLO-SAXON GRAVES

Museum, found a few years ago with so many fine specimens of Anglo-Saxon metal-work and inlaid jewellery, in a tumulus opened by Mr. Grenfell, at Taplow on the Thames, may be taken as an example in which these processes may be followed (Pl. XVI.). The quilling or teething along the side of the prunts is very similar to that often seen at the point of attachment of the handle on Roman vases.[1]

Now these prunted beakers are of interest for two reasons. In the first place, we cannot find any Roman prototype for the long drooping tears of glass. Again, the fact of the wide distribution of almost identical pieces would point to the necessity of throwing back the date of origin for some considerable time. But at what point in their wanderings did these Germanic tribes acquire this remarkable skill in the handling of glass? The fact that these processes were known to the Chingoutin in the fifth or sixth century makes an Oriental origin for the system of decoration not unlikely. In any case, this type of prunted surface seems to have had a special attraction for the Germanic peoples, for we can hardly doubt that from these old thorn-bossed beakers and horns, by continuous tradition, the *stachelnuppen* on the *krautstrunk* and the *roemer* of the sixteenth century were derived.

Much more numerous in the Anglo-Saxon tombs are—1st, the little bottles of simple form often stringed spirally round the neck (or in other cases the stringing may be applied in the more complex gadroons and other patterns on the body); 2nd, the small wide-mouthed and footless cups, often of bell-like section. These were held in the palm of the hand while drinking, as we may see in contemporary manuscripts and perhaps in the Bayeux tapestry.[2] They are true tumblers in the original sense

[1] I have seen, in the collections of Mr. Kennard, the lower part of a vase of thickish clear green glass, from an Anglo-Saxon tomb. On this the tails of the well-formed prunts *sweep downwards diagonally*; on the head of each is a rosette. Such a form one may perhaps connect with the '*hroden ealo woege*,' the 'twisted ale-cups' of Beowulf's poem (cf. Hartshorne, p. 24).

[2] Note in this tapestry, in more than one feast scene, the swaggering action

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of the word, in that they have no foot and will not stand upright. A very similar form is common in Merovingian graves.

The tall, conical, trumpet-shaped cups are often carefully made and of considerable artistic merit (Plate XVII.); the sides are sometimes gadrooned and fluted, and threadings of glass of various colours are applied to them. On a fine specimen found in the cemetery of the South Saxons near Worthing, the stringing has been 'dragged' to form graceful festoons or chevrons, calling to mind the patterns on the primitive glass of the Eastern Mediterranean.

The simpler forms—the little bottles and cups—may well have been made in some of our southern counties, perhaps in the very glass-houses abandoned by the Romans; at any rate in Kent, the Jutish graves from which so much of this glass has been derived are, as I have said, intimately associated with the earlier Romano-British cemeteries. On the other hand, for the north of England, we have the distinct statement made by Bede, in his *Historia Ecclesiastica*, that at the end of the seventh century the glass-workers who were brought over from Gaul taught to the natives not only the making of glass for windows, but also of glass 'for the lamps in use in the church, and for vessels for other various and not ignoble uses.' So again a little later, in the middle of the eighth century, Cuthbert of Jarrow, writing this time to the Bishop of Mainz, says: 'If you have any man in your diocese who is skilful in the making of glass, I pray you send him to me, . . . seeing that of that art we are ignorant and without resource.' That at this later period Cuthbert should have had to send all the way to Mainz is, I think, a point of some significance.

The ensuing centuries are the most barren in the whole history of glass. We know that in France the

with which the guests raise the drinking-horns, either to drink from the larger end or to let the liquid pass into the mouth from the pointed extremity.

glass-workers returned to the woods to manufacture in large quantities the *verre à fougère*—common glass for domestic use, which does not seem to have come into any close relation with the artistic movements of the time. Here before long all interest was centred in the manufacture of stained glass for the windows of the churches, and this art became of supreme importance with the rapid development of the new architecture in the twelfth century. Whether we in England at so early a date manufactured glass to any extent on either of these lines is, I am afraid, still a disputed point.

It was in Germany, and especially in the intermediate tract that for a time existed as an independent kingdom —in Lotharingia, I mean—that the old traditions seem to have held their ground most firmly. To Germany from time to time during the Middle Ages came new waves of influence from the East, by various and sometimes very circuitous paths,—in Charlemagne's time by way of Ravenna and Rome, more directly from Constantinople in the tenth century, when Otto the Great married his son to the grand-daughter of the Greek Emperor. About the same time we hear of Greek craftsmen at work in German monasteries, as at Reichenau on the lower Lake of Constance, where, by the way, a great slab of bluish-green glass, traditionally of Byzantine origin, is still preserved.[1]

But it was probably by more remote paths, through Poland and other Slavonic lands to the east,[2] that the designs on the only specimens of mediæval glass still existing in Germany that show distinctly oriental motives[3] —if indeed the glasses are not themselves Oriental—found their way westward. I refer to the rare carved

[1] In the sacristy of the church at Mittelzell, where I recently had an opportunity of examining it. This is an irregular oblong slab, about twenty inches in length, weighing about thirty pounds. One surface is nearly even, as if the molten glass had been poured out upon a table.

[2] The Slavonic tribes before their conversion do not appear to have had any knowledge of glass; it is not found in any of their tombs to the east of the Elbe.

[3] Apart from a few examples of enamelled glass of Saracenic origin preserved in church treasuries; these probably came in somewhat later.

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GLASS CUP, CARVED IN HIGH RELIEF

GERMAN OR ORIENTAL. TWELFTH OR THIRTEENTH CENTURY

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ably older. The important point to remember is that during the later Middle Ages the carving of glass was quite unknown in Europe, and that the art of employing the lapidary's wheel as a cutting instrument appears to have been lost. Indeed we do not meet with carved glass again in any form until the beginning of the seventeenth century, and then the rapid development of the art by the Lehmanns and the Schwanharts at Prague is acknowledged to have depended upon technical processes learned from Italian carvers of rock crystal.

I will now enumerate the most characteristic of these carved glasses, basing my description in part upon the careful account given by Von Czihak in his *Schlesische Gläser.*

1. In the Museum of Silesian Antiquities at Breslau. The design consists of a vase, surmounted by a crescent and star; on either side heraldic lions, each surmounted by a small three-cornered shield, beyond them a conventionalised tree; the whole most rudely cut. (Figured by Von Czihak.)

2. In the treasury of the Cathedral at Cracow. Lions and shields as above, and eagle 'displayed.' It is claimed for these two glasses that they were used by St. Hedwig.

3. In the Germanic Museum at Nuremberg. Two lions 'passant' in the same direction; small shields as above and a griffin (Plate XVIII.).

4. In the Rijks Museum at Amsterdam. Eagle 'displayed,' two lions and triangular shields. This glass was formerly an heirloom in the Nassau-Orange family. On the base is engraved '*Alsz diesz glas war alt tausend Jahr, es Pfalzgraff Ludwig Philipszen Werehret war*—1643.' (Figured by Hartshorne and by Garnier.)

The above four examples closely resemble one another; in each case the design is relieved upon a scalloped back, something like the linen-fold of late Gothic wood-panelling.

5. In the Cathedral treasury at Minden. The glass is of a pale honey tint. The design is formed of a lion

with a shield containing a triangle, an eagle displayed and a 'tree of life,' somewhat similar to that on No. 1. The elements of the design are arranged stiffly with a wide field between. (Figured by Von Czihak.)

6. Formerly in the Cathedral at Halberstadt, now in Berlin, in private hands. Of greenish glass, only three and a half inches in height. Design—two lions and triangular shield.

7. In the Cathedral Treasury at Halberstadt. The design on this little glass has degenerated into a meaningless juxtaposition of bosses, bars, and fretted bands. (Figured by Von Czihak.)

This appears to exhaust the list of these little carved glass beakers. There is nothing in the treasury of St. Mark's that can distinctly be classed with them; on the other hand, the '*voirre taille d'un esgle, d'un griffon et d'une double couronne*,' mentioned in the inventory of the possessions of Charles the Bold of Burgundy, may well have been a cup of this class (Laborde, *Les Ducs de Bourgogne*, ii. No. 2753).

CHAPTER VII

MEDIÆVAL TREATISES ON GLASS

IN a general way, it may be said of the Oriental glass that penetrated into Europe in the early Middle Ages, that the type is given by carvings in rock crystal. We can point to no example of sculptured glass that can be compared to the magnificent vases carved out of that mineral that we may see in the Louvre or in the treasury of St. Mark's. I should be inclined to place the district where this branch of glyptic art flourished, whether we consider works of rock crystal or of glass, somewhere in what may be called Upper Western Asia—in Armenia, Georgia, or Western Persia—and to refer many of the extant examples to a date rather before than after the Arab conquest. But all this, of course, is pure conjecture.

Of quite another type was the glass made, it would seem without interruption during all this period, in various parts of Syria. The industry appears by this time to have passed in great measure into the hands of the Jews. Benjamin of Tudela in the twelfth century found Jewish glass-makers at Antioch and at Tyre. It was they, apparently, who carried on the old traditions in the manufacture of artificial pastes, coloured to imitate precious stones. The fusible glass containing lead of which such pastes were made had indeed been from an early date associated with the Jews—'*Vitrum plumbeum, Judæum scilicet*,' says Heraclius. The demand for such work must have increased immensely with the prevailing fashion of incrusting reliquaries, the covers of books, and various personal ornaments with large

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papyrus of Leyden, which alone has survived the destruction that the Roman law again and again attempted to enforce in the case of all books of magic. M. Berthelot, whom I follow for these early writers,[1] calls this papyrus the working notes of an '*artisan faussaire et d'un magicien charlatan*.' This little work, found long ago at Thebes, is a Greek manuscript of the third century; it contains, however, little or nothing about glass, and is of interest merely as an early specimen of this class of composition.

Other Greek treatises of a similar character, which are either lost or survive only in extracts or translations, are attributed to Zosimus, a writer of the third century, who had a section on glass; to Synesius, a Cyrenaic bishop (400 A.D.), married, and half a pagan; and to Olympiodorus, a priest of Isis, who in the sixth century kept up some of the Hellenic traditions. The late Byzantine scholiasts drew up summaries of these treatises and of many others; an important manuscript of this class at Venice gives a list of fifty-two such works. But these Byzantine summaries are of little value to us; all grip of fact is completely lost in the mystical jargon of the school.

Of much greater interest are the many series of practical formulas written in Latin, beginning with the *Compositiones ad Tingenda*, known to us from a manuscript of the eighth century. Here we find a section upon the colouring of artificial stones, their gilding and polishing, and upon the colouring of glass generally—how it is rendered milky by means of tin, red by cinnabar (?), by litharge (?), and by a substance called *calcocecaumenon*; the latter word doubtless a corruption of the Greek equivalent of the *æs æstum*, or burnt bronze, the well-known mediæval source of an opaque red. Further on recipes are given for other colours to be applied as varnishes. There is also a chapter on the making of

[1] *Les Origines de l'Alchimie*, 1885; *La Chimie des Anciens et du Moyen Age*, 1889; *La Chimie au Moyen Age*, 1893.

glass and some summary account of glass-furnaces, interesting solely as the earliest example of the many such descriptions that have come down to us. In fact, all these writers copied one from the other, summarising or amplifying. The same recipes, more or less intelligently expressed, turn up again and again: we can trace them in Theophilus, and even in such comparatively modern writers as Neri and Kunckel.

A later treatise, the *Mappæ clavicula* (ninth or tenth century), follows closely upon the *Compositiones*. As regards glass, we find headings—for that is unfortunately all that remains of this section—on unbreakable glass, on the soldering of glass, on the art of tracing trees and fruits of all kinds upon a flask, on an indelible manner of painting on glass, and finally, three sections on the fabrication of pearls.

I have already discussed one of the recipes of Heraclius (or Eraclius) when describing the cemetery glasses. All that we know of this writer is that he was a monk, and that he probably wrote in Rome, not later than the tenth century. The twenty-one little sections that make up his two books are written in hexameters, and treat of *The Colours and Arts of the Romans*. A third and much larger book in prose, that is found in some manuscripts, is of a considerably later date and of quite a different nature.[1] I will now briefly summarise what the true Heraclius has to say about glass in his two metrical books.

In the third section we are told that earthenware may be glazed with a preparation of pounded Roman glass, mixed with water and gum and then carefully refired. The fourth section—*De Sculpturâ Vitri*—describes a method by which glass may be first softened by smearing it with a mixture of fat worms and vinegar, sprinkled over with the blood of a fasting goat that had been fed

[1] This I shall refer to later on as the pseudo-Heraclius; it contains several sections treating on the manufacture of glass, and forms a valuable commentary on the decidedly earlier treatise of Theophilus.

with ivy; the glass may then be cut with a hard stone called *pirites*. This association of goat's blood and ivy occurs more than once in the old recipes; for these strange ingredients there may have been originally a cryptic interpretation, but we should perhaps rather take the pretended necessity of their employment as a sign that the art of cutting glass had been lost. Then in section v. follows the account of the writer's attempt at imitating the gilt glass of the catacombs, which I have already analysed (p. 92). The description of the manner of cutting (*secari*) the *cristallum* in section xii. is more practical; we are told of a plate of lead mounted on iron, over which a certain hard powder is sprinkled. But here, too, the virtue of goat's blood is not forgotten; by its means the diamond may be made to yield to iron. In section xiv. a process is described by which Roman glass may be melted and cast into moulds of chalk to form 'fair shining gems.' Heraclius has been called an ignorant quack, but he well represents the views of his time. Compared with him, Theophilus, who wrote in the north of Germany some hundred or two hundred years later, seems almost a modern.

More important to us than any of these Western sources of information before the time of Theophilus, are certain Syriac manuscripts preserved in the British Museum and at Cambridge. For our knowledge of the contents of these I am again indebted to M. Berthelot (*La Chimie au Moyen Age*, vol. ii.). In the sixth and seventh centuries Syria had taken a commanding position, both commercially and artistically. The trade between the west and the east, when not interrupted by the wars between the Greeks and the Sassanians, passed through Antioch, and after the Arab conquest the seat of the Caliphs was for a time at Damascus, a Syrian town. In the history of glass, from the very earliest times down to the Middle Ages, Syria, as represented by the coast towns at least, has vied with Egypt for the premier position; the two countries have always been closely connected,

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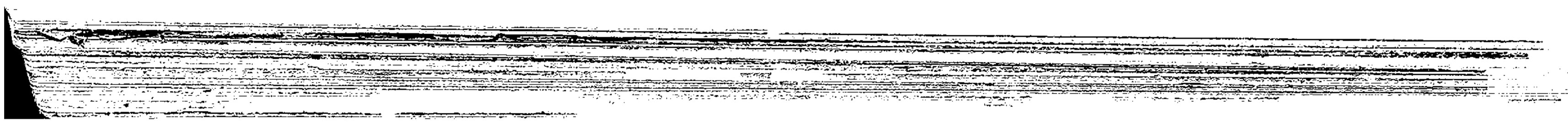
as a roasted ore of cobalt. For producing other colours, mention is made of various substances, but I am unable to give any reasonable interpretation of this part; we hear of tin, lead, and borax—the preparation of a fusible enamel would seem to be implied. Finally, we are told—'Do what is to be done, according to the will of the Lord Sabaoth!'

There follows on this what is perhaps the earliest extant description of a glass furnace. 'The furnace of the glass-makers should have six compartments, of which three are disposed in stories one above the other. . . . The lower compartment should be deep, in it is the fire; that of the middle story has an opening in front of the central chambers—these last should be equal, disposed on the sides and not in the centre (?), so that the fire from below may rise towards the central region where the glass is and heat and melt the materials. The upper compartment, which is vaulted, is arranged so as uniformly to roof over the middle story; it is used to cool the vessels after their manufacture.'[1] We have also the description of a smaller furnace, which is perhaps that in which the more fusible glass for enamels and minor objects of *verroterie* was melted. Finally, an oven with a floor of brick-earth is mentioned, for fritting the sand and alkali. In spite of much that is obscure in this description, we can trace in it the general type of furnace which, doubtless handed down from Roman times, has survived in places with few important changes to the present day.

And here I may call attention to a contemporary drawing of a mediæval glass furnace—a source of information as unique as it is unexpected. This is to be found in a manuscript of an encyclopædic work, *De Originibus Rerum*, compiled by Rabanus Maurus, one of the earliest of the schoolmen. Rabanus lived in the Benedictine monastery of Fulda, in the first half of

[1] Compare with this account the furnace now used in Northern India described in Chapter xxi.



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the ninth century. The manuscript in question, which is attributed to the year 1023, has been carefully reproduced by the monks of Monte Cassino where it is preserved. The full-paged miniature is to be found in a chapter headed *De Vitro*; I can, however, discover nothing in the text that throws any light on our subject. In the illustration we see to the left a nearly naked workman who holds a mass of some green material, perhaps the frit; another man is blowing through a tube what is probably meant for the unfinished cup; to the left a chalice-like vessel, perhaps the model, is depicted. Notice, too, in the pediment of the roof (probably to be regarded as the annealing oven) a cup with a knob for stem, and hemispherical foot. Cups of a similar form, apparently in these cases of metal, are found in other illustrations of the manuscript (Plate XIX.).

M. Berthelot has reproduced in his earlier work (*La Chimie des Anciens*) several rough pen-sketches of the apparatus used by the mediæval alchemists, taken from the St. Mark's manuscript mentioned above. These drawings help us in a measure to understand the important place taken by glass vessels of various forms in the researches of these early experimental workers. Still more interesting are the illustrations in the Syriac manuscript from which I have just quoted; in these, the modern chemist may recognise many familiar forms. The glass vessels have chiefly reference to processes of distillation. The most important is the alembic, a form easily made; the neck of a long pendulous *paraison* has only to be heated on one side near the base, when it falls over of itself to assume the well-known shape. We see also flasks, standing in water or sand baths, within which various substances are digesting; in other cases the contents are volatilising into the turban-shaped *aludels* placed above them.[1]

[1] At South Kensington, in the Indian section, may be seen some native distilling apparatus of glass, which follows very closely in the line of these old Syrian drawings.

But in all this strange literature, which, starting from the banks of the Nile in the first centuries of our era, spread over the Byzantine empire and was so eagerly absorbed by the first Arab conquerors, the interest in glass is only of a secondary nature,—the great question was the transmutation of matter and the consequent preparation of gold. Glass, as I have said, was of importance chiefly as a means to that end.

It was far otherwise with the writer whose work we must now examine. Theophilus, the author of the *Schedula Diversarum Artium*, was, it would seem, a monk in the monastery of Helmershausen, not far from Paderborn, in the old Saxon land. The earliest manuscript of his work probably dates from the twelfth century; it is preserved in the famous library at Wolfenbüttel. The treatise itself may perhaps be referred to the end of the eleventh or to the beginning of the next century; but in spite of this early date the style of the book is modern compared with the mediæval compilations we have lately been considering. That the German monk Rugerus, or Rogherus, should have assumed the Greek name Theophilus is itself a significant fact. He was, it would seem, a hard-working goldsmith and a 'skilled artificer' in many branches of the arts. He drew his inspiration from the Byzantine East on the one hand, and on the other from the younger civilisation that was beginning to centre in the new kingdom that was growing up in and around the Isle de France. To these sources we must perhaps add the older Cluniac tradition: from Tuscan artists also he had something to learn.[1]

'Theophilus, an humble priest, servant of the servants of God, addresses his words to all who desire by the practical work of their hands and by the pleasing meditation of what is new, to put aside and trample under foot

[1] For the relation of Theophilus to his predecessor, Bishop Meinhart of Paderborn, and to the Greek influence still prevailing in Germany, see the Introduction by Albert Ilg to his edition of this treatise in the *Quellenschriften für Kunstgeschichte*, vol. vii.; Vienna, 1874.

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heated by one fire. In the earlier furnace there were as many as eight pots, with corresponding openings, but these pots were probably much smaller than those of the thirteenth-century oven.

We must now turn to the materials from which, according to Theophilus, the glass was prepared. Beechwood logs are dried and burned, and the ashes are carefully collected so as to be free from earth. Two parts of these ashes are mixed with one part of clean sand.[1] The mixture is roasted on an upper hearth and stirred with an iron trowel, so that it may not liquefy, for the space of a night and day. Note here that the ashes of the beechwood are used directly without any previous lixiviation; such ashes would contain, besides some alumina, more or less lime and silica, and these substances would pass into the glass. The glass pots are conical in form, curved inwards round the mouth, and they have a small lip. They are filled with the frit in the evening, and for the whole night a fire of dried logs is kept burning.

There follows what is probably our earliest account of the process by which the gathering on the blowing-iron is converted either into a sheet of glass or into a hollow glass vessel. In the first case the *fistula* or blowing-iron is dipped into the molten metal and turned round so that a mass of glass gathers on it. You blow gently through the tube, beating the glass at times against a flat stone that stands by the furnace.[2] You heat again the end of the long vesicle of glass, and with a piece of wood open out the aperture which now appears at the extremity to the full width of the glass tube. We have here a somewhat primitive method of forming a cylindrical *manchon*. The cylinder is now reheated in what is apparently a separate oven—the dilating oven;

[1] Not long after this a German poet writes to this effect—

'Gott hat erschaffen manchen Mann
Der Glas aus Asche machen kann
Und dass kan schöpfen wie er will.'

[2] This is, of course, the 'marver,' not yet of iron as in the thirteenth-century writer (cf. p. 76).

it is slit lengthways and opened out with an iron forceps and a piece of wood. When the glass has been smoothed out into sheets it is taken to the annealing oven, where the sheets are ranged on end against the wall and gradually cooled. It is somewhat of a surprise to find this 'cylinder process' for making a sheet of glass described by Theophilus, while not a word is said of the older process of 'flashing' or 'spinning.' There is some reason to believe that the knowledge of the former process was never lost in Germany. It was, however, only in the seventeenth or eighteenth century that the preparation of crown glass by means of cylinders came into general use in other parts of Europe.

Theophilus proceeds in the tenth section to describe how a vase of glass is prepared, and we have here again our earliest description of the process by which the gathering on the blowing-iron is manipulated so as this time to become a hollow vessel. In this case, he tells us, after blowing out your gathering of glass, instead of making an opening at the further end as in the case of the preparation of cylinders, you separate the bulb from the rod with a stick of moistened wood, and make the rod adhere to the lower end of the glass.[1] After reheating the glass, you now, with a piece of wood, widen and shape as you desire the opening where the tube was first attached. The foot is then shaped and hollowed. (If this foot is to be regarded as a separate piece, it is not quite clear how it is attached to the vessel.) The handles are fastened on by means of a string of glass taken from the pot with a slender rod of iron, and by similar means the surface may finally be decorated with threadings of glass. Theophilus then describes how a simple flask with a long neck may be prepared by swinging the bulb over your head, and then, as it cools, letting it hang down from the end of the tube; the

[1] From the expression used, '*quam fistulam*,' etc., it would seem that the identical hollow tube was used again and not replaced by a simple rod—the *pontil*; but perhaps this is merely a slip on the part of Theophilus.

vessel is then separated by a piece of moist wood; in this case no second rod is needed. No mention is made of the use of shears for cutting the semi-molten glass; they are replaced in a measure by shaping tools of wood.

In the twelfth section we are told of the remains of glass mosaics of various colours found in old pagan buildings, and how from these little cubes enamels are made to be set in gold, silver, and copper. In like manner it is by means of fragments of divers little vessels (*vascula*)—sapphire, purple, or green—that the French colour the costly glass so admired in their windows. This is a statement of no little interest.

Section xiii. treats of the manner in which the Greeks decorate the glass cups made from 'sapphire stones' with gold and silver leaf, covering the foil with a layer of very fusible colourless enamel. The passage is obscure, and I can only say in passing that I do not think that the process described can be identified with that adopted by the makers of the Roman cemetery glass. In the next section is described the Greek method of decorating glass vessels with the same colours—green, red, and white—that are used in the cloisonné enamels (*electra*). With these colours laid on pretty thickly, as well as with a preparation of gold, ground in a mill, they paint birds and beasts or little rosettes and knots in circles.[1] The Greeks make also bowls of purple and light blue, and flasks with longish necks, twisting around them threads of white glass, of which too the handles are made.

It may be inferred from these two sections that Theophilus probably regarded all the artistically coloured and enamelled vessels of his time as of Byzantine origin. He knows nothing about the constituents of the fusible enamels. The pseudo-Heraclius, on the other hand, has

[1] The literal statement is that 'the painted gold figures are covered with the clear fusible glass of which we have already spoken'; over this again the coloured designs are painted—a curious and elaborate process. We must, however, remember that although Theophilus may have seen specimens of Byzantine enamelled glass, he can have had little opportunity of learning how they were made.

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CHAPTER VIII

GLASS OF THE LATER MIDDLE AGES IN WESTERN EUROPE

ONE of the chief glories of the later Middle Ages in Western Europe is undoubtedly to be found in the stained glass windows of the churches. Theophilus early in the twelfth century had already made himself master of this art, which he regarded as essentially a French one. The preparation of these *vitraux* involved a knowledge of the process either of spinning the molten *paraison* or of opening out the cylinder of glass, both comparatively late developments of the art of glass-blowing. In the staining of the glass we know from extant specimens what splendid results were obtained.

The composition of the window-glass of the thirteenth century is in some ways remarkable. It contained as much as from 8 to 10 per cent. of alumina, which we must regard as replacing in a measure the silica, for this constituent falls to as low as 56 per cent., and we can hardly otherwise account for the high percentage of the other bases—14 per cent. of lime, 17 per cent. of potash, and often 3 or 4 per cent. of iron. The result was a tough, somewhat horny glass, hard to work in consequence of the short duration of the viscous stage during the cooling. This was one reason for the smallness of the gatherings, and the modest dimensions of the resultant discs. On the other hand, such glass resists the action of the atmosphere better than any made nowadays, and the large amount of potash present probably promoted the brilliancy of the colours. From the earliest times the blue colouring was given by cobalt, and this

was never of a richer and purer tint than in the twelfth century; already in the thirteenth copper was added to correct a tendency to purple. The famous ruby red, which became rarer after the thirteenth century until in the seventeenth the secret was entirely lost, was produced by the partial reduction of a small quantity of suboxide of copper, but in this case the colour is only developed on reheating the glass. The more purplish tint given by a somewhat similar treatment with gold was not known to the mediæval glass-maker.[1] Manganese was of course the source of the purple—the colour was used for flesh-tints in the twelfth century! The green was made by a mixture of the *æs ustum* or copper scale with a native oxide of iron, the latter often known as *ferretto*—of this the best came from Spain. Finally, the yellow was given either by the sesqui-oxide of iron kept well oxidised by the presence of bin-oxide of manganese, or (where the surroundings favoured a reducing action) by a mixture of sulphur and some sooty material which probably yielded an alkaline sulphide. But in the older glass the yellow colour was never very brilliant; at a later time a fine yellow was obtained by a cementation process from silver, which was applied as a chloride or a sulphide to the surface of the glass.

If I trespass beyond my limits to give this rapid summary of what is known of the colours of mediæval window-glass, it is because much of it will be found applicable to the contemporary Oriental enamelled ware and to the later Venetian glass.

In view of the high technical skill thus shown in the colouring and working of the material, nothing is more remarkable than the almost total absence from our collections of any glass, using that word in the narrower sense, that we can classify as Gothic. We know, indeed, that during these centuries much glass was made in France,

[1] Yet in France much of the old glass was sacrificed at the Revolution in order *to extract the gold.* See Appert, *Les Vitraux Anciens*, for the composition and colour of mediæval window-glass.

Germany, and Italy. But for one reason or another the material was not in favour for objects that had any claim to be regarded as works of art. And yet during all this time the few rare specimens of sculptured glass brought from Constantinople, or of enamelled glass from Egypt and Damascus, were highly prized, and it might well be thought that the skill and knowledge to rival these examples were not wanting in the West. Such was not the case, however; the monasteries had ceased to be centres of practical art industry,[1] and the glass-makers had retired from the towns to the depths of the forests, where under the patronage of the local *seigneur* they built their glass-houses, moving on from one spot to another as the fuel became scarce.

On the condition of delivering yearly to their feudal lord a specified number of vessels, these glass masters appear to have been freed from further imposts, and indeed they soon began to claim special privileges. In France some of these grants or contracts have been preserved in local archives, and in them we have a source of information lacking in other Western countries. Perhaps the most significant of these patents is that granted in 1338 to a certain Guionet. The Dauphin of the Viennois conceded to this *maître de verrerie* the right of taking wood when it suited him from parts of the forest of Chamborant, on condition that the said Guionet should furnish him yearly, for the use of the prince's household, with the following pieces of glass:—240 beakers with feet, known as *hanaps*; 144 *amphoræ*, 432 *urinalia*, 144 large basins, 72 plates, 72 plates without borders, 144 pots, 144 water vessels, 60 *gottefles*, 12 salt-cellars, 240 lamps, 72 chandeliers, 12 large cups, 12 small *barils*, 6 large vessels for transporting wine, and one *nef*. This

[1] Early in the eleventh century, a saintly German bishop, Bernard of Hildesheim, is said to have made for himself a chalice of glass, and a few years later a bishop of Auxerre founded three prebendal seats, one for a painter, one for a goldsmith, and a third for a glass-worker (*vitrier*—probably a maker of glass windows). We must not, then, be surprised at the acquaintance with the practical arts shown by the monk Rugerus (Theophilus).

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Long after the introduction of the *cristallo* from Italy, there were many in France who preferred to drink from the old greenish glass; like the Germans of to-day, they declared that the wine tasted better. Even Boileau, late in the seventeenth century, talks of a man holding '*un verre de vin qui rit dans la fougère.*'

We see then what an important place bracken, *feucheria ad faciendum vitrum*, played in the old glass-works of France. Now glass made from fern-ashes must of necessity be of a very inferior quality, more so probably than that made from the beechwood ashes used from of old in Germany. The passage to the new methods would here be much more revolutionary than in the case of the latter country. This consideration may help to explain the fact that while the manufacture of potash glass survived and adapted itself to the new methods in Germany, it became in time quite extinct in France.

The chronicles and romances of the thirteenth, fourteenth, and fifteenth centuries have been carefully searched by French scholars to find references to glass. Some ambiguity arises from the vague use of the word *verre*, to which I have already referred. But when Joinville tells us how the Comte d'Eu, in a moment of expansion, '*dressait sa bible le long de nostre table et nous brissoit nos pots et nos vouerres*,' we can probably accept the latter vessels as *verres de verre*.

In the royal inventories of the fourteenth and fifteenth centuries, above all in those of Charles v. and of his brothers the Dukes of Anjou, Berry, and Burgundy, where there is any mention of vessels of glass, it is almost without exception of *verre de Damas* or of *verre à la façon de Damas* that we hear. Quite an exception is the *goblet de voirre blanc de Flandre, garny d'argent*, that we find in an inventory of the possessions of Charles v., taken in 1379. Notwithstanding this, it is evident that the French kings at this time took much interest in the manufacture of glass. When hunting in the forests around Paris, they would turn aside to visit

1

2

GERMAN LATE MEDIÆVAL GLASS

1. PRUNTED CUP FOR HOLDING RELICS

2. WAX COVER TO THE SAME, WITH SEAL

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1 2

GERMAN LATE MEDIÆVAL GLASS

1. CUP WITH PRUNTS

2. CUP WITH CONICAL COVER, FOR RELICS

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the furnace of one of these local makers of *verre de fougère* who already claimed the privileges of gentlemen. Thus early in the reign of Charles VI. we find an entry of a payment '*pour don fait par lui aux voirriers, près de la forest de Chevreuse, où le roy éstait alez veoir faire les voirres.*' This was at the beginning of the fifteenth century; later on, as we shall see, both King René and Louis XI. were patrons of the glass-makers; and yet it is doubtful if we have in our collections any examples of French glass which can be attributed to as early a period as the reign even of the latter king.

Of glass made in Germany before, say, the end of the fifteenth century, we know even less than of the contemporary production in France. Theophilus, it is true, tells us of the manufacture of sheets of glass from cylindrical *manchons*, and this was probably until the seventeenth century a specially German process; he describes, too, the manufacture of blown glass of simple forms. But from his time, or at least from the time of the pseudo-Heraclius a little later, to that of Georg Agricola in the sixteenth century, when we find the glass industry taking an important place in many parts of Germany, there is little direct evidence on the subject to bring forward.[1] Apart, however, from a few insignificant little bottles, used as reliquaries (Plates XX. and XXI.), nothing survives from this time. On the other hand, when in the fifteenth century we come again upon evidences of contemporary glass in Germany and Holland, as above all in the pictures of the early Netherlandish and of the Cologne schools, we find a distinct form of goblet already established, the prototype, it would seem, of a famous shape that was able to hold its own at the time of the invasion of Italian glass in the sixteenth century. There is nothing in France, still less in

1 What little we have comes mostly from the Venetian archives. We hear already in the fourteenth century of German hawkers of glass, and of the skill of the Germans in making glass mirrors.

England, corresponding to the *römer* and its various kindred forms.

In one application of glass the Germans appear early to have acquired some skill. We may perhaps regard the thirteenth century as the time when the use of glass for mirrors of any size first became general; this may account for the frequent references to them in the literature of the time. As far back as 1250, the great Dominican encyclopædist, Vincent de Beauvais, states that the best mirrors are made from glass and lead (*ex vitro et plumbo*). A *spiegel-glas* is mentioned by a German writer as early as the end of the twelfth century, and by the end of the next century the mirror provided a frequent metaphor for the poets of the time. Thus Dante, in two passages in the *Divina Commedia*, speaks of 'a leaded mirror.' In the *Paradiso* (ii. 89) Beatrice declares that the rays of the sun are reflected from the moon—

'*Come color torna per vetro*
Lo qual diretro a sè piombo nasconde';

and in the twenty-third book of the *Inferno* (25-26) Virgil says to the poet, '*S'io fossi d'impiombato vetro*—I should not more quickly receive your image than now my mind receives your thoughts.' This double reference would seem to point to a recent discovery that had attracted Dante's attention.

In the thirteenth and fourteenth centuries it would appear that although the German mirror-makers had to import the clear crystalline 'metal' from Venice, the Venetians attempted in vain to make mirrors on the German system. The difficulty, perhaps, was to prepare flat and even sheets of glass of any size, and this difficulty the Germans may have surmounted by means of the cylinder process described by Theophilus.

The Nuremberg mirrors, however, so famous at a later time, were of a different type. They were of spherical outline, cut directly from the *paraison* of the glass-blower; into this *paraison* a mixture of '*piombo*,

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in 1380 had a grant of house and land at Shuerwode, Kirdford,[1] and there made 'brodeglass and vessel'—that is to say, window-glass and hollow ware (Nesbitt, *South Kensington Catalogue*, and Hartshorne, p. 132, etc.).

I reserve what I have to say of the mediæval glass of Italy—of the early Altarists and Muranists—until I have described the enamelled Saracenic glass which in some measure influenced it.

But before turning again to the East, I must not omit to mention certain applications of glass that found favour in Western Europe during the later Middle Ages; indeed, apart from the coloured windows, such objects constitute the only *genre* of glass that can distinctly be classed as Gothic. I group together here various devices by means of which a design or pattern was applied to the back of a small sheet of glass—in gold for the most part, but other colours were sometimes used. The plaque thus decorated was either fixed into a piece of furniture, or simply backed with some impervious material. In this somewhat indefinite group is included, on the one hand, what is in fact a kind of thin mosaic; on the other, something that passed into the variety of painted glass known in later times as *verre églomisé*. What distinguishes all this class of decoration is that neither the colour nor the backing is fixed by any furnace process—it is scarcely to be regarded as an *art du feu*, and thus lies somewhat outside our subject.

Of the so-called Cosmati mosaics, where the little triangular pieces of glass are inlaid in marble or wood, we have a good example in the thirteenth-century shrine of the Confessor in Westminster Abbey. At the same period a more elaborate means of decoration was obtained by painting the backs of little plaques of glass with gold and colours, and fixing them on the panels of pulpits, on the frames of the painted reredos, or even on secular furniture. I have seen examples of church furniture thus

[1] The village of Kirdford is situated about four miles to the north of Petworth.

decorated at Aachen and in the Norman churches of Southern Italy—a pulpit at Bitonto in Apulia is a remarkable example. But we need not go far to find a still finer specimen of such work: the Gothic framework of the *retabulum* that formerly was placed in front of the high altar in Westminster Abbey[1] is decorated with bosses of glass paste cut or cast *en cabochon*, with casts of antique gems, and, above all, with little plaques of blue and purple glass backed with silver foil. On the upper surface of these glass plaques a design in gold, consisting of small medallions with animals and twining branches, stands out in low relief. The pattern, says Viollet-Le Duc (*Dictionnaire du Mobilier français*, i. 338), was first painted on the glass with a mixture of red ochre, wax and turpentine, and over this, before it was dry, gold leaf was laid, the gold adhering only to the soft ground. The effect of this external decoration is heightened by the shadow which it throws upon the silver foil beneath.

In other examples, the pattern is painted in various colours under the glass, and a leaf of gold, pasted beneath the more or less transparent pigments, shows through here and there. In all these instances the crude colour of the gold is lowered in places by coatings of varnish.

But plates of glass, somewhat similarly decorated, may play an even more important part in the decoration of the backs of altars, especially on the spandrels in the lower arcades of the reredos. The decoration now becomes pictorial, and is often most carefully executed. Or, again, such a little glass picture may be detached and mounted in a frame to form a pax or *baiser-de-paix*, a *bijou* reliquary, or other small devotional object. In such cases the gold is applied to the back of the glass by weak gum, and the design traced with a pointed instrument somewhat in the manner of the catacomb glasses. The

[1] It stood for long against the wall of the South Ambulatory. As in this position the paintings appeared to be suffering from the damp, it has lately been removed to the Jerusalem Chamber.

effect may be heightened in various ways by additional touches of pigment on the draperies, or by a glazing of colour for the flesh-tints; the colours are worked up with a resinous body, and silver foil in little plates and spangles is added in places; finally, over the back is laid a piece of tinfoil, and this is folded over the edges (M. Alfred André, quoted by M. Molinier, *Spitzer Catalogue*, vol. iii. p. 54). The back of the plate is generally found to be protected by a kind of pitchy varnish; to fix this some application of heat was doubtless necessary, but in no case, I think, is the gold design in this late mediæval work enclosed between pieces of glass which have been subsequently fused together.[1]

We are here concerned only with the Gothic examples of this class of work, and of these the majority appear to come from the north of Italy—they are probably of Milanese or Venetian origin. There is often in these early Italian plaques a coloured backing under the gold, generally of a bright red, but sometimes of green or black, and this backing shows through in places. In the case of a very beautiful example formerly in the Spitzer collection, the design was drawn upon the central portion of a plate of flashed glass; although this medallion is only 5½ inches in diameter, there is a distinct boss in the centre. That such a defective piece should have been chosen for this delicate work would go to prove the rarity of sheets of glass with even surface at this time.

In later days more colour was used in the decoration, but such work as the magnificent *baiser-de-paix* in the Louvre, which came from the chapel of the order of the St. Esprit, does not fall within our present limit of time.

The late Marquis Emanuele D'Azeglio devoted himself to collecting specimens of gilt and painted glass of all ages and countries. This collection, unique of its

[1] A fifteenth-century plaque at South Kensington is possibly an exception. Here the gold leaf lies between two sheets of glass, the lower one of considerable thickness, but how these sheets are united I cannot say.

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CHAPTER IX

THE ENAMELLED GLASS OF THE SARACENS

I HAVE here to deal with a singularly restricted family of glass—that made in the Saracenic East during the thirteenth, fourteenth, and fifteenth centuries. This enamelled glass is important for more than one reason. It is undoubtedly, as a group, the most magnificent and decorative that we meet with in the whole course of our history. Technically, again, the interest of the group is supreme, for this application of solid enamels, translucent or transparent, to the surface of glass, was a new departure, and it preceded, as far as we know, the use of any material of the kind in the decoration of porcelain and fayence. The Romans and the Byzantine Greeks, it is true, decorated their glass at times with thin washes of opaque paints, but we have no definite proof that they ever applied fusible lead enamels in this way.

There is every reason to believe that this method of decoration was not in any general use in the East before the thirteenth century. But if we are still quite in the dark as to the origin of the art, it may be some consolation to remember that barely thirty years ago the few rare pieces of Saracenic glass that had reached us were classed as Venetian. It is only quite lately that this important ware has met with due recognition.

No doubt much of the sculptured and engraved glass, that we have for convenience of arrangement dwelt upon in the last chapter, is of Saracenic origin; I do not, however, remember any instance of an Arabic inscription being found on such vessels, but on the deeply carved

vases of rock crystal that seem to have formed the models that these engraved glasses closely followed, in more than one case tall cufic characters form part of the decoration. I will only point to the magnificent crystal vase which bears the name of an early Fatimi caliph (975-996 A.D.), preserved in the treasury of St. Mark's.

Apart from that in daily use among the people, we may, however, look upon the glass made during the first four or five centuries of Arab domination as on the whole following in the wake of the carvings in hard stone, above all in rock crystal, then so much in vogue. During the whole of this period the Saracens had hardly developed any well characterised art of their own: they followed in this, as in so many other matters, the traditions of the countries in which they dwelt. At this period their art was at best but a mingling of Byzantine and Sassanian elements. But before the end of the twelfth century a great change had come about, and during the course of the next century there had arisen a definite style—one that has remained ever since the type of what we know as Saracenic art. It would be impossible to dissociate this change from that which took place in the West about the same time. But the Gothic art that sprung up in the land of the Franks was but one phase of a continuous evolution, while the wonderful outburst that had in the main its centre in Cairo, became either locally stereotyped or shared the decay and neglect that overtook other branches of Mussulman civilisation.

So far as the art of glass is concerned, we may note in the thirteenth century a strange contrast between the East and the West. For while in both lands the material was applied essentially to supply a scheme of colour in decoration, in the West its use was restricted to the stained glass in the windows of churches; in the East the source of colour was obtained from translucent enamels applied to the surface of glass lamps and vases. The Saracens, in the stained glass of their windows,

merely followed in the old Byzantine lines; the pierced framework of plaster, filled in with fragments of coloured glass, is but a development of the marble *chassis* of the Romans and the later Greeks. In the West, on the other hand, the art of building up pictures by means of segments of glass was rapidly developed, while the 'hollow ware,' the *verrerie* in daily use, had, as we have seen, received little attention, and it was reserved to the few precious pieces of enamelled glass brought from the Holy Land to find a place along with the plate and jewellery in the inventories of princes.

The fabulous wealth accumulated by the Fatimi caliphs of Egypt (908-1171 A.D.) became proverbial in later days. Makrisi, writing about the year 1400, quotes from an older writer the description of the treasure-house of the Khalifah Mustansir Billah. This building was sacked and burned with all its contents during a military riot between Turkish and Soudanese troops in 1062. Here among the vast accumulation of Oriental wealth were, it is stated, many thousand vases of rock crystal and others of sardonyx. We hear also at this time (but not in the list of these treasures) of glass mirrors in filigree frames, and of vessels of glass ornamented with figures and foliage. How the decoration in this last case was given we are not told, but the reference is probably to carvings in relief: at any rate it would, I think, be an anachronism to look for enamelled glass in this connection.

There is, however, one application of glass that we can definitely associate with these heretic caliphs, but this is scarcely an artistic one. The little coin-like discs of glass stamped with an inscription in Arabic had their prototypes in Roman times; a few rare examples have been found with the heads of Roman emperors and letterings in Latin. Among the Saracens these coin-like discs continued in use as late as the fifteenth century. In all cases, I think, they come from Egypt. The glass discs of the Fatimi period are, however, the most

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sultans, almost all of them Turks by birth, that the great mosques that gave to mediæval Cairo its special *cachet* were erected. As for the artists themselves, though a few may have come from the Persian borderland, they were, for the most part, of the old stock of the land, and many were doubtless Christians.

In the towns of the Syrian coast, the change of mastership did not interfere with the work of the glass furnaces. We have seen in the Syriac manuscripts how fragments of Arabic are interlarded with the old indigenous dialect in passages treating upon the manufacture of glass. Around Hebron the manufacture of glass on primitive lines was carried on through the Middle Ages: a German pilgrim of the fifteenth century speaks of the many furnaces in which the 'black glass' was melted: the industry is indeed even now not extinct. There is one form of early Arab glass which we may perhaps associate with this centre. Certain long nail-shaped bottles, square in section and pointed at the base, have sometimes been classed with the old primitive glass of Egypt and Phœnicia, on the ground probably of the 'dragged' decoration of white on a black base found on some of them. But Franks was undoubtedly right in attributing these elongated flasks—they are sometimes of considerable size—to Saracenic times.[1]

William of Tyre says that the glass of his native town was exported to all countries, and Benjamin of Tudela, the Spanish Rabbi, praises the beauty of the glass vases there made. There were, he tells us, four hundred Jewish glass-makers and shipowners in Tyre, and in other cities of the coast the glass industry was in the hands of the Jews. This was about the middle of the twelfth century. The Jews long before that time had, it would seem, a monopoly of glass made with lead. It was to them, then, that the first enamellers must have gone for their materials. An Arab writer

[1] In shape they resemble the little bottles in which attar of roses is still sold in Oriental bazaars, and this resemblance may give a hint as to their original use.

distinguishes among the exports from Sour (Tyre) both objects of *verroterie* and glass vessels worked on the wheel.[1] Of the glass-works of Tripoli, one of the last towns held by the Franks, I shall have something to say in a future chapter.

Just as in the case of the glass found in Egyptian and in early Greek tombs, so now with the enamelled glass of the thirteenth and fourteenth centuries, we are once more brought face to face with the question as to where it was made—in Syria or in Egypt. Syria was at this time again under rulers who had their capital in Egypt; there are indeed few important periods in Egyptian history when this has not been the case. Alexandria, it is true, had fallen from its old position,[2] but it is distinctly recorded that glass was made in the fourteenth century at Mansourah, the recently founded 'town of victory,' above Damietta. At many places in Upper Egypt, especially at Achmin, fragments, most of them, but not all, to be referred to Saracenic times, have been found. But on the whole the evidence for a Syrian origin for this enamelled ware is much stronger,—I say the *origin*, because it is just in the case of those rare pieces to which an early date can be ascribed that we can be certain of an Asiatic *provenance*.

The enamelled glass of the Saracens forms, as I have said, a compact group. The specimens that we have of it are all, or nearly all, handsome pieces, worthy, apart from their archæological interest, of a conspicuous place in our museums or on the shelves of the most

[1] Schefer, *Relation des voyages de Nassiri Khosrau* (1035-1042 A.D.), pp. 42 and 46. The information from Arab writers collected in the notes to this work must not be confused with what Khosrau himself says. There is, however, one important reference to our material in the text:—we are told that glass, transparent and pure as the emerald, was sold in Cairo by the weight. This was in Fatimi times. There may, perhaps, have been some confusion with the glass weights themselves, of which we have spoken above.

[2] We may find, perhaps, what is the last reference to Alexandria in connection with glass in 'the most precious vase, *Alexandrini generis*,' that the Emperor Henry II. (*d.* 1024 A.D.) presented to the Abbot of Cluny. This was probably an example of sculptured glass, which may have come to Henry through his relationship with the Byzantine emperors.

fastidious amateur. Their number is strictly limited—indeed Herr Schmoranz has drawn up a careful list which claims to contain every known example.[1] Thanks in great measure to the researches of this expert, we are able now to make a rough general division of this glass into two classes:—

1st. Vases, goblets, and basins of many forms, brought for the most part from Syria. The bulk of the enamelled glass in this division appears to date from the thirteenth century. Several famous pieces have for centuries been preserved in the treasuries of Western churches. For these it is claimed that they have been brought back from the Holy Land by crusaders and pilgrims—filled, some of them, with earth taken from Bethlehem or other holy spots.

2nd. Lamps, obtained almost without exception from mosques in Cairo. These lamps belong, as a class, to the fourteenth century. Only of recent years has much attention been given to them; they were almost unknown to the older collectors.[2] The supply appears, however, to be already exhausted. The decoration on these lamps is on the whole more broadly treated, with less detail and finish, than that found on the vases and goblets of our first class.

The glass itself is in all cases remarkable for the number of minute bubbles contained in it; in some of the lamps these bubbles are so numerous that the material is barely to be classed as transparent. In colour the glass varies from a pronounced bottle-green to an amber tint; it is more rarely of a greyish white. The size of many of the lamps and bowls must have

[1] Gustav Schmoranz, *Old Oriental Gilt and Enamelled Glass Vessels*, 1899. One hundred and forty glass lamps are accounted for, of which number exactly half are now in the Museum of Arab Art at Cairo. The remaining pieces—goblets, bottles, etc.—only amount to forty-four, but these are nearly all in European museums or private collections.

[2] There was only one, for instance, in the Slade collection. There are now seven in the British Museum and nine at South Kensington, without counting the smaller specimens.

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including the white, are probably produced by the addition of a little oxide of tin to the flux; Dr. Linke, however, does not seem to have found that metal in his analysis.

It is when we come to the blue, the dominant colour in this scheme of decoration, that a surprise awaits us. This colour, we should almost have taken for granted, would be derived from cobalt, for it is now recognised that at this time the use of that substance in the painting of earthenware (under the glaze) was prevalent in Western Asia. Dr. Linke, however, declares 'that even the most subtle re-agents failed to discover any trace' of either cobalt or copper in the blue enamel. For the grounds upon which he was able to attribute the origin of this fine blue to minute fragments of *lapis lazuli*, only partially dissolved in the flux, we must refer to the German chemist's report. Now as ultramarine, the colouring matter of this mineral, contains a considerable amount of sulphur, some of it in an unoxidised state, it could not be used in combination with a flux containing lead, and indeed an analysis of the blue enamel proved it to be essentially of the same composition as the glass of the lamps; it contained, however, as much as 24 per cent of alkali, and this excess would ensure a slightly greater fusibility. It will be observed that the thick blue enamel on this Saracenic glass has considerable translucency as seen by transmitted light, but that the surface is always dull. In the British Museum is an admirably executed imitation of one of these mosque lamps, made as long ago as 1867 by M. Brocard of Paris. The blue, in this case cobalt, differs little in hue from that on the old lamps that stand beside it. It is, however, somewhat cruder in effect, and the surface is quite glassy.[1]

I come now to the scheme of decoration of this

[1] Note that the use of cobalt as an *overglaze* enamel on Chinese *porcelain* did not come in until the seventeenth century, and that this enamel at first gave more trouble than any other.

FLASK OF ENAMELLED GLASS

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Saracenic glass. The important point to bear in mind is that the gold has for the most part disappeared from the surface. This gilding, however, played originally a most important part in the decoration. The fine lines of opaque red now so prominent were originally drawn with a free hand upon a detailed pattern of gold, with the object of accentuating the design. This gold brocading, when it is preserved, is of great beauty, especially that found upon the older pieces. Examine carefully the tall-necked bottle in the Slade collection: the body is covered with a fine arabesque of red lines, the pattern being made up of long-necked birds among foliage, and this appears poor in effect compared with the bands of rich enamel on the shoulder and neck. The effect, however, was very different at first when these dull red lines were carried over a rich ground of gold, of which traces only now remain here and there.

The gold, then, was applied first—at an early stage in the development of this family of glass it was perhaps the only decoration; the outline was then accentuated by means of red lines, and the coloured enamels then laid on in thick masses. We cannot say whether the colours were all melted on at one firing, for we know nothing in this case of the practical arrangements of the muffle-stove. On the exquisitely enamelled bottle from Würzburg in the British Museum (Plate XXII.), perhaps technically the most superb specimen of this class of decoration that has come down to us, the pinkish tint of the red and the manner in which it is gradated into the white, call to mind the use of the *rouge d'or* on Chinese porcelain of the eighteenth century; the green also of the conventional foliage is here shaded into the opaque white. The blue ground of the central medallion is of a brilliant turquoise, quite unapproached in other examples; the surface, however, of this blue enamel is in this case glassy and quite unlike the dead surface that we see on the mosque lamps. Are we to regard this opaque turquoise enamel as also based upon *lapis lazuli*, or rather as a soda-copper silicate?

As to the motives of the enamelled decoration—if figure subjects are absent from the mosque lamps, they are of frequent occurrence on the bottles and goblets: there we have polo-players and falconers mounted on horses, yellow, pink, and white; seated figures drinking and feasting or playing on musical instruments—always the same jovial, round-faced type; in only one instance have I noticed an elderly man with a beard. We sometimes find a frieze with dogs chasing stags and hares, or it may be a row of conventional lions. Birds are still more frequent—flying geese, as in the background of the hunting scenes, or long-necked herons forming part of the ornamental design of the field. Certain quaint little fishes with big heads and long fins, always of the same form, are not uncommon on the vases and cups; they are sometimes arranged herring-bone fashion; in one case, indeed, these little fishes are found on a mosque lamp.

But the more conspicuous part of the decoration is formed by bands of tall cufic[1] letters and by flowers, more or less schematised. Apart from a fleur-de-lis, which occurs chiefly in medallions, the most important flower is the Oriental lotus. This flower as it appears relieved on a blue ground in the later mosque lamps is identical in drawing with the lotus that we see so frequently in Indian and Chinese art. It is often combined with what at first sight appears to be another flower, treated *en rosette*, with an involucre of six oval and six triangular petals, and an indication of a seed-vessel in the centre; but this again may perhaps be only the same lotus-flower seen full-face. In some cases, as on certain mosque lamps, these flowers, broadly treated, form the sole decoration; but more often the floral design passes into the formal schematised patterns so characteristic of Arab art at this time.

The medallions that interrupt the broad bands are an essential part of the decoration; they are filled sometimes

[1] I use this term for the writing with tall perpendicular strokes, although much of it, I understand, should not strictly bear the name.

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collections, unless it be one of gilt green glass now at South Kensington (Plate XXIV. 2). This lamp, however, is somewhat large for the position assigned to it, and it certainly resembles those sometimes found in Coptic churches.

These large lamps or lanterns were suspended by chains from the roof or from the arcades of the mosque. From the Sultan Hassan mosque alone have come twenty-one glass lamps, now in the Arab Museum at Cairo, and there are others from the same source in our home collections. The effect in the mosque when these lamps were all lighted must have rivalled the illumination of St. Sophia, described by Paul the Silentiary (p. 97). We must not forget another essential part of the Arab lamp: this is the little sphere from which the smaller chains that pass to the handles of the lamp radiate. In private houses—for the general arrangement is the same in them—this globe may be replaced by an ostrich egg. In the mosques these spheres are of metal or of glass; we have only two specimens of the latter material in European collections—one of amber-yellow glass in the British Museum (Plate XXVII. 2), a second, larger and ovoid in shape, at South Kensington. There are three others, one of blue glass, in the Arab Museum at Cairo.

A similar method of suspending the lamps was in use in Byzantine churches, and something of the sort may still be seen in St. Mark's. In the pictures of the Venetian painters of the later fifteenth century—of Bellini, and Cima, and Carpaccio—the lamps, of a strictly Oriental or Byzantine type, that hang from the niches that form the background to their enthroned Madonnas, well illustrate this arrangement.[1]

It may be said generally of the Saracenic enamelled glass as of the unadorned glass of the Byzantines that preceded it, that the lamp in one shape or another is the

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master form—no longer the wine-cup, as among the Romans. It would be an interesting study, were the thing possible, to trace the steps by which the later arrangement of an outer lantern of glass grew out of the simpler Byzantine or Sassanian prototype. But it must be remembered that these gorgeous mosque lamps or lanterns are quite a specialised form; they are only found, as far as we know, in Egypt and Syria, and they belong essentially to the fourteenth and fifteenth centuries. The typical Oriental glass lamp is of quite a different type —a little cup in the shape of a truncated cone, from four to six inches in height. This is a form that is generally in use in the East at the present day. Such a vessel constitutes the essential part both of the street lanterns (the conical cup in this case passes through an aperture in the base) and of the coronas of lights by which the larger rooms are illuminated. In the latter case the cups pass through apertures in a ring or disc of wood or metal, which is itself suspended, often from an ostrich egg, in the way already described.

The little vessels are filled halfway up with water, upon which the oil floats; the wick passes up through a tube which is fixed at the bottom in various ways. I have before me a cup of this description brought from an old house in Cairo; it is of very thin, tough, greenish glass; the 'kick' at the bottom is pushed deeply in and is open at the apex. This opening has been sealed up with some hard pitchy substance, into which the little glass tube (of later date apparently) that carries the wick has been fixed. In another type of these cup or beaker lamps the base ends in a blunt point which is prolonged by one or more knops, so as to resemble the stem of a wine-glass without the foot.[1] This is the form that, as I have already mentioned, is so often represented,

[1] Glass lamp-cups of this form are still made in India; Mr. Forrest, ex-Director of Records at the India Office, has shown me a specimen brought from Gujerat. Glass lamps of a similar construction seem to have been in use in bedrooms in Germany in the fifteenth century; they may be seen in contemporary pictures.

suspended from the roof in the altar-pieces of the Venetian painters. Such lamps are generally elaborately mounted in metal.

But the other form, the truncated cone (the 'spear-butt' of Paul the Silentiary), was in use in Italy at an earlier date. In the chapel of the Arena at Padua is a careful wall-painting of an elaborate compound corona or lantern built up with hoops of metal to resemble a large bird-cage. The little lamps of plain glass fitted into this framework are of two shapes; one resembles the truncated-cone cup just described, while the other may be compared to a mosque lamp with the foot removed and the body prolonged to a point. I do not know if this painting is contemporary with the famous frescoes of Giotto that cover the adjacent walls, but to judge from the Gothic framework that surrounds it, it cannot well be later than the fourteenth century.

This conical cup, then, was widely employed in the later Middle Ages for suspended lamps. It had quite replaced the balance-pan form of lamp support of early Byzantine days, some specimens of which, preserved in St. Mark's treasury, we have already described: such pans, we should add, probably supported little standing lamps, more or less of the well-known classical form. But both these and the conical cups may possibly at times have held candles, an essentially Oriental means of illumination.[1]

We must now return to our enamelled glass, and consider a remarkable series of little beakers very similar in size and outline to the lamps of truncated conical form that we have been dwelling upon. Many of these have now passed, from the treasuries of churches and convents in which they had been long preserved, into various local museums. Round more than one of them

[1] The magnificent specimen of enamelled glass with geometrical decoration, which belonged to the late Baron Alphonse de Rothschild, figured in Schmoranz's work as a lantern, is, of course, a stand for a candle. It resembles in every respect, except material, the well-known cylindrical candle-stands of inlaid bronze.

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through the bottom of the glass which is only closed by the fixing on of the added foot. This feature appears to be common in these Oriental goblets, and as far as my experience goes, is not found in any of European make.' Such an arrangement would surely have one practical disadvantage if the cup had been used as a drinking-vessel—the liquid would lodge between the false bottom and the foot, so that it would be almost impossible to clean out the cup, and this is a point that would especially appeal to a Mohammedan. On the other hand, this open 'kick' would be admirably adapted to the introduction of a wick[1] if the vessel before the soldering on of the ring at the base had been used as a lamp. I should myself be inclined to think that the little cups in question, sold perhaps by Jewish dealers at Aleppo or at one of the Syrian ports to wandering pilgrims before their return from the Holy Land, were never intended for any practical use. The peculiarity of the form may have been a result of the prevailing use to which such vessels were put in their own country, or at least a survival of such a use. I should add, that for such a suggestion—it is nothing more—I am alone responsible.

[1] The construction, indeed, closely resembles that of the Cairo cup-lamp described above.

CHAPTER X

THE ENAMELLED GLASS OF THE SARACENS—*continued*

I WILL now pass in review some of the more famous specimens of Saracenic glass.

Of the 'Goblet of the Eight Priests,' now in the museum at Douai (figured in Gerspach, p. 107), we have an earlier record than in other cases. It was bequeathed by one Marguerite Mallet, early in the fourteenth century, along with other property, for the endowment of that number of chantry priests. The case of *cuir bouilli* in which the goblet is preserved is a remarkable specimen of the French art of that time. The inscription on this cup is unfortunately now illegible.

For the 'Glass of Charlemagne,' which has passed from the treasury of an abbey near Chartres to the museum of that town, it is claimed that it was presented by Harun-ar-Rashid to the great Emperor. M. Schefer many years ago made this cup the starting-point of a special memoir, in which he collected a mass of information from Arab sources. This essay may perhaps be regarded as the earliest example of any intelligent interest in this class of Oriental glass.

The 'Luck of Eden Hall,' long preserved in the home of the Musgrave family, has acquired a certain factitious celebrity from a legend that has served as the theme of more than one ballad, none, however, of any great antiquity.[1] Like the Douai cup, it is preserved in a

[1] The oldest of these ballads only dates back to the time of the Duke of Wharton, at the beginning of the eighteenth century. The 'wicked Duke,' it is said, when in his cups would toss the 'Luck' into the air and catch it in his hand.

leathern case—in this instance not of earlier date than the beginning of the fifteenth century. The 'Luck' is figured in Lysons's *Magna Britannia*, vol. iv.

These three goblets form a compact group. In all of them the decoration is simple, consisting chiefly of interlaced bands or straps forming geometrical patterns. There are no figures of men or animals, and the colouring is for the most part confined to blue and gold. We may, perhaps, attribute these glasses to the beginning rather than the end of the thirteenth century.

Probably of as early a date is the goblet preserved at Breslau (there is a photograph of it in Von Czihak's *Schlesische Gläser*). Here there is no ornament apart from some fine arabesques of gold. This cup has long been associated with St. Hedwig, but it must not be confused with other so-called 'Hedwig glasses,' which, as we have seen, are carved in the manner of rock crystal.

I now come to a more elaborately enamelled group, in the decoration of which the human figure plays an important part.

In the Grüne Gewölbe at Dresden are two beakers or *hanaps* of this class, set in rich silver-gilt mountings of the fifteenth and sixteenth centuries. Round one of these cylindrical beakers runs a spirited frieze, with polo-players, mounted on brown, white, and yellow horses; above is a cufic inscription in gold on a blue ground (Plate xxv.). On the other beaker, probably the earlier of the two, we see a group of brilliantly clad turbaned figures seated by a flowing stream—the water is naïvely rendered by a meandering line of blue enamel; the background is formed by a flight of aquatic birds. On both these glasses, beside the usual gamut of colours—gold, blue, red, green, yellow, and opaque white—we find some mixed brownish tints.

Somewhat taller than these Dresden *hanaps* is the beaker at Wilhelmshöhe (it is some nine inches in

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a few drawn bubbles, in no way differs from that of the beakers already described.[1] So of the shape and of the quality and colours of the enamel. The slight 'kick,' however, at the base is normal: that is to say, there is no aperture (see above, p. 159); the cup, therefore, needs no rim or stand. As regards the decoration, we find, in addition to the usual colours, an inscription in Gothic lettering, now quite black, but originally executed in silver. I shall return to this cup in the next chapter. I mention it here as I am inclined to find for it an Oriental *provenance*.

I have dwelt at perhaps disproportionate length on this special type of goblet. We have here, however, a group from a historical point of view, of exceptional interest.

A small damaged goblet of cylindrical shape at South Kensington forms a transition to the group of larger beakers. It bears a series of medallions of blue enamel containing a curious design—a bird of prey seizing a duck. The cylindrical goblets with projecting collars do not present any special point for remark. There is some reason for regarding the quaint little flasks, with narrow swelling necks, as an early type. There are two of this class at South Kensington; in both cases the glass is much decomposed. Better preserved is the little bottle with the red eagle figured in Schmoranz (Plate vii.); the evidence, however, for the early date (1217) given to it is not quite conclusive.

It is not known at what time the large pilgrim's bottle in the Domschatz of St. Stephan at Vienna was brought from the Holy Land (Schmoranz, Plate iv.). Much of the surface is left undecorated, and the glass is whitened by the chalky earth with which it is still filled. This earth is reputed to have come from Bethlehem, and to be stained with the blood of the Holy

[1] In this respect differing from the other cup in this collection to which the same date and origin are ascribed. I refer to the Aldrevandini goblet, with the armorial shields, described in the next chapter. The glass of this cup is already quite of a Venetian type, approaching to a true *cristallo*.

Innocents. The main design of musicians, seated beneath a conventional tree beside a stream (represented by a blue meander), calls to mind the decoration of one of the Dresden beakers. Near in style to this flask is the quaintly shaped pilgrim's bottle in the British Museum, that was long in the possession of a noble family at Würzburg. I have already spoken of the superlative quality of the enamel on this remarkable example of Saracenic glass.

In the cathedral at Vienna is another enamelled vase (Schmoranz, Plate xiii.). This graceful amphora-shaped vessel follows exactly on the lines of the water jars of earthenware still in use on the coasts of the Mediterranean. The blood-stained earth that it once contained is gone, but the seal of attestation remains—strong evidence that the bottle was purchased at Bethlehem by the German pilgrim who brought it home. The blue is of a poor greyish tint, and the enamels on the whole low in tone, but the interlaced geometrical design is not the less decorative.

The little jug (Schmoranz, Pl. xxx.) now in the hands of one of the Rothschild family in Paris, was purchased at the Hamilton sale for £2730; in the catalogue it was described as a specimen of Venetian glass! The enamels are brilliant and well preserved—polo-players, mounted on horses of various colours, surround the body. A curious feature is a collar of wood round the base of the neck, kept in place by a series of claw-shaped projections.

The larger bottles with tall necks form a class by themselves; they are often remarkable for the delicacy of the decoration. On the neck of a tall and richly enamelled example in the museum at Vienna (Schmoranz, Pls. vi. and vii.) we find a distinctly Chinese motive:—in addition to the well-known phœnix may be seen a curious development of the cloud pattern, in the shape of four many-coloured bars. There is a fine example of these long-necked bottles at South Kensington and another in the British Museum. The first is remarkable

in combining on the same piece motives from many sources —the Chinese phœnix, the so-called Egyptian hieroglyph, together with birds and animals in many styles (Plate XXIII.).

The bowls and dishes form a more miscellaneous group. These we may regard as essentially 'table ware.' In Persian manuscripts—in the illustrations to Hariri's tales, for instance—we see such vessels piled up with fruits and cakes.

The shallow plate belonging to Lord Rothschild is perhaps the oldest example of this class in our collections. The medallions, skilfully filled with groups of lions attacking deer and with other similar subjects, are distinctly Byzantine, or some would say Sassanian, in character.

An interest of another kind may be found in a pair of dishes, one bowl-shaped, the other in the form of a tazza mounted on a tall foot, which have long stood side by side in the Cluny Museum at Paris. These are undoubtedly specimens of enamelled Saracenic glass, both probably dating from the fourteenth century, the bowl, however, somewhat earlier than the tazza. This latter vessel is decorated with a gold arabesque combined with the thick translucent blue enamel and the red lines so characteristic of Saracenic glass. A label, however, still proclaims this tazza to be 'Style Arabo-Venitien, XVme siècle.' On the other hand, no less an authority than Labarte (*Histoire des Arts Industriels*, iv. p. 546), it is true as long ago as 1864, found in this tazza an example of one of the processes of enamelling described by Theophilus, and on this ground deliberately declared it to be a Byzantine work. On the basis of a vague inscription found on the companion piece—the deep bowl—a whole theory of the Egyptian or Byzantine-Egyptian origin of this enamelled glass has been built up by a German writer (Carl Friedrich, *Die Alt-Deutschen Gläser*).

There is in the British Museum a large deep bowl with a gigantic cufic inscription in blue, overlaid with

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reign of the Sultan Baybars II. (1309-1310)[1] probably belongs the beautiful lamp of deep cobalt blue glass that Mr. Pierpont Morgan obtained from the Mannheim collection. There is only one other example, as far as I know, of enamelling on a dark blue ground,—a lamp of nearly the same date formerly belonging to M. Goupil.[2] The only specimen apparently in our English collections of a lamp of so early a date is the beautifully enamelled example at South Kensington (Myers bequest), the inscription on which probably refers to the same Baybars.

By far the greater number of these lamps date from the latter half of the fourteenth century. We have seen that the famous mosque built by Sultan Hassan (1347-61) has provided numerous examples to our collections. In these we already find less delicacy and detail in the decoration, but the broad and effective treatment is well suited to the position in which these lamps were placed, suspended as they were from the arcades of spacious mosques.

The period of decline that set in after this time is usually associated with the advance of Timur (Tamerlane). When in the year 1400 Damascus was taken by that ruthless conqueror, we are told that he transplanted to his new capital of Samarkand whole regiments of skilled Syrian artisans, and among these the glass-workers are definitely mentioned. Others of these men may have fled to Egypt; in any case the art lingered on in that country for another hundred years. According to Schmoranz, the latest known example of this school of Oriental enamelled glass is a lamp from the mosque of Kaït Bey (1467-1495), now in the Arab Museum at Cairo. In this specimen we see the art in the lowest stage of decay.[3]

[1] He reigned during the temporary deposition of Malek Nasir.

[2] This lamp also has, I think, passed into the Pierpont Morgan collection.

[3] The badge of a sword is very frequent upon these later lamps, but it can hardly in all cases refer to the same sultan or emir.

reign of the Sultan Baybars II. (1309-1310)[1] probably belongs the beautiful lamp of deep cobalt blue glass that Mr. Pierpont Morgan obtained from the Mannheim collection. There is only one other example, as far as I namelling on a dark blue ground,—a lamp of [illegible] the same date formerly belonging to M. Goupil[2] [illegible] only specimen apparently in our English collections of a lamp of [illegible] a date is the beautifully enamelled example at South Kensington (Myers bequest), the inscription on which [illegible] refers to the same Baybars.

By far the greater number of these lamps date from the latter half of the fourteenth century. We have seen that the famous mosque built by Sultan Hassan (1347-61) has provided numerous examples for our collections. In these we already find less [illegible] in the decoration, but the broad and [illegible] suited to the position in which [illegible] were suspended as they were from the roofs of the mosques.

The period of decline [illegible] in after this time is usually associated with the advance of Timur (Tamerlane). When in the year [illegible] Damascus was taken by that ruthless conqueror we are told that he transplanted to his new capital of Samarkand whole regiments of skilled Syrian artisans, and among these the glass-workers are definitely mentioned. Others of these men may have fled to Egypt; in any case the art lingered on in that country for another hundred years. According to Schmoranz the latest known example of this school of Oriental enamelled glass is a lamp from the mosque of Kait Bey (1467-1495), now in the Arab Museum at Cairo. In this specimen we see the art in the lowest stage of decay.[3]

[1] He reigned during the temporary deposition of Malek Nasir.

[2] This lamp also has, I think, passed into the Pierpont Morgan collection.

[3] The badge of a sword is very frequent upon these later lamps, but it can hardly in all cases refer to the same sultan or emir.

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The rise and fall of this great school of enamellers on glass covers but a brief period—a glorious interlude in the long story of the glass-workers of Egypt and Syria. In the latter country after this time, they appear in a measure to have fallen back upon the older and more primitive methods, handed down, perhaps, from the days of Phœnician and Egyptian domination. I have already spoken more than once of the still existing glass-works near Hebron on the high plateau to the west of the Dead Sea.

There remain, however, to be mentioned one or two mosque lamps which depart from the normal type.

In the lamp (now at South Kensington), apparently of green jade-like glass, which was brought with so many others from Cairo by the late Captain Myers, the effect is obtained by a wash of green translucent enamel over the whole of the *inner* surface. The outside is covered with an effective but somewhat summary decoration in gold and red lines, without further enamelling. The Sultan named in the laudatory inscription may be either Sultan Hassan or his father Nasir.

Another exceptional lamp now in the museum at Cairo is well illustrated in Schmoranz's great work (Pl. xi.). This is a smallish lamp of green cloudy glass; the whole of the body and neck, except a plain band at the top, is worked into shallow, wavy ribs. It bears no enamel, but on the surface there are traces of the gilding that formerly covered it: this lamp came from a mosque built in 1363. At South Kensington are two small lamps of colourless glass of somewhat abnormal form without decoration of any kind.

I must finally mention the charming little lamp from the Myers collection (now at South Kensington) which, it is stated, was found in a Christian monastery in Syria (Plate XXIV. 1). The thin clear glass, with pearly patina, the graceful, vase-like form, and, above all, the sparingly applied but quite exceptional decoration, in which the human figure finds a place, distinguish this lamp from

the ordinary Cairene type. In this case the treatment of the figures, which, as I have said, are never found on true mosque lamps, closely resembles that on the inlaid metal-ware made at Mosul in the thirteenth century.[1]

And this carries us back to the question of the origin of this enamelled glass, and we are brought face to face with quite a number of interesting problems which can only be indicated here. That the application of enamels to glass by the Saracens was prior to the use of similar materials on porcelain by the Chinese, I have already mentioned. It is, indeed, not impossible that this method of decoration may have been suggested to the Chinese potters by specimens of the Saracenic glass which, as we now know, found their way to China at an early date. The use of enamels of very similar constitution on metals had, however, been known in certain parts of Europe since the first century of our era if not earlier, and the cloisonné enamels of the Byzantines had long been famous. In this connection, too, we must not forget the *vitrum plumbeum* with which the Syrian Jews manufactured artificial gems. It is to materials of this kind, true lead-fluxed enamels, that we must look for the origin of the decoration on Saracenic glass, rather than to the paint-like colours occasionally used by the Romans and Byzantines.

We may safely associate the apparently sudden appearance of this richly decorated enamelled glass with the change that came over the other arts of the Saracens about this time, and Dr. Lane-Poole is probably right in connecting this change with the rise of the Kurdish and Tartar families who played so important a part in the history of the twelfth and thirteenth centuries (*Art of the Saracens*, p. 127 *seq.*). Nur-ed-din, who ruled at

[1] The only other lamp, as far as I know, that has been obtained from Syria, is one from Damascus, presented to the British Museum by the late Sir A. W. Franks. This in no way differs from the ordinary type except in the enamelled decoration at the base of the handles. A lamp of quite normal description at South Kensington has also been attributed, but very doubtfully, to the same Syrian town.

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fact, a version of our 'spear-butt' or cup-lamp suitable for fitting into a wooden or metal frame. Barbaro urges the senate to see to the execution at Murano, with the greatest care, of as many as nine hundred pieces after these designs, for the demand came from no less a person than the Grand Vizier himself. There is no reference, in the order for these lamps, to any enamelling: those that are not plain (*schietti*) are to be decorated in the Venetian way (*a reticelli*).[1]

The old form was, however, kept up in those beautiful mosque lamps of fayence, Rhodian or Damascan in style, of which we have a few rare examples in our museums; these, I think, were made in the days of Turkish rule, in the sixteenth and seventeenth centuries.

I shall return in a subsequent chapter to the later glass of the Mohammedans—that of Persia and of India—glass that was for the most part influenced by Venetian models, in part even made by Venetian workmen: it would be hardly possible to treat of this glass before we have said something of its European prototype. We know practically nothing of any mediæval Saracenic glass other than the enamelled ware of Syria and Egypt. The little bowl of amber-yellow glass in the British Museum, enamelled with the figure of an angel, was considered by Franks to be Persian ware of the fifteenth century (Plate XXVII. 1). With it we may compare the already mentioned sphere from a lamp-chain in the same collection which is of very similar glass. The decoration of the first object is distinctly Persian, but its origin may be sought, perhaps, in the Tabriz district or even further north in Georgia, rather than in the more southern and eastern districts where, under Venetian influence, a glass industry sprang up in later days.

A few fragments of glass have been brought from

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excavations made on the site of the old city of Rhé, or Rhages, which was destroyed by Hulaku Khan in 1250. But there is little to be found among these that has any bearing upon the interesting question of a mediæval Persian glass industry, nor do I think that the evidence of so early a date for all these fragments is by any means conclusive. In the rubbish-heaps of Fostat or Old Cairo, which, like those of Rhé, have yielded so many interesting potsherds that throw light on the early history of pottery, many pieces of glass have been found, among them some fragments of bracelets. These are of two types, in one case of the primitive Hebron character, in the other built up of twisted rods of *reticelli* glass,—these last may undoubtedly be referred to Venice. For the rest, these Fostat fragments point to a local manufacture of somewhat rough glass of brilliant hues, but the enamelled glass of which we have treated in this chapter is, as far as I have had opportunity of judging, conspicuous by its absence.

CHAPTER XI

THE GLASS OF VENICE—THE ORIGINS—BEADS

BEFORE taking up the subject of Venetian glass, it will be well to say something of another early Italian centre of the industry. It is only of recent years that the important part played in the sixteenth century by the glass-workers from L'Altare, in spreading the new methods through France and the low countries, has been made manifest.

L'ALTARE is a little Ligurian town, situated a few miles to the north of Savona. It belonged in the Middle Ages to the Marquis of Montferrat, and the relation of that family both with France and with the East should not be forgotten in this connection. According to the local tradition, the glass industry was established as far back as the eleventh century by a body of immigrants from Normandy, and a French origin has been found for the names of the families employed in the glass-works.[1] At a later date, probably in the fourteenth century, other workmen came from Murano, so that when by the end of the fifteenth century the skilled glass-workers of L'Altare began to seek employment in foreign countries, they became the principal agency by which the newer methods of the Venetians were introduced into Northern Europe. These Altarists must indeed have been a thorn in the side of their Muranese

[1] We should have looked rather for some trace of Oriental influence. Freeman (*Historical Geography*, p. 240) speaks of the marquisate as 'a feudal state, whose rulers had in various ways a singular connection with the East. As Marquesses of Montferrat they claimed the crown of Jerusalem and had worn the crown of Thessalonica.' Again, early in the fourteenth century the marquisate passed to a branch of the imperial house of Palæologus.

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information if the attempt be made to trace the early history of the glass industry of that city, and these archives have been explored by a succession of native inquirers.[1]

For the earlier periods the negative evidence is of some importance. There is no reference of any kind to the manufacture of glass before the thirteenth century,[2] although by this time a great part of the interior of St. Mark's had been covered with mosaics. Like the enamels of the Pala D'Oro, we may probably look upon the earlier Venetian mosaics as of Byzantine origin. After the capture of Constantinople in 1204, the Venetians obtained a firmer grip upon the trade of the Eastern Mediterranean. Their factories had long been established on the coast of Syria. 'When Sidon fell,' says Mr. Horatio F. Brown, 'the Venetians received from Baldwin, King of Jerusalem, in return for their assistance, a market-place, a district, and a church. This was in fact the nucleus of a colony living under special treaty capitulations' (*Cambridge Renaissance*, vol. i.). This happened early in the twelfth century. I shall have something to say later on concerning the relations of the Venetians with the Latin principalities of Northern Syria towards the end of the next century, when the republic engaged to pay the '*dhime*' for the broken glass that they exported. It was during this period, and under such influences, that the manufacture of glass was established in the republic.[3]

[1] The results are perhaps best summed up in the memoir contributed in 1872 by Cecchetti to the *Reale Instituto Veneto*. See also the *Monographia della Vetraria Veneziana*, the combined work of Zanetti, Cecchetti, and others, drawn up upon the occasion of the Viennese Exhibition of 1873. Vicenzo Zanetti, in his account of the *Museo Civico* at Murano, gives a list of more than three hundred works (including manuscripts, drawings, and pamphlets) treating upon Venetian glass.

[2] A possible exception has been found in a document of the year 1090, in which a certain citizen adds the word *fiolarius* to his name. This word, which in the Venetian tongue generally takes the form *friolaro*, is of some importance to us. In Dante the word *fiala* is used for a wine-bottle: '*il vin della sua fiala*,' Par. x. 88.

[3] As early as 1175 it is mentioned that the Venetians had certain privileges in the *Daciones de Vitro* at Tyre.

Early in the thirteenth century there is evidence of the existence of a guild of glass-blowers. In 1224, twenty-nine members of the *Ars Friolaria* were fined for breaking the rules of the trade. In 1268, the chronicler Martius da Cavale tells us, the *maestri vitrai Muranesi*, on the accession of the Doge Lorenzo Tiepolo, bore in procession '*ricche girlande di perle . . . e guastade ed oricanni ed altrettali vetrami gentili*': water-bottles and scent-flasks and other such graceful objects of glass.

In 1279 we hear of German pedlars at Venice—*Todeschi qui portant vitra ad dorsum*—but each man was only permitted to carry off ten lire worth of glass at a time.

Meantime, as in other mediæval towns, the question of allowing dangerous trades to be carried on within the city bounds became a pressing one at Venice. The newly constituted *Maggior Consiglio*—it was soon after the famous *firmata*—issued a decree '*quod fornaces de vitro in quibus laborantur laboraria vitrea*' should be all destroyed within the state and see of the Rivo Alto. But this apparently was found to be too extreme a measure, for in the next year the decree was modified so as to allow of the manufacture of small objects (*Verixelli*—the French *verroterie*) in little furnaces (*fornelli*) under certain conditions, and this modified regulation remained in force until the eighteenth century. The privileged position of Murano, which lay outside the see of Venice, was thus firmly established.

About this time, too, we hear of furnaces worked by expatriated Venetians at Treviso, Ferrara, Padua, and Bologna, where factories had been already established, sometimes under treaty with Venice. It will be remembered that as yet the republic had no territory on the mainland of Italy.

There have been some differences of opinion as to what kind of glass was produced at this time in Venice—in the thirteenth and fourteenth centuries, I mean.

Without prejudging the question as to whether anything in the nature of enamelled glass was yet known, we have evidence for the following statements:—that the preparation of various descriptions of beads constituted at that time, as indeed it has ever since, the main staple of the industry; that in the second place, the blowing of hollow ware for general use already gave occupation to a separate guild of workmen; and that finally the members of both these guilds, together with the makers of the *rui*—the little panes of thick green glass (similar to our 'bull's eyes') still to be seen in the windows of many old palaces in Venice—were devoting themselves to perfecting certain new discoveries. These related above all to the manufacture of mirrors of glass, backed with lead, of which I have already said something. Again, the making of lenses, the *oglarii di vitro* or *lapides ad legendum*, now became a distinct industry. It was at this time (for instance in the year 1300) that we find the *Cristallai di Cristallo di Rocca* complaining of the competition of the glass-makers. These carvers and polishers of rock crystal were already established as an important guild in Venice; they looked upon the glass-workers as intruders. On the other hand, the efforts of the latter to imitate the nobler material had no doubt an important bearing on the development of Venetian glass, for it was as a consequence of their success in making an absolutely white transparent 'metal' that the Venetian glass-makers first acquired a European fame. It was this *cristallo di Venezia* that revolutionised at a later time the glass of Europe. At an early date, in spite of edicts forbidding its sale to the *Todeschi*, the unworked material, *en masse*, found its way into Germany, there to be worked up after remelting. Already in the fourteenth century the water-power of Alpine streams had been applied to the grinding and polishing of glass, as, for example, at Cortina d'Ampezzo in the Italian Tyrol. The glass-makers at the same time, or a little later, came into competition with the carvers of jasper

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VENETIAN GLASS. THE ALDREVANDINI BEAKER

CIRCA 1300, A.D.

and agate, which, among, they imitated by means of ingenious combinations of coloured glass (*millefiori*).

So far there is no evidence that the newly developed art of enamelling on glass had passed from the Syrian coast to the Lagoons. The Venetian glass-makers were still working on other lines, and with other aims. In view, however, of the close commercial intercourse of the Venetians with the coast cities of Syria,[1] we may well imagine that some attempts were made to imitate the brilliant enamels of the East. But the successful handling of these colours was not a matter to be easily learnt. There were as yet no handbooks to teach the composition of the coloured fluxes, to say nothing of the various devices and 'wrinkles' to be mastered before the enamels could be successfully applied to the surface of the glass. In the Aldrevandini beaker in the British Museum we may perhaps see an attempt to overcome these difficulties. The 'metal' itself is here quite of a Venetian type, thin and absolutely white, although disfigured by the black specks so characteristic of early Venetian glass. There is no trace of Oriental influence in the decoration; the three heater-shaped shields have charges—boys, antlers, and fesses—that have been traced back to certain Swabian towns, but the inscription in Gothic letters—✠ MAGISTER ALDREVANDIN ME FECI—points to a Venetian origin. On the ground of the heraldry and of the inscription, a date of about the year 1300 may be ascribed to this goblet. The enamels, it should be noted, are of the poorest description; all the well-known Saracenic colours are imitated, it is true, but with a striking want of success.

Compare with this goblet the cup from the Hope collection that stands near it in the Glass Room. The glass is thicker than in the last example, it is of a slightly greenish tint, and contains a few elongated bubbles. The

[1] Ayas, Tripoli, Tyre, and Acre constituted under Frankish rule during the greater part of the thirteenth century. Acre, the last to fall, was taken by the Saracens in 1291.

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decoration is in its way masterly: on either side of a throne on which is seated the Virgin with the Child in her lap, stands an angel holding a tall candle; beyond are the figures of St. Peter and St. Paul. As to the style of the decoration, it is to my mind distinctly Western; the figures might be taken from a French missal of the thirteenth century. The *Arte Francisca* was no doubt coming into favour in Venice at this time, but even in the fourteenth century it was regarded as something exotic, and I doubt if it was as yet practised by Venetian craftsmen who, in the minor arts, long adhered to Byzantine models. When we come to examine the technique of the enamels, we are at once struck with their resemblance to those on the Saracenic glass of the period. We have here the work of one who was master of his craft; above all, the quality of the blue enamel should be noted and compared with that on the Aldrevandini goblet.

I think, then, that both the glass and enamel of this cup are the work of Syrian craftsmen, possibly working at Venice, but more probably at the court of one of the Frankish princes who held fiefs in Syria during the thirteenth century,—at that of Bohemond VI. possibly, prince of Antioch and Count of Tripoli, or of his son Bohemond VII., who celebrated his marriage with a noble lady from Champagne only a few years before his expulsion by the Saracens. It was in 1277, under the rule of the former, that the treaty was drawn up that contains the often-quoted—and misquoted—words, '*Et si Venitien trait verre brizé de la vile, il est tenuz de payer le dhime.*' What is more likely than that such a goblet may have been made by some Jewish or perhaps Christian glass-worker for a nobleman of this thoroughly French court?[1]

Such an origin may help to account for the fact,

[1] My point is that in this beautiful cup the scheme of decoration is essentially French, while the technique of both glass and enamels points to a Saracenic place of origin.

otherwise somewhat difficult to explain, that this goblet is a unique example of its class. If the Venetians of the thirteenth and fourteenth centuries were complete masters of the art of enamel, how comes it that no other example of the art at all comparable in excellence to this glass has come down to us? No one, I think, now believes in the Venetian origin of the *hanap de voirre en façon de Damas*, of the glass vessels *de l'ouvrage de Damas*, or *peintes à la morisque* mentioned in the inventories of the French princes of the fourteenth century. These were evidently decorated in an Oriental style. We must also remember that before the end of the thirteenth century the Christian rulers were finally driven out of Syria; there was therefore only a brief period during which such a goblet decorated with Christian motives could have been made in the East.

When some century and a half later the Venetians began freely to decorate their glass with enamels, we note an entire change both in the colours and in the nature of the fluxes used. To this point I shall return later on, but I may call attention here to the almost total absence of Oriental influence in the designs found on the Venetian enamelled glass of the fifteenth century. This is the more remarkable when we remember that at this time as regards other arts—their inlaid metal-ware and the stamped leather of their bookbindings, to give but two instances—not only is this influence strong, but we know that Oriental craftsmen were at work at Venice. I think that one simple explanation may be given of this apparent anomaly, namely, that by the time the Italians took to the practice of enamelling their glass, that art was practically extinct in the East.

It was during the course of the fourteenth century apparently that the glass-workers organised themselves into separate guilds or *arti*, governed by the rules set out on the *Matricola* or *Mariegola*. It is from these *matricole* that the little we know of the Venetian glass of

this time is derived.[1] The glass-workers now obtained many important privileges, and the town of Murano was granted a considerable measure of self-government; but it was not till the year 1445 that these rights were fully established. Each *arte* was governed by an elected *guastoldo*, assisted by three superintendents, to whom it fell among other duties to bring the petitions and complaints of the glass-workers before the Great and the Lesser Council at Venice. Not the least important duty of the *guastoldo* and his lieutenants or *compagni* was the periodical selection of the proof-pieces—the *prove*—to be made by the apprentices of the various *arti* before they could claim rank as masters. These tasks were inscribed in the *Mariegole*, and from them Signor Cecchetti, in his often-quoted paper, has extracted many examples. To give an instance: the *Maestri di Rulli* (*Rui*, small window-panes) had among other things to make '*due occhi di bo*,' an early instance of the term 'bull's eyes.' But the technical terms employed in most cases render the interpretation very difficult. Some of the strange-shaped vases in our collections may not improbably be examples of such proof-pieces.

After this time the working year—the period during which the furnaces were kept constantly alight—was confined to nine months; this was afterwards prolonged to forty-four weeks. There was, however, plenty of work to do during the summer vacation, which ended on October 1, for the furnaces had now to be repaired if not rebuilt.

The number of separate *arti* or guilds appears to have varied, and it was not till the fifteenth century perhaps that the divisions that were maintained until the last days of the republic were finally established. But at an early date the *fialai* and *cristallai* were separated from the *specchiai* or mirror-makers on the one hand, and on the other from the *perlai*—the bead-makers, more especially the makers of the 'canes' and pastes for

[1] They have been analysed by Cecchetti in the paper quoted above.

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apt expressions with which to indicate specialities of manufacture, varieties of shape or shades of colour, recourse must continually be had, however unwillingly on the part of the writer, to the French language. But in one case, at least, we have our revenge. We possess in the word 'bead'[1] a convenient term, of which the exact equivalent, strangely enough, exists in no other language. Nothing can be more inconvenient and more likely to lead to misconception than the use of the word 'pearl,' or 'false pearl,' in this general sense, and yet no term more definite has been found in either the French or the German language. In Italian the use of the term *conterie* is confined to certain classes of beads. The only fault, from our point of view, to be found with our English word is that it may be applied to objects made of other materials than glass. A term of very similar origin—'paternosters'—was formerly employed for a certain class of large beads in France and Italy, but the use of it has never become general.

We have seen that towards the end of the thirteenth century the *cristallai di cristallo di rocca* fell foul of the glass-workers of Murano, and induced the authorities to forbid the imitation of their work in the inferior material. Not the least important of the productions of these workers in rock crystal and other hard stones were the beads for use in the rosaries (to use a word of later introduction)—the *paternostri.*

We know, too, that some such prohibition as that referred to was revoked in 1510; and the ground for this change of policy is found in the fact that for some time the Germans had been in the habit of carrying to their own country the 'canes'[2] of glass, which they there cut and polished to form *paternostri.* These beads,

[1] The term 'bead' was early transferred from the 'bid' or prayer to the small spherical bodies strung on a cord by which these prayers were counted, and before the end of the fourteenth century the word was already used in a secular sense also.

[2] These *canne* are described as '*de vero* [*vetro*] *commun, Christallini et colorade de diversi sorti.*'

re-imported into Venice, found their way ultimately to all parts of the world.

The Venetians, we must remember, at an early date, long before they had acquired territory on the mainland, had established factories at Treviso, at Belluno, and along the upper course of the river Piave. It is probable that advantage was taken of the abundant water-power to establish in these towns mills for the grinding and cutting of their glass. This industry, forbidden for a time at Murano, may have been carried on in a more or less clandestine manner.[1] It was through this country, too, that the German traders passed, and a link between the trans-Alpine and the Italian glass industries was thus early formed.

The starting-point in the manufacture of beads is a rod or cane of glass: according as this cane is hollow or solid, the manufacture is carried on by radically distinct methods.

In the case of the hollow cane or tube, we start from a 'gathering' at the end of the blowing-iron; this gathering is slightly inflated to form an incipient *paraison*, and a rod of iron is attached to the further extremity. This rod is seized by a boy—the *tirador*—who runs with it at full speed so as to elongate the glass as much as possible before it has time to cool; the thin tube, or *canna*, thus formed may, it is said, be as much as 150 feet in length. This tube, broken into rods of convenient lengths, then passes into the hands of another set of workmen, living for the most part in Venice. The rods are now carefully sorted, as to size, by women—the *cernatrici*—and handed over to the cutter, who, seated at a bench, cuts off equal lengths by passing the rod between a blade or chisel held in the hand, and a similar tool fixed in the bench, the size of the fragments being regulated by means of the *scontro*, a semi-cylindrical block of steel. If the object was to manufacture the little cylindrical

[1] Note in this connection the recent discovery of 'chevron' beads at Treviso, referred to below.

bugles or *jais*, the bead—if so it may be called—is now completed. But in the case of a normal bead, the edges had now to be rounded. With this object the aperture of the little tubes had first to be filled with some infusible substance; this was done by rolling them in the hand with a finely ground mixture of lime and charcoal. They were now placed along with a quantity of sand in a tubular iron receptacle, which was rotated over the furnace.[1] By this means the angular edges were rounded off. The beads were then sifted from the sand and shaken up in a bag to remove the material with which the tubes had been plugged; finally they were sorted into various sizes by means of a sieve, and, in the case of spherical beads, those of irregular shape were eliminated by rolling them on an inclined table. It only remained for the *lustratori* to give them a final polish by shaking them up in a sack with bran.

This was the process adopted for the smaller beads—the *conterie*—which, before packing, were threaded on a string by girls. The larger *perle*, such as the *perle a rosette*, or chevron beads, of which I shall speak presently, had to be ground into shape on the wheel. Any ornament or design that appears on these beads depended of course upon the constitution of the original *canna*. This was often built up of a succession of layers of various colours, obtained by dipping the first gathering into one or more pots of coloured glass, before drawing it out to form a tube.

Beads made by this process belong strictly to the class of *blown* glass. The other system which we will now describe takes us back to the old primitive methods of glass-working. In this case we start from a *solid* rod of glass, which is manipulated in the hand of the workman somewhat like a stick of sealing-wax. Seated at a

[1] Something like the apparatus used for roasting coffee, it would seem. I do not attempt to give any explanation of the two rival processes—*a spiedo* (on a broach or spit) and *a ferracia*. That attempted by Mr. Nesbitt (*South Kensington Glass*, p. civ.) is not satisfactory.

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one type, generally of commanding size, which may perhaps claim some attention. I refer to the great Chevron Beads, the *Perle a rosette* of the Italians, *à propos* of the origin and date of which a not insignificant literature has accumulated. I treat of them here, as in by far the larger number of instances, if not in all cases, these beads can be undoubtedly recognised as of Venetian manufacture. These chevron beads have been made from canes built up of concentric layers of coloured glass. They have attracted exceptional attention from the fact that examples have been found in so many widely separated parts of the world, and from their possessing, in some cases, apparently well founded claims to great age. The arrangement and the succession of the colours in the glass is in every case practically identical. The canes from which they were formed have been built up of three main concentric layers, externally a deep cobalt blue, then an opaque brick red, and in the centre a tube of pale green transparent glass; these main layers are divided by thinner ones of opaque white glass, and the dividing surfaces have been worked into a series of chevrons or zig-zags (these chevrons are in all cases, I think, twelve in number) so as to present a star-like pattern on a cross section. The only variations on this general type are as follows: the chevrons are, in a few cases, dragged laterally so as to resemble the teeth of a circular saw; the central tube of transparent glass is sometimes divided by a zig-zag layer of opaque white; and, very rarely, the external layer is green instead of blue. In shape and size, however, these chevron beads show wide divergences: in length they may vary from two and a half inches to as little as a third of an inch, and the diameter, though generally less, is in a few cases greater, than the length. The extremities in some of the larger and presumably older specimens are facetted, that is to say, ground down to a pyramidal form. What, however, we may call the normal type, is of a cylindrical shape with rounded ends (Plate xv. 2).

These *perle a rosette* are at the present day made at Murano for the African market. When in the spring of 1903 I visited the glass-works of the 'Venice and Murano Company,' I was shown by Signor Andrea Rioda specimens both of these beads and of the canes from which they are prepared; the company was at that time executing a large order from a French firm, for the Congo. This work, however, is not generally undertaken by the firms that make the ordinary *conterie*, for these large beads have to be separately ground and polished on a wheel—an important point, as we shall see. They have been made at Murano, the local tradition affirms, from time without memory.

Quite recently, in the immediate neighbourhood of Treviso, a deposit of these chevron beads has been discovered in a bank beside an open field; 'bushel loads' of fragments were extracted, but not a single perfect bead. They were without exception broken fragments, not improbably 'wasters,' thrown aside possibly by those who were employed in grinding them. Treviso, I may note, is a town of mills and swift-flowing streams—in fact, the nearest point to Venice where abundant water-power could be found. Unfortunately no light so far has been thrown upon the age of this curious deposit.[1]

In general aspect, in the scheme of colour especially, there is something unmistakably African about these chevron beads. To say nothing of their exceptional size, they have little in common with any other type of polychrome bead, whether Egyptian, classical, or from Teutonic graves.

I may at once say that I consider these *perle a rosette* as essentially of Venetian origin, and made, above all, for the African market. How the industry arose, and

[1] Now preserved in the local museum at Treviso, where I lately had an opportunity of examining them. Nothing was found with them except a few small rods of coloured glass. It has been suggested that this was a contraband store, at some time destroyed by fire; but the fragments are in no case fused together. This parti-coloured glass, we may note, would be of little value for 'cullet,' and defective beads would therefore be thrown away.

whether the Venetians in this instance as in other cases took the place of earlier Byzantine or Syrian glass-workers, there is nothing to show. We know that the Alexandrians of Greek and Roman times, like the Phœnicians before them, traded with the native races of Central Africa. These beads have certainly been found in Egypt,[1] especially in Upper Egypt and Nubia; it is even said that some of the Soudanese tribes have succeeded in making passable imitations of them.

It must be remembered that the Venetians, at least in later times, did not trade directly with inland and barbarous races. Their business was to deliver their merchandise at certain seaport towns where they had factories or agencies. The goods then fell into the hands of local merchants who distributed them by caravans or sent them on coastways in their ships. So the Arab traders of Egypt, reshipping the Venetian wares at Suez or other ports of the Red Sea, would carry them in their dhows to Zanzibar or India; and so again in later days the merchants of Amsterdam and London, who held at times vast stores of Venetian beads, distributed them in Dutch or English ships to the very extremities of the world. The trade in beads was very active in the seventeenth and eighteenth centuries. At the present day, in the warehouses of Bevis Marks and Houndsditch, there is probably accumulated a larger stock of beads than in Venice itself.

So far we are on firm ground, nor is there anything surprising when we are told that the large chevron beads have been found in Central Africa,[2] in the South Sea Islands, and even in Canada and the United States. But when we hear of examples being taken from Red Indian grave-mounds and even from ancient Peruvian tombs, we feel some need of hesitation before accepting the state-

[1] A fine specimen has found its way into the collection of Egyptian antiquities in the British Museum.

[2] The term 'Aggri' should, perhaps, be reserved for large beads, of which the colours extend right through the mass, but the term is not very definitely used in the African trade.

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CHAPTER XII

THE ENAMELLED VENETIAN GLASS OF THE FIFTEENTH CENTURY

IN the fourteenth century, as we have seen, the Venetian galleys brought glass ware to the ports of England and the Netherlands. M. de Laborde (*Les Ducs de Bourgogne*) found in the archives of Lille an order for payment, signed by Duke Philip of Burgundy, '*pour seze voirres et une escuelle de voirre, des voirriers que les galées de Venise ont avan apportez en nostre pays de Flandres—quatre franc.*' This is dated from Paris, 1394. Even after making every allowance for the larger purchasing power of money in those days, the seventeen vessels of glass bought by a royal prince for four francs cannot have been of exceptional quality. Again, in the year 1399, Richard II., shortly before his deposition, granted permission to certain traders to sell, on the decks of the Venetian galleys lately arrived in the port of London, their cargo of small glass vessels and earthenware plates (*Calendar of State Papers—Venetian*, 1899-1900). Here again there is nothing to suggest any high artistic value in the glass offered for sale.

As we have seen, with the possible exception of two goblets in the British Museum, there does not exist a single example of glass of an earlier date than the fifteenth century, which can definitely claim to be of Venetian origin.

The *quattro-cento* glass of Venice,[1] for the most

[1] Some of this enamelled glass no doubt dates from the early years of the next century. On the other hand, some of the thin white glass of capricious forms described in the next chapter may have been made before the year 1500.

part decorated with enamel and gilding, may be conveniently arranged in accordance with the nature of the enamels that cover it.

I will take first a class in which the enamel plays but a subordinate part. The clear white glass, somewhat thick and heavy compared with later examples, is often ornamented with *appliqué* bosses of coloured glass; such glass is sparingly decorated with opaque enamels, and this decoration takes the form of little beads or studs, at times combined with an imbricated pattern in gold. We sometimes meet with large bowls on low feet (a form of *drageoir* or sweetmeat dish) which are so decorated. There is, however, no finer example of this style of ornament than the standing beaker with cover in the British Museum (Slade, 362). The general outline and the obliquely curved gadroons of this magnificent cup were no doubt suggested by some piece of late Gothic silver-plate. On the flat-headed knob that surmounts the cover are the half obliterated remains of a coat of arms, but otherwise the enamelling is confined to some sparely applied studding and filleting. There is a covered goblet of the same class in the Waddesdon collection remarkable for an inscription in some South-Slavonic dialect, scratched with a diamond on the foot. The blue and purple bosses round the body of these beakers partake somewhat of the nature of prunts.

Another class of fifteenth-century enamelled glass calls to mind in the manner of its decoration the contemporary enamelled copper ware of Venice (*émaux peints*). Indeed, in some examples where the enamel is spread over the whole field and subsequently decorated with other colours, there is little to indicate that such a vessel has a basis of glass rather than of metal. This is the case with the beautiful goblet covered with pale turquoise blue enamel in the Waddesdon Room

Apart from the generally vague ground of shape and style of decoration, there is no means of fixing the date of Venetian glass, so that in the absence of costumed figures or of coats of arms we are often very much in the dark on this point.

in the British Museum. The decoration is given by an elaborate imbrication of white, red, and gold; the well-drawn male and female figures, in lozenge-shaped medallions, closely resemble certain woodcuts in Venetian books of the fifteenth century. If, as is probable, this cup is not much later in date than the year 1450, we have in it one of the earliest examples in glass of the complete goblet or wine-glass form, with bowl, stem, and foot.[1] The outline of the bowl should be noticed: the double curve, *tending somewhat inwards* at the top, is characteristic of these *quattro-cento* glasses; here again the form is doubtless derived from silver-plate.

These opaque solid enamels are, however, more frequently applied here and there upon a basis of transparent coloured glass. For the ground a deep cobalt blue was most in favour, but a rich leafy green and other colours also occur at times. The opaque enamels are laid on thickly in masses; upon these again details are painted by further touches of colour.

Perhaps the most famous example of this class is the *Coppa Nuziale* in the Museo Civico at Venice (Plate XXIX.). This cup, in outline somewhat like a Greek *crater*, with simple massive foot and stem, is of deep blue glass; it is some eight or nine inches in height. On one side we have a procession of knights and ladies on horseback; on the other side the company are seen bathing in an open fountain. Between are medallions with male and female heads—presumably the bride and bridegroom. The costume would point rather to the first than to the second half of the fifteenth century. There is not much prominent colour apart from the green of the grass and the trees; the horses and the flesh-tints are rendered by white enamels, and gilding, of course, is freely used; here and there we see a little pale blue enamel. This *coppa* is traditionally assigned to Angelo Berovieri, the greatest name among the Venetian glass-workers of the

[1] I have seen, however, in a fourteenth-century manuscript, glasses with well developed stems carefully depicted.

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MARRIAGE CUP BY BEROVIERI

VENETIAN, FIFTEENTH CENTURY

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green ground, there is no finer example than the standing cup from the Debruge and Soltykoff collections (Slade, 361). This, too, is without doubt a *Coppa Nuziale*, and in the heads in the two medallions we may again recognise the bride and bridegroom. On a scroll by the latter head we read, AMOR VOL FEE—'Love needs faith.' The quaint head-dress of the woman calls to mind certain figures in Carpaccio's pictures of contemporary Venetian life.

In the enamelled cups of this class the technical imperfections of the deep-coloured glass ground should be noticed. This is seen above all in the irregular outline of the margin. We have here a class of imperfection of quite a different nature from the tendency to collapse so often seen in large pieces of Saracenic glass. In the case of the Venetian glass the unevenness appears to arise from the imperfect fluidity of the metal when in the hands of the blower.

The date of this enamelled glass is fairly well fixed by the style in which the figure subjects are treated. The processions—the *trionfi*—are but rudely executed reproductions of those found on fifteenth-century marriage coffers, the heads in the medallions we meet with again on the contemporary mezza-majolica. Both may be seen in the woodcuts of the earliest printed books. We find the source of the gadroons and imbricated patterns in the *repoussé* forms given by the Venetians to their enamelled copper-ware.

There is somewhat more difficulty in determining the date of another class of Venetian enamelled glass. I refer to that on which the opaque enamels are painted with a brush upon a ground of thin colourless glass. In this decoration, especially in the conventional foliage, the drag of the brush loaded with the thin, somewhat intractable pigment, may often be clearly traced. There are some early examples of these 'painted' enamels which we may regard as the prototypes of a style of decoration on glass which soon obtained almost a

monopoly among enamelled wares. We see the same technique and the same opaque colours on the French glass of the sixteenth century, and the faults are exaggerated and the palette even heavier in the case of the German glass of a still later time. We must seek the origin of this school in the Italian painters on majolica; on the other hand, in the eighteenth century the methods of the enamellers on glass no doubt influenced the decorators of porcelain both in Germany and elsewhere.

And here I may say that certain important technical difficulties, that must always have hampered the use of true transparent enamels on glass, have scarcely received the attention that they deserve. I mean the relations of the enamels, as regards the softening-point and rate of contraction on cooling, to the ground on which they rest. The question here is very similar to that which presents itself in the case of porcelain. Our present problem is, however, somewhat simpler, for with the latter material we have not only to consider the relation of the enamels to the glaze on which they lie (this takes, indeed, the place of our glass ground), but in addition the relation of the glaze itself to the porcelain body beneath must not be neglected.

The first condition for the successful application of an enamel is that it should be more fusible than the glass to which it is applied; not only that, but at the temperature at which the enamel fuses, the glass must still maintain its rigidity, otherwise the vessel on coming from the enameller's stove will not preserve its original symmetry. It has been already suggested that the partial collapse so often observed in the large Cairene lamps may probably be explained in this way.

On the other hand, if the surface of the glass is not to some degree softened, there will be no intimate connection between it and the enamel, and the latter will be likely to scale off before long. This tendency will be increased if there is much difference in the rate or amount of contraction between the two materials. Diffi-

culties of this kind long hindered the employment of certain fluxes and colours—that of cobalt, for instance, combined with a transparent flux. Such obstacles may, however, be surmounted in a measure, and the process simplified by employing (in place of a transparent lead flux) an opaque white, stanniferous enamel merely stained, in cases only externally, by a little colouring material. This apparently was the plan universally adopted by the Venetians in the fifteenth century, and it is here that their experience of the use of a similar enamel on copper may have served them.

One cannot but marvel at the technical dexterity so early acquired, and, alas! so soon lost by the Saracens, in the application of enamels to glass. The means by which they avoided the use of a lead flux in the case of their famous translucent blue, is above all worthy of admiration (see above, Chapter x.).

Certain defects which we note in the glass to which the Venetians applied their thick enamels may have been inseparably bound up with the use of these same enamels, and the impossibility of overcoming these defects may have been one of the causes of their abandonment and of the general adoption in their place of the painted decoration—mere thin skins of colour—which they were now able to apply to their white *cristallo*, the typical glass of Venice. After the commencement of the sixteenth century, indeed, the use of the solid enamels was almost confined to beadings and subsidiary ornament sparingly applied.

To return after this long digression to our class of thinly painted enamels. We find that the use of these painted colours came in at quite an early date. I will take as typical examples a pair of goblets or wine-glasses in the British Museum, one from the Slade collection (No. 391), the other presented by the late Sir A. W. Franks. These are both conical cups of simple outline, of which the bowl passes directly into the spreading foot. The edge of this foot is turned over to form a sort of

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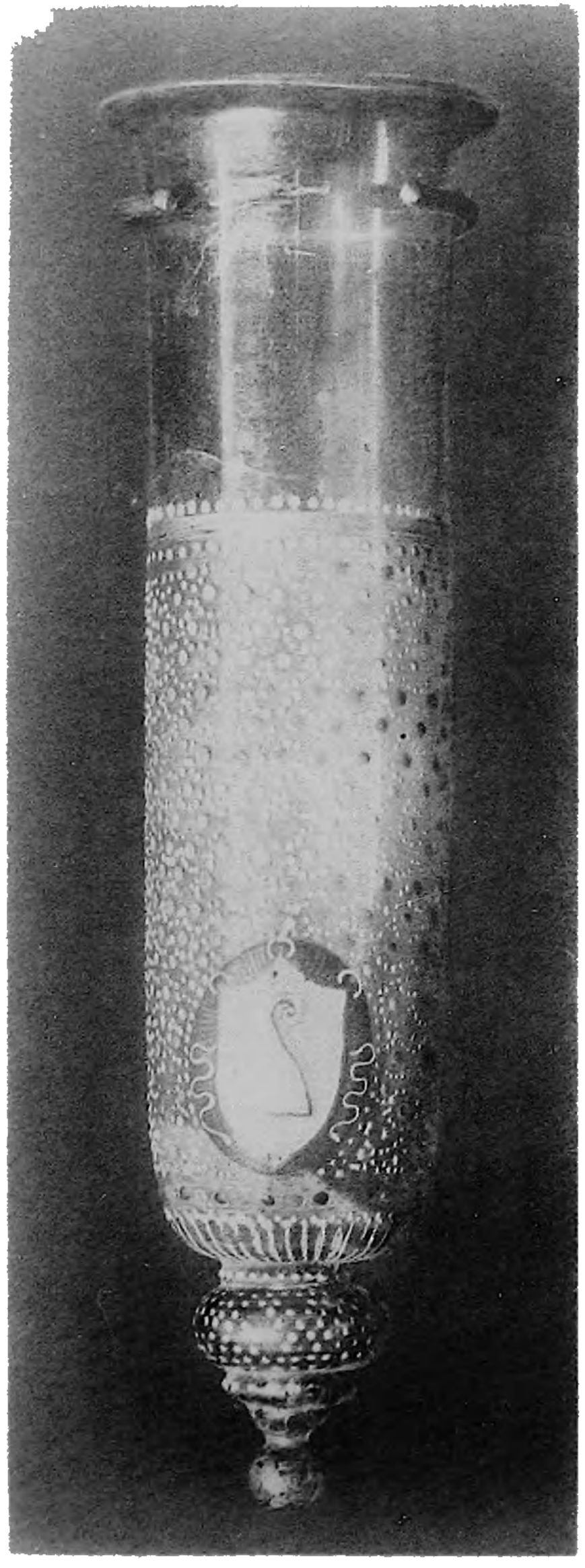

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ring on the upper margin. In fact, these goblets may be taken as representatives of one of the earliest types of that long series of wine-glasses that we shall come across again and again in later days. On the first of these cups we see two figures on horseback, one waving a banner and the other holding a flag; the costume points to the end of the fifteenth century. This is a detail of some importance, for as a rule the decoration of the ware of enamelled glass is confined to foliage, [illegible] conventionally treated figures of sirens or satyrs.

[illegible] in shape, and decorated in a similar [illegible] a Venetic goblet, or rather fragment of a goblet, [illegible] up in the Piazza of St. Mark at Venice during excavations for the foundations of the new Campanile. (Plate xxx. 2). This little glass, between four and five inches in height, is of a thinnish clear metal, decorated with scrolls of a somewhat Gothic character, indicated by lines of opaque white; the other enamels are green, an opaque red, a rich yellow, and a deep as well as a turquoise blue, the latter laid on thickly. This goblet may perhaps be referred to the middle of the fifteenth century.

A still finer example of these 'painted' enamels is to be found in a very beautiful ewer now in the Louvre. The colours are laid on with a brush as in the previous specimens, but as we often find in later examples—and this applies equally to the French and German enamelled glass—the opaque red is here replaced by a poor brown. Within a large medallion is seen a herald riding on a griffin; the ground is covered by scale patterns and scrolls of many colours.

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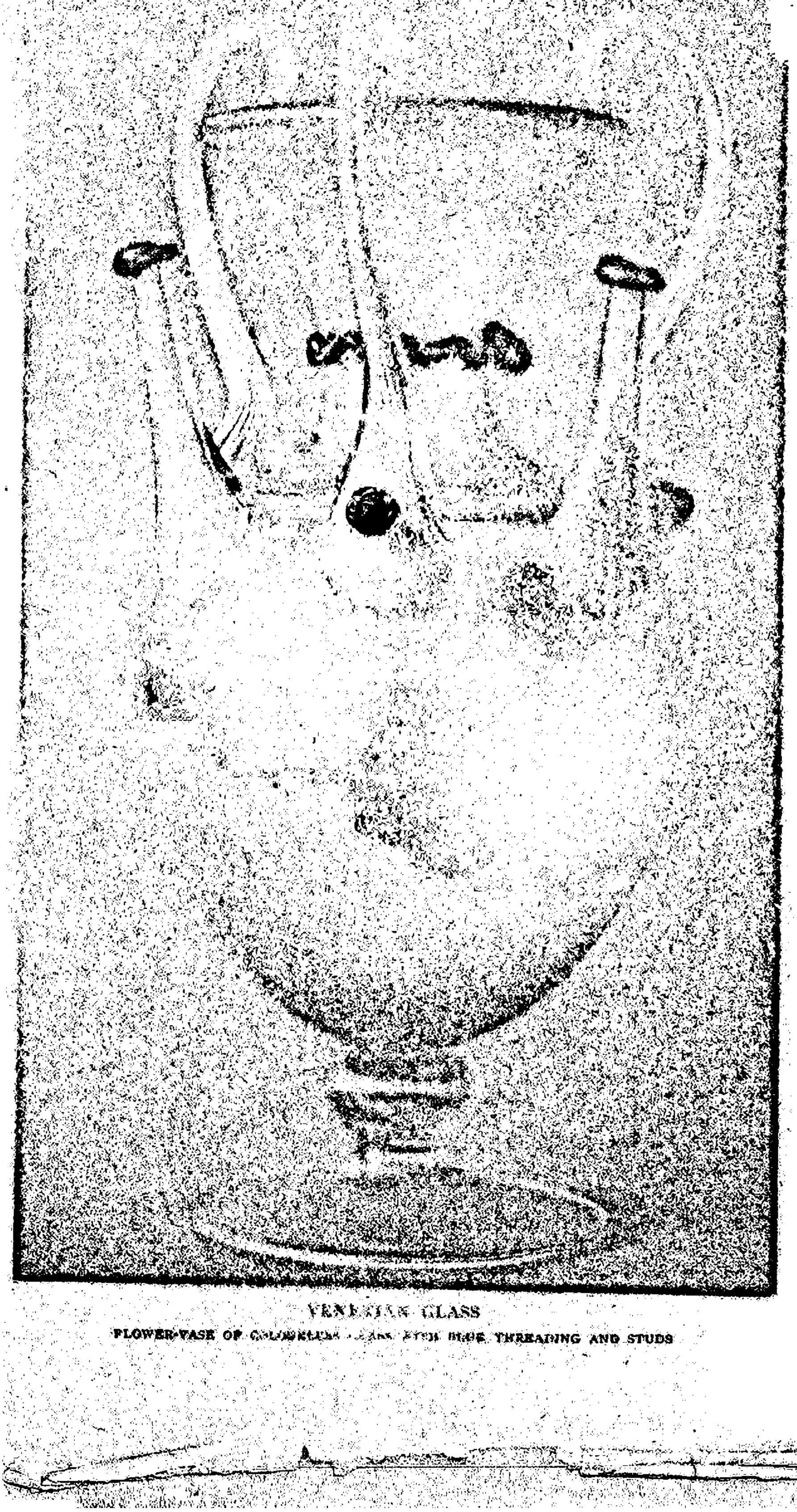
CHAPTER XIII

VARIETIES OF VENETIAN GLASS—EARLY LITERATURE

THE history of modern glass begins, as I have said, with the famous Venetian *cristallo* of the sixteenth century. Many other varieties were made at this time, but it was the absolutely colourless and transparent glass, capable of being blown to extreme thinness and then worked into every variety of form, that above all established the European reputation of the Murano glass-workers. Before long, in nearly every country of Western Europe, the old methods of working were falling into disuse; and by the aid of skilled workmen who were tempted away from Murano, or, failing that, were hired from the rival glass furnaces of L'Altare, the attempt was made to imitate this clear white glass of Venice.

We have, then, in this *cristallo* the typical glass of Venice, and here more than in any other group, whether of earlier or of later date, we find a family of glass of which the artistic merit depends directly upon the skill of the glass-blower, rather than on that of the enameller or engraver. In the simpler and earlier specimens, an undeniable charm is derived from the extreme tenuity of the material—there is an evanescent and almost ghostly air about the 'diaphanous, pellucid, dainty body'[1] of not a few of these glasses. Although entirely free from any positive colour, there is often a certain tendency to greyness in the metal, and this is increased to a misty cloudiness when the surface has been attacked by atmo-

[1] James Howell, *Epistolæ Ho-elianæ.*



VENETIAN GLASS

FLOWER-VASE OF COLOURLESS GLASS WITH BLUE THREADING AND STUDS

CHAPTER XIII

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spheric influence, as is not unfrequently the case with glasses that have been long exposed to our damp English climate.

There is little change or development to be observed in the glass of this character made at Murano during the sixteenth and seventeenth centuries, nor is it always safe to regard contorted shapes and elaborate decorations as necessarily a sign of a late origin. This caution is confirmed by an often quoted passage from Sabellico, the learned librarian of St. Mark's and historian of Venice; it is from a Latin work, *De Situ Venetæ Urbis*, written about 1495. We can form from it some idea of the wonderful variety of the outturn from the Murano glass-works at that time, and of the elaborate shapes that were already given to the vessels. When we pass, says Sabellico, from Venice to the suburb of Murano, we are struck by the grandeur and size of the buildings; it appears from afar as a city, extending for a mile in length. The island owes its chief renown to its glass-works. It was a famous discovery to make glass that should vie with crystal in clearness. Since then the nimble wit of the workmen and the never-resting care to find something new have led them to apply to the material a thousand various colours and shapes without number. Hence the *calices*, the flasks, the *canthari*, the ewers, the *candelabra*, the animals of every race, the horns, the beads (*segmenta*), the bracelets, etc. etc. So far Sabellico—the good man is, I am afraid, more concerned with his latinity than with the matter in hand: but this is a weakness that he shares with more than one writer of this time. He goes on to speak of the 'Murrhine vases' made at Murano, of which the only fault is their cheapness; all these marvels had the Venetian galleys brought before the eyes of the nations, so that, wondrous to say, by familiarity they had become as things base and common.

In the means adopted by the Venetians to adorn their *cristallo* we are at times taken back to Roman methods.

The handles, often of blue glass, and the stringings and frillings that surround the body are applied hastily but skilfully by the light hand of the workman. This kind of ornament reached its completest development in the tall beakers and vases with handles that took the form of wing-like excrescences. These 'winged beakers' were afterwards copied and the forms exaggerated in Germany and in the Netherlands, where they were held to be especially characteristic of the now fashionable glass of Venice.

It is certainly remarkable how little this Muranese glass as a whole reflects the glorious Venetian art of the *cinquecento*. Apart from some of the earlier enamelled and gilt examples and from the simpler forms of the pure thin *cristallo*, we can find among it little that is quite satisfactory from an artistic point of view. Much even of the sixteenth-century glass is merely fantastic, and appeals only to childish tastes. The bulk of it was probably made for foreign markets, for the dull northern barbarian, whose attention had to be caught by something new and extravagant.

Little heed is paid to this more elaborately decorated glass by the great contemporary painters. In fact, I can find no example of it in their works. When glass is introduced, it is invariably of the simplest description. In the big altar-pieces of Giovanni Bellini, of Cima, or of Carpaccio, the glass lamps that hang from the roof are in the form of little conical cups of plain outline. Amid all the elaborate *staffage* of Crivelli's pictures, the lily on the table or ledge beside the Virgin stands in a little cylindrical beaker of glass, for all the world like a modern tumbler.[1] So in the next century we may search in vain in the pictures of Titian or of Veronese for elaborate examples of Venetian glass. In the banquet scenes of the latter painter, the wine indeed is served from graceful decanters with tall necks and globular bodies, and is

[1] This vessel appears to be sometimes filled, not with water, but with moist sand or earth.

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VENETIAN GLASS

OPAQUE WHITE WITH GILT SCROLLS EARLY SIXTEENTH CENTURY

drunk from tazza-shaped goblets of glass,[1] but on the credenza or buffet at the side, the gold and silver plate is never relieved by examples of our material.

A curious account of a banquet given at Mantua, on the occasion of the marriage of the Marquis, is quoted by Mr. Nesbitt from a contemporary writer. There was, we are told, on this occasion such a display of '*diversi bicchieri, carrafe, e giarre ed altri bellissimi vasi di cristallo di Venezia, che credo vi fussero concorse tutte le botteghe di Murano!*' And there was need of this store, he adds, seeing that after they had drunk, the guests proceeded to break the glasses they held in their hands '*per segno di grande allegrezza.*'[2] We are reminded of the feast described by Joinville, though in that case the glasses were swept off the table by the well-aimed Bible of one of the guests (see p. 136).

I shall now have to pass in rapid review the principal varieties and applications of the glass made at Murano in the sixteenth and seventeenth centuries.

The Frosted or Crackle Glass is perhaps the simplest modification of the pure *cristallo*. To produce this, the *paraison* is plunged rapidly into cold water, and after reheating to the necessary degree, but not beyond, it is blown into the desired form. A similar effect is at times produced by rolling the molten *paraison* upon fragments of crushed glass. I have spoken in the introductory chapter of certain rare cases where a minute fissuring has been set up in the substance of the glass. This true crackle is probably in all cases the result of a subsequent structural change.

Lattimo, *Lattimo*, or *Lattimo* [illegible] by the Venetians to a milk-white opaque glass. [illegible]te

[1] In the Louvre, the nymph of Giorgione's 'Fête Champêtre' [illegible] ing of glass of graceful form over the well to the left, and in Titian's 'Supper at Emmaus' in the same gallery, the [illegible] lines that surround a decanter with its neck and handles, suggest a decoration with *lattimo*.

[2] The quotation is from the Appendix to Vincenzo Cervio's *Il Trinciante*, Venice, 1593.

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enamels were freely used in the fifteenth century, but the earliest known specimen of Venetian glass, the whole body of which is rendered opaque by the presence of oxide of tin (*calcina di stagno*)—the *vetro bianco di smalto* of the early writers[1]—can hardly be older than the beginning of the next century.

The spherical vase (Slade, 402) formerly in the possession of the Marquis D'Azeglio, is an exceptionally beautiful example of this milk-white glass (Plate XXXII.). The gilt scrolls harmonise well with the slightly warmish ground, and were it not for the rudely executed mermaids on either side, an Eastern origin might well have been sought for this quite exceptional piece; in fact, I do not know of any other specimen of undoubted Venetian glass so distinctly Persian in character.

In the Museo Civico at Venice is a flask (*circa* 1530) of this *lattimo* glass, about five inches in height, decorated in blue, with allegorical subjects. Although somewhat rudely executed, the painting is masterly in style, and may be compared to that on the best contemporary majolica (Plate XXXIII.). At a first glance this little vase might be taken for an example of Medici porcelain, and indeed we must bear in mind that all through the sixteenth century attempts were being made in Venice to imitate the porcelain of the Far East, more especially the plain white and the blue and white wares which were already arriving at Venice in considerable quantity.

This *lattimo* glass came much into favour for a second time early in the eighteenth century; it was at that time often decorated in colours in a pseudo-Japanese style. This later milk-white glass is once more closely associated with the attempts then again made at Venice, as in so many other countries, to imitate the porcelain of China and Japan. This had indeed, before the end of the previous century, been in a measure accomplished

[1] '*Ma quando particolarmente se voglion' far vetri bianchi di smalto vi s'aggiunge calcina di stagno e questo si chiama latticinio del quale si fanno opere diverse sopra i vasi di christallo*' (Garzoni, *Piazza Universale*, 1585, p. 550).

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in France by means of a soft paste, in the composition of which a glass-like frit played an important part. At a still later time this *lattimo* glass was even painted in monochrome, in imitation of our early printed Worcester porcelain!

Closely based upon this *latticinio*—for the threads in a vast majority of cases are of an opaque white—is the famous *Vetro di Trina* or lace-glass. At the beginning of the last century the art of making this net-work decoration appears to have almost died out, but in the thirties and forties it was revived by Domenico Bussolin, and when later on more interest began to be taken in the Murano glass, it was to this *vetro a reticelli* that at first most attention was given. The details of the manufacture were described and illustrated by the well-known director of the Choisy glass-works, M. Bontemps (*Exposé des moyens employés pour la fabrication des verres filigranes*, 1845).

There is, however, a simpler and perhaps easier application of these bands of *lattimo*, in which they are applied in a series of festoons to the surface. In this case the opaque white enamel appears to have been laid on to the *paraison* at an early stage and dragged into crescent-shaped waves, so as to resemble closely the decoration of the little flasks of coloured glass from Egyptian and early Greek tombs—to those later examples more especially, from Rhodes and Cyprus, on which the colours are only applied to the surface (p. 37), the resemblance in technique is very close. There are many interesting specimens of this festooned *latticinio* in the British Museum. In the case of the little *biberon* (Slade, No. 628) the festoons are worked into a palm pattern, identical with that often found on the little primitive vases.

I shall not attempt to follow in detail the manner of preparation of the true *vetro di trina*,—suffice to say that it is built up of a number of juxtaposed rods; these rods are arranged perpendicularly, side by side, so as to

form a hollow cylinder, and into the midst a small vesicle of molten glass is inserted; to this the rods adhere, and the whole mass is then worked into the desired form. The rods themselves—they are similar to the *canne* supplied to the *suppialume* workers (p. 187)—may be either of opaque or clear glass, or they may be formed of elaborate combinations of the two (*canelle a ritorto o merlate*); the most complicated patterns are thus obtained. When two series of these rods are arranged to cross one another at an angle, we get a reticulated pattern, and within the *reticelli* thus formed a bubble of air may be caught up. There is, indeed, little opportunity for finding in this kind of work any free play for the decorative feeling of the artist, and the result of all these ingenious combinations of crossings and interlacings is only too often to give a tame and machine-made air to the finished vase or tazza.

The Opalised Glass, the *Calcedonio* [1] of the Venetians, is obtained by adding the same materials as in the case of the *latticinio*, but in very small proportions: it stands to the latter as weak milk and water to pure milk. In practice, I believe, the opalescence is often given by the addition of phosphate of lime in the form of bone-ash, sometimes, perhaps, by arsenious acid.[2] Pale blue by reflected light, it takes various orange and yellow tints when the light is transmitted through it. Such a vessel as the cylindrical goblet and cover of thick *calcedonio* in the Waddesdon Room at the British Museum, with a design in high relief representing the Triumph of Neptune, must have been cast in a mould.

We now come to certain varieties of glass which were much admired at one time, but are now little in favour. The aim, it would seem, in this class, as in the case of the old Roman prototype, was to imitate various kinds

[1] But in the earlier writers this name is given rather to the imitations of agate—what was afterwards known as *schmelz* (cf. p. 218).

[2] A similar effect is obtained nowadays by means of a salt of uranium, but as is so often the case in the modern handling of old decorative systems, the opalescence is generally overdone.

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are in this case harmoniously blended. To judge from the form of the bowl and stem, the cup of finely marbled schmelz at Hertford House cannot be dated much later than 1500. In this case, and probably in others also, the marblings are only on the surface; the interior is of a uniform greyish-green colour.

Of scarcely less importance is the splashed ware for which we can again find a Roman if not an Egyptian prototype. The splashes of enamel of various colours must have been scattered over the *paraison* at an early stage, for they have had to follow the changes of form given to the surface in the shaping of the vessel: we see them stretched out at the neck on the little burette in the Slade collection (No. 783). This splashed glass was much admired by the French and successfully imitated by them.

Something should be said of the painted Venetian glass of the seventeenth and eighteenth centuries. I say 'painted,' for such it is in general effect, although the pigments have probably in most cases been subjected to some kind of firing. The very poverty and dulness of the colours are indeed a proof of this; the artist's palette has been subjected to the exigencies of the enameller's muffle. We find landscapes with classical figures and *amorini* painted on the lower surface of bowls and rondelles (*tondi*). In the Dutuit collection, now housed in the Petit Palais at Paris, is a circular dish some fifteen inches in diameter, painted on the under surface, so as to be viewed through the glass; the subject, a dance of cupids, is treated in an exceptionally fine style and can scarcely be later than the middle of the sixteenth century. In many cases these designs have been added to Venetian glass by non-Venetian, sometimes by northern hands. This kind of painting or enamelling is, however, very subject to injury by use, and doubtless for this reason it is sometimes protected by a second sheet of glass. We have in such painted dishes a variety of the so-called *verre églomisé* to which reference has already more than once been made.

The Venetians at times drew designs on their glass with a diamond. There are some examples of this in a good *cinquecento* style in the Slade collection; but this work was confined to the pure scratched line, and even shading was not much used. It was not till the eighteenth century that they began to copy the later German methods of deep engraving and cutting with the wheel.

The British Museum has lately acquired a square plaque of clear thick glass; at the back, in deep intaglio, is the portrait of a Doge, who, on the ground of the letters A. G. on either side of the head, may be identified with Andrea Gritti (1523-1538).[1] The late M. Piot has extracted from a fifteenth-century treatise on architecture by Antonio Averlini a dialogue between two artists upon some curious applications of glass. We hear of *cristallino* plaques with figures carved on the lower surface, so as apparently to stand out in relief—a description which would apply well enough to this *piastra*.

There is no more troubled story in the history of glass-making than that of the manufacture of MIRRORS at Murano from the fourteenth to the eighteenth century. We have seen in the early days, when these mirrors were backed with lead (p. 138), that the Germans had already become experts in this department. More than once in the Venetian archives there are references to the secret methods of these *Todeschi*. In a petition of 1503 there is mention of a plan for making good and perfect mirrors, a precious secret unknown except to certain Germans. It is impossible to resist the suspicion that there is here a reference to the cylinder process, which, as we have seen, was already known to Theophilus (p. 129); by this process it would have been possible to produce a fairly large and comparatively flat sheet of glass. The Venetians,

[1] In the museum at Murano is, or was, a similar plaque thus described by Zanetti, '*Una grossa piastra col busto incavato del Doge Andrea Gritti fra le initiali A. G.; secolo XVI.*' (*Il Museo Civico-Vetrario di Murano*, 1881).

on the other hand, probably continued to a late period to use the old method of 'spinning' or 'flashing.'[1]

It was only after the middle of the sixteenth century that the mirror-makers, the *specchiai*, formed themselves into a separate corporation; but in this guild were included, it would seem, the makers of the so-called mirrors of steel.[2] Thus we find that in 1574, one Francesco Zamberlan, who only two years before had taken out a patent for his '*specchi d'acciaio*,' was admitted to the new guild on the ground of his special knowledge. Those engaged in the polishing—the *lustratura* and *spianatura*—of both materials, glass and metal, were also members of the guild.

For us the interest in these mirrors lies rather in the framing. We find the new corporation early engaged in quarrels with the painters and with the workers in tarsia, mother-of-pearl, and coral (*i miniatori, i marangoni, e muschieri*), who found employment in decorating the frames.

For a time, no doubt, the Venetian mirrors held their own, but before the end of the seventeenth century the French, thanks to the energy of Colbert, had not only learned all their secrets, but by an entirely new method—namely by a process of casting or founding, and subsequent rolling and polishing of the glass plates—were able to meet the demand for the large mirrors that were now regarded as indispensable in a Louis-Quatorze salon. But these '*glaces de St. Gobain*' are of an entirely different nature from the exquisitely framed little *lustri*

[1] By the eighteenth century, however, they had adopted the German system. The President De Brosses, in one of the admirable letters that he wrote from Italy (1739), when describing the manufacture of mirrors at Murano, gives a vivid account of the cylinder process.

[2] Not really steel, of course, but a kind of speculum metal containing about one part of tin to two of copper. Fioravanti, in his *Specchio di Scientia Universale*, tells us that this *acciaio* was made of equal parts of brass and tin. He contrasts the German and Italian methods of preparation of glass mirrors, giving the preference to the former. Fioravanti then speaks of the interest taken in these mirrors—not by women only—and after balancing the pros and cons, he concludes that, on the whole—'*gli specchi son' mala cosa nelle case.*'

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House. Such chandeliers were known in England in the eighteenth century as 'lustres.'[1] They are above all numerous in German palaces, and most of the glass is probably of German or Flemish origin. But of the earlier type I cannot find a single example in any of our public museums.[2] The manufacture, however, has been revived at Murano, and chandeliers of this class, with no claims to antiquity, may often be seen in private houses both at home and abroad. The spread of electric lighting has given a stimulus to work of this kind, for the corolla-shaped shades that so often accompany our incandescent lamps have, in most cases, obviously been modelled upon the glass of the old Venetian chandeliers.

The glass-workers of Murano were a conservative body; their work was based upon secret processes and rule-of-thumb formulas. The elaborate division into different *arti* or corporations, each governed by its separate *mariegola*, made it excessively difficult to introduce any radical changes into the methods of work. It is quite pathetic to observe the efforts of the comparatively enlightened governing body, the *conservatori alle arti*, who in the last years of the republic attempted to introduce the new processes that were revolutionising the glass industry in the north of Europe. We find reports signed by great names—Morosini and others—recommending the introduction of English machinery, and drawing up plans for the cultivation of the *Salsola soda* on the islands of the lagoons. Little attention apparently was given to the artistic side by these reformers. One of the last names in the long list of the Murano glass-makers is that of Giuseppe Briati, famous for the purity of his *cristallo*; he excelled, too, in the designing and the execution of the *vetro di trina*, and Lazari declares that much of the 'lace glass' in our collections attributed

[1] A word that must not be confused with the term *luse* or *lustro*, applied by the Venetians to a mirror.

[2] There is a magnificent chandelier of this class in the drawing-room of Mr. Beaumont's house in Piccadilly. It dates probably from the early years of the eighteenth century.

to the *cinquecento* belongs rather to him or to his school.[1] Briati in 1739 was allowed to set up a furnace in Venice itself for the preparation of his *cristallo*, the first time for more than four hundred years that such a permission had been granted. It is of this Briati that we are told that his glass found a place on the *credenza* or buffet at the public banquets of the Doge, beside the gold and silver plate. This would appear to have been an innovation (see above, p. 203) introduced with the special aim of encouraging the declining industry. An exception was again made in favour of one Giorgio Barbaria, who so late as 1790, in the parish of the Gesuiti, manufactured bottles by a new English method. But as a French writer somewhat naïvely puts it—'*ce genre ne prête guère à la fantaisie.*'

Before this time the Venetians had yielded to the new fashion of the day, and were making cut and engraved glass more or less after German or Bohemian models. Of this class were the *trionfi di tavola*—trophies of glass for the decoration of the dinner-table—as well as the gigantic chandeliers known as '*ciocche.*' To such productions the artistic work of the time appears to have been confined. Of the first there is a fine specimen from the Casa Morosini set out in the centre of one of the rooms in the Museo Civico at Venice. I have already mentioned the chandeliers of cut glass. They played an important part in a *rococo* interior.

After the occupation of Venice by the French in 1797, the Directory attempted unsuccessfully to transplant the manufacture of beads (*marguerites*) to Paris. It is significant that they regarded this as the most important part of the glass industry. The corporations or *arti* were finally abolished in 1806.

During the ensuing thirty years the manufacture of glass was at the lowest ebb. There was, however, a first revival about 1838, which is associated with the name of

[1] '*Notizia delle opere d'arte.*' I quote at second-hand, as I have not been able to find a copy of this work.

Bussolin. But it was the energy and skill of a lawyer from Vicenza, Antonio Salviati, with the financial assistance of certain English enthusiasts for the art, Sir Henry Layard and Sir William Drake, in the first place, that led, not long after the middle of the century, to the furnaces of Murano again turning out something beyond window-glass and beads.

From the technical side Venetian glass belongs essentially to the Mediterranean family—the art was possibly learned in the first instance from the Byzantine Greeks. But it is probably as a consequence of their intercourse with the coast of Syria, the old home of glass, that the Venetians acquired at so early a date a pre-eminent position as glass-workers. Like that of their predecessors, theirs was essentially a soda glass. What distinguished it was, above all, its total freedom from colour; the Venetians were the first, at least since Roman times, to make an absolutely clear white glass. This result they obtained not only by care in the selection of their materials, especially in the source of the silica, but also by an early mastery of the use of manganese, 'the glass-maker's soap.' The Venetian glass excelled again in its working qualities, in the extreme ductility which it maintained through a wide range of temperature. This property was in a measure due to the large quantity of alkali which entered into its composition. On the other hand, this excess of soda has led at times to a rapid tarnishing of the surface, visible above all in our damp climate.

But it is to the works of the contemporary Italian writers that we had better turn for information on these practical points. These are of two classes:—1st, Works of some literary pretension which contain chapters on the glass of Murano for the information of the general public. 2nd, Technical treatises, consisting for the most part of formulas for the use of the glass-maker. To the first class belong Fioravanti's remarks on mirrors, which we

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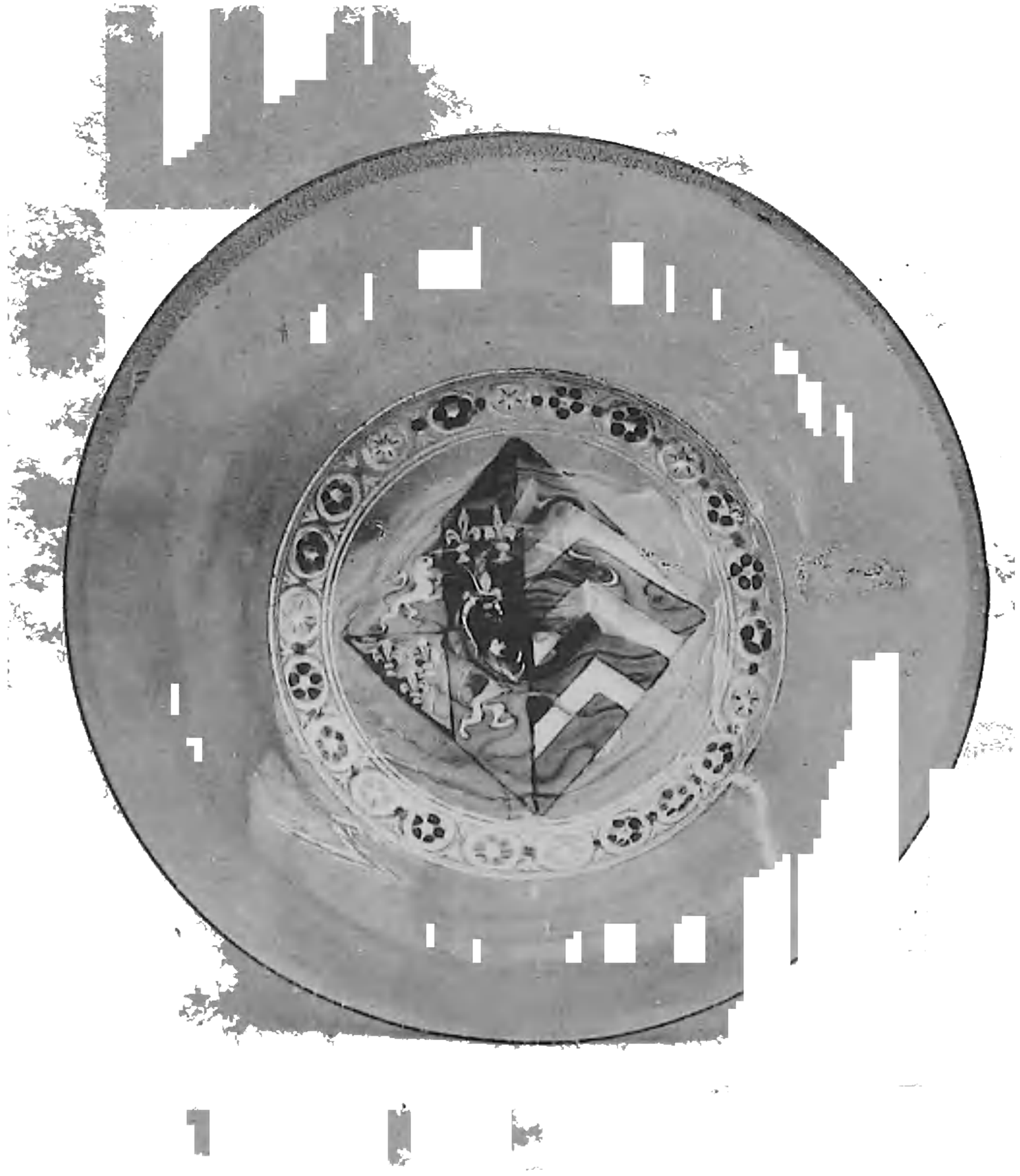

2

VENETIAN GLASS

ABOUT 1500

1. PLATE, ENAMELLED AND GILT—ARMS OF DELLA ROVERE FAMILY 2. TAZZA, ENAMELLED WITH COAT OF ARMS

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first edition, is dated Venice, 1585. It contains a chapter entitled '*De Vetrari, o Biccherari, Occhialari e Fenestrari.*' The superiority of the glass of Murano, '*luogo amenissimo e delitiosissimo presso a Venetia,*' he attributes to the saltness of the water, to the absence of dust, so detrimental to the work, and to the abundant supply of wood which gives a most beautiful and clear flame. Besides, it is only at Murano that they know how to prepare the soda with which the beautiful *cristallo* is made. That made from the herb *ugnea* (cf. the *duznea* of Biringuccio) or from fern, produces a yellow and brittle glass,—the inferiority of the potash glass is here indirectly indicated. Among the long list of the vessels made at Murano we find *zuccarini a reticelli* or *a ritortoli*, interesting as an early mention of lace glass. The word *zuccarino*, literally a basin for sweets, is used as a general name for covered bowls or dishes. We then have the account (already quoted) of the preparation of *latticinio*, and also of a glass made up of fragments of *canne* of various colours, a kind of *millefiori*, in fact. There is, he tells us, nothing imaginable in the world that these Muranese cannot make with glass—castles even with towers, bastions, walls, and cannon. '*Come nell' Ascensa di Venetia talvolta s' è vista,*' he continues. This refers, I think, to the display of masterpieces of glass in the procession on Ascension Day.

Garzoni, we must remember, is in this book in the first place concerned with the various trades and professions of his time, and he takes us next to the *occhiolari*, the makers of spectacles, who ply their trade in the Merceria, and finally to the *Finestrari* or *Vetriari*, who with marvellous rapidity fit into frames of lead '*certi occhi di vetro*' made at Murano. We see from this that the old bull's-eye glass was still in general use.

I must now, in conclusion, say something of the other class of writers, those who, without any literary pretensions, claim to disclose the secret processes and formulas of the glass-workers. These men are the successors of

Theophilus and of the compilers of the early alchemistic treatises of which I have spoken in a previous chapter. It is noticeable that not one of these men, as far as we know, was a Venetian; indeed in every case, if the writer is not a Florentine himself, it is from Florentine libraries and archives that his works have been extracted.

Cennini was essentially a writer of this class, but in his *Trattato della Pittura* there are only a few casual references to glass. The three little treatises found by Gaetano Milanesi in the Florentine archives, and published by him in 1864, are chiefly concerned with the preparation of glass for mosaics. They may probably be attributed to the first half of the fifteenth century, and we thus have in the recipes which fill these books the earliest documentary evidence for the composition of Venetian glass. I will quote from the first of these little works a section (xxiii.) which treats of 'the placing of glass on the surface of glass.' The writer, it should be noted, is concerned with the preparation of the *piastre* or slabs from which were cut the little cubes for mosaic work; this question of the various ways in which a leaf of gold may be included between two sheets of glass is one which has already interested us.

'℞ The glass to be about as thin as an eye-glass. Cut the leaves of the gold to the length of the glass, and put the gold upon the glass with white of egg; then place above this gold the other upper glass, and dry the whole. Then put them in the small ovens (*fornelli*), and let them be on a level so as not to slope, in order that the glass may not run. When they have become red-hot, load them with an iron so that they may grow together and unite. Then place them over the arch of the *fornacetta* (probably the fritting-oven), and let them cool little by little.'

The next section treats of the preparation of *lattimo bianco* by calcining four parts of tin and two parts of lead, and then mixing the resulting powder with ten parts

of Syrian soda. But as is the case with all the treatises of this class, the majority of the sections are concerned with the preparation of the various ingredients by means of which glass may be coloured—the *colori da ismalti.* The green and opaque red are both obtained from copper-scale, the purple and crimson from various mixtures of manganese[1] (so spelt in the text), and the yellow either from iron-scale or from a mixture of resin and tartar. As for the fine blue—the *zaffiro*—it should be noted that the pigment employed is described as *azurro da vetro*,[2] probably a preparation of cobalt—similar to what in later times was known as smalt—which the glass-workers obtained ready-made from Germany.

In the early sections of the third of these little treatises[3] the preparation of the soda is described in some detail. Much importance appears to be attached to the frit, for the third section is headed '*Questa si è la pratica di fare la fritta, ciò è li pane del cristallino. Nota ed impara.*' In the composition of this frit there enters not only soda and the white pebbles from the Tecino, but a considerable amount of *gromma* or tartar, a substance containing potash, and perhaps lime also.

The preparation of '*calcedonio in tutta perfezione*' is next described, and I may note that the presence in it of

[1] Not to be confounded, says the writer, with the stone known as Magnese, found '*nella Magna*' (Allemania or Germany). 'Quite other are the virtues of this stone [magnetic oxide of iron ?] when placed under your pillow, . . .' but for the context I must refer the reader to the sixty-ninth section of the original work.

[2] In the fourth section of the second treatise the author speaks of '*azurro della Magna del quale si tinge il vetro.*' There is also a section at the end of the first book on the preparation of *azurro fine* from *pietro d'azurro ultramarino*, but I do not think that this has anything to do with the colouring of glass, as it is associated with recipes for dyeing grey hair of a blonde colour and for preparing the *acqua virgine* by which the face is rendered beautiful. It is difficult to understand what relation the *Acqua di Philoseophy* (*sic*—there are several sections so headed at the end of the treatise) has with the preparation of glass. But all these old formulists are only too ready to run off at a tangent to discuss questions of alchemy.

[3] In spite of what Milanesi says in his introduction, I strongly suspect this third treatise to be of a later date than the others; the whole tone of it seems to smack more of the *cinquecento* than of the previous century. At the same time it is inferior to the two preceding treatises in practical knowledge—indeed it contains much nonsense.

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CHAPTER XIV

THE FRENCH GLASS OF THE RENAISSANCE

IN the history of European glass the culminating point is perhaps reached in the Venetian glass of the first half of the sixteenth century—I am speaking, of course, from the artistic point of view. For a century or more after this time our history is concerned with little else than the spread of the Italian methods of manufacture and decoration over the west of Europe. After the middle of the seventeenth century the interest becomes more and more centred in the technical and economical improvements in the manufacture. The invention of plate-glass by the French, in England the use of coal instead of wood in the glass-furnace, and the adoption of a heavy fusible type of glass containing lead (an indirect consequence, perhaps, of this change of fuel) —these are the really notable points in the history of the first century of industrial advance. After the middle of the eighteenth century England takes a more and more important position, and the prominent question was the production of a glass of high technical excellence at a greatly reduced price. Preoccupied as we were at that time with the absorbing interest of this industrial revolution, less attention was given in this country to the artistic side in the manufacture of glass.

In the sixteenth century the interest of our subject centres in the story of the emigration of skilled glass-workers from Venice and from L'Altare, and in the more or less complete replacement of the old methods, as these Italians found their way into nearly every corner of Western Europe. It was technically the victory of the

carefully prepared *cristallo* over the old mediæval *verre de fougère* or *wald-glas*. From another point of view the revolution was but one phase in the spread of the Italian renaissance. In fact, in one respect it was distinctly a renaissance, for the glass of Venice in composition differed little from that made during the Roman domination: it belonged essentially to the great Mediterranean family of soda-lime glass, prepared, if not from sea-weed, at least from maritime herbs. On the other hand, the indigenous glass which the *cristallo* replaced was almost without exception of forest origin, a potash glass made from the roughly lixiviated ashes of beech-wood or bracken.

I have said that these Italian glass-workers carried their new methods all through Western Europe, but, as we shall see, their permanent influence was not the same in each case. In Germany it was in a measure but a passing fashion—neither the Italian designs nor the Italian methods of manufacture ever became prevalent. The *wald-glas*, in an improved form certainly, held its own, and indeed before the end of the next century was threatening the supremacy of its Venetian rival.

In France, on the other hand, the victory was in a manner complete; the old *verre de fougère*, it is true, long survived, but in an acknowledged position of inferiority. In the Netherlands the case was more complicated; for while on the one hand at Antwerp and at Liége the typical Venetian *cristallo* was more successfully imitated than elsewhere out of Italy, on the other hand, in many places in the Low Countries, the old green glass continued to be made, and the old shapes, above all the essentially Teutonic *roemer*, never fell out of favour. It so happens indeed that for the best renderings of examples of both these schools of glass we must go to the works of the Dutch and Flemish painters, rather than to the contemporary pictures of either Germany or Italy. This is an interesting point about which I shall have something more to say later on.

As regards Spain, the Italian influence became on the whole predominant, but here the question is complicated by the existence, in Catalonia at least, of a school of enamelled glass of which the Venetian origin is by no means certain, and this school was already well developed before the end of the fifteenth century. Finally, in the case of our own country, the Venetian emigrants who came for the most part by way of the Low Countries, had soon to divide the hitherto almost free field with glass-workers from Normandy and Lorraine.

It is only of late years that the full significance of this emigration of glass-workers from Murano and from L'Altare has been recognised. A distinguished Belgian antiquary, M. Schuermans, President of the Cour d'Appel at Liége, about the year 1880—following in this in the steps of his countryman the late M. Alexandre Pinchart, and in a measure also in those of M. Houdoy (*Verrerie à la façon de Venise*, Paris, 1873)—began a systematic investigation of the subject, and during a period of ten years, from 1883 to 1892, contributed to the pages of a learned periodical published at Brussels (*Bulletin des Commissions Royales de l'Art et de l'Industrie*) a series of letters—for so M. Schuermans modestly called them, though they were in fact so many treatises, extending some of them to more than a hundred pages—packed full with the results of his researches. One of the most curious sources of information M. Schuermans found in the reports sent from the Venetian embassies and agencies in France and elsewhere to the Council of Ten at Venice. It was not the least important duty of the diplomatic agents of the Republic to trace out the fugitive Muranese glass-workers, to endeavour to induce them, by threats or promises, to return to their homes, and if unsuccessful in this, to denounce them to the authorities in Venice, who might then proceed to throw into prison the unhappy families of these recalcitrant workmen. In extreme cases there are hints of more drastic measures in dealing with the traitors themselves—for so they were regarded

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working. In France, where so many of these Altarists settled, these restrictions were the cause of constant friction, but so successfully were they as a rule enforced, that we find that, in the case of more than one centre of the new industry, it was necessary during a period of at least a century to have recourse from time to time to the original source at L'Altare, to replace the Italian workmen who had died or wandered off to other towns. For like their rivals from Murano, these Altarists were always on the move. We are reminded in this of the wandering porcelain 'arcanists' of the eighteenth century, who carried from one German court to another the secrets of their craft. To give but a single example; M. Schuermans has traced one of these *gentilshommes de verre* in migrations that led him successively to London, Liége, Maestricht, Rouen, and Paris.

In what respect, if in any, did the glass manufactured by these 'licensed' craftsmen from L'Altare, differ from that made by their rivals the 'outlaws' from Murano? This is a question that we are not in a position to answer. That there was some difference in style of working, and not merely in the technical excellence of the glass, would seem to be proved by the expression '*à la façon d'Altare*,' or '*ad uso d'Altare*,' so often applied to it. There is no doubt that the glass made '*à la façon de Venise*' was, on the whole, regarded as of greater excellence, and that in the impossibility of obtaining workmen from Murano, the resort to the Consuls at L'Altare was in a measure a *pis aller*. We must not, however, as has sometimes been done, look upon the craftsmen from the latter town as incapable of producing anything of artistic merit. On the contrary, they not only turned out a true *cristallo*, but much of the enamelled glass that was so successfully made in France in the sixteenth and seventeenth centuries came in all probability from furnaces worked by Altarists.

In fact, our ignorance on this point affords an excellent example of a difficulty that is met with again

and again in this history of ours,—the difficulty, I mean, of controlling our literary material by means of the scanty examples of glass that have come down to us. It would require a large shelf in a library to hold all the bulky volumes dealing with the history of French glass that have of late years been published, works that are due above all to the local patriotism and the industry of provincial investigators. For books of this kind, the fashion was set as long ago as 1864 by M. Benjamin Fillon in his *L'Art du Verre chez les Poitevins*. Since then have appeared not mere *brochures*, but in many cases portly volumes tracing the history of the manufacture in Normandy, Picardy, Lorraine, Nevers, Lyons, and Provence. M. Schuermans has devoted to France a long letter, chiefly concerned with the settlements of Altarist workmen (*op. cit.*, vol. xxxi.). And yet not only are specimens of glass, undoubtedly French, of the sixteenth and seventeenth centuries comparatively rare, but in very few cases can anything more than a guess be made as to the provinces to which these specimens are to be attributed. Such attributions indeed, when attempted, have for the most part had to be based either upon the armorial bearings forming part of the enamelled decoration, or again upon the localities where the glasses have been found—and these are criteria that fail in most cases.

Among the many anomalies that we encounter in the course of this inquiry—and surely in no kindred branch of art history are so many met with—there is nothing more surprising than the numerous important 'developments' of glass of one kind or another, for which we may search in vain a rational explanation—unless, indeed, it is the corresponding fact of the unexplained barrenness of certain periods and countries where such poverty would have been the least expected. One source of this apparent caprice in the presence or absence of glass of artistic merit at times and at places where the contrary might have have been looked for, may be found, perhaps,

in the fact that although, since Roman days at all events, the making of glass has always been an important industry, it is an industry that has only incidentally come into connection with the æsthetic movements of the time.[1] Some such explanation may perhaps be given for the comparatively subordinate place taken by France in the history of artistic glass, at least until quite recent days. In one department of the vitreous arts the French occupied no doubt for a time the premier place—the stained glass of their cathedrals is acknowledged to be the finest in Europe. But in our branch of the manufacture, a branch for which, curiously enough, the French alone have provided a name—*la verrerie*—that nation has never occupied a prominent position. Since Roman times, the first place as producers of glass vessels of artistic importance has been held in succession by Byzantine Greeks, by Saracens, by Venetians, by Germans, and for a moment by the English. It is only quite of late, since the commencement of the last quarter of the nineteenth century in fact, that any claim for such a position could be made for the French. And yet, in spite of this, the literature of that special subdivision of the *arts du feu* with which we are here concerned is especially a French one, and this is true not only for the technical and industrial side of the subject, but for the artistic and historical in an even greater degree.

I have spoken of the determined way in which these wandering Italians kept themselves apart from the native workmen, so that the secrets of their craft were preserved through more than one generation. In time, however, in France at any rate, not a few of these Italian craftsmen became sedentary, and not the least curious result of the recent researches by French and Belgian *archivistes* has been to show how certain well-known families of glass-

[1] But much the same might be said of the potter's art; in this case, however, the artistic history is far more continuous and inter-connected than in the case of glass.

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quantity of lime is essential. Now in the forest glass—the *verre de fougère*—sufficient lime (or equivalent bases) is provided by the impurities in the crude potash employed; but this is no longer the case when the more carefully prepared Oriental or Spanish soda takes its place: it is now necessary to supply additional lime. It is not impossible that the secret of the shrewd Italians may have lain in this direction.

When speaking of the mediæval glass of France, I have brought forward some evidence to show that, by the fourteenth century at least, vessels of glass must have been produced in large quantities for domestic use. This of course was, without exception, *verre de fougère*, essentially the glass of the people, which for long was little influenced by the new Italian methods. It was this glass chiefly that was hawked round the country by itinerant vendors. Their cry was well known in Paris—'*Gentils verres, verres jolis—à deux liards les verres de pierre!*' Others, as in old days at Rome (see the quotation from Martial on p. 82, note), collected broken glass to the cry of '*Chambrières, regardez-y!—Voirre cassez, Voirre cassez!*'[1] Bernard Palissy, writing towards the end of the sixteenth century, gives but a mean idea not only of the hawkers, but of the makers of glass in his day:—'Je te prie, considère un peu les verres qui, pour avoir esté trop communs entre les hommes, sont devenuz à un prix si vil que la plupart de ceux qui les font vivent plus méchaniquement que ne font les crocheteurs de Paris . . . et ces verres sont venduz et criez, par les villages, par ceux mêmes qui crient les vieux chapeaux et les vieilles ferrailles' (quoted by Gerspach, p. 193).

It was only when the secrets of the pure *cristallo* and the application of enamels were introduced from Italy that glass began to take a more honourable position

[1] Truguet, *Les Cris de Paris*—no date, but soon after 1600. *Verre de pierre* we may compare to our expression 'flint' or 'pebble glass.' It has been altered to *verre de bière* by a recent French writer on glass, who quotes the cry!

in France. We cannot safely trace back the foreign influence to an earlier date than the middle of the fifteenth century, and it was not brought into full play till just a century later.

The name of René, 'king of Sicily and Jerusalem,' and ruler under various titles in Provence, Anjou, and Lorraine, was at one time a name to conjure with in matters connected with art and literature, above all in the south of France. Of late years there has been a tendency to strip this much harassed king of many of his claims to distinction as a patron of the arts. There seems, however, every reason to connect his name with the introduction of the finer sorts of glass into France, not, of course, of the industry as a whole, though even this was at one time claimed for René. There is evidence to show that as early as 1443 a member of the Ferro family[1] of L'Altare was working for him at Goult, in Provence. This would be the earliest instance known to us of Italian glass-workers in France.

King René, we are told, presented to his nephew Louis XI. some pieces of glass '*moult variolés et bien peincts*.' But we can hardly refer to so early a date the beaker of enamelled glass formerly preserved at Aix, painted inside with the kneeling figure of the Magdalen by the side of her Master, so arranged that the former was only visible when the cup had been drained; so that, as the inscription quaintly expressed it:—

'*Qui bien boira*
Dieu verra
Qui boira tout d'une haleine
Verra Dieu et la Madelaine.'

It was but a few years later, in 1448, that the famous charter, of which a nearly contemporary copy has fortun-

[1] It was a Ferro who, as far back as the fourteenth century, taught the glass-workers at L'Altare the Venetian methods of making glass. The glass industry of Provence has at the present day been almost monopolised by the French branch of this family.

ately been preserved, was granted to certain glass-workers in Lorraine by Jean de Calabre, governor of that duchy in place of his father, King René. In this document we have early evidence of the claim of the glass-workers to the rights of gentlemen.[1] Full recognition is given to the '*plusieurs beaux droitz, libertez, franchises et prérogatives, et dont eulx et leurs prédécesseurs ayant joui et usé de tous temps passez et esté tenus et réputez en telle franchise comme chevaliers estimez et gens nobles dudit duchié de Lorrainne.*' Then follows a list of all these privileges, not the least important being the exemption from '*toutes tailles, aydes, subsides, d'ost, de giste et de chevaulchiées quelconques.*'

This is by no means the earliest French document in which the claim to some kind of nobility is made for the profession. As far back as the later thirteenth century, in the reign of Philippe le Bel, the glass-workers of Champagne claimed similar rights, basing their pretensions on certain edicts of Constantine and on others found in the Theodosian Code! Charles VI., whose interest in the manufacture of glass has been already referred to (p. 137), in his *Lettres Royales* of 1399, granted important rights to the glass-makers, '*à cause de la noblesse du dict mestier.*' These privileges, however, were confined to those whose ancestors had followed the craft for several generations.

But for all this, these poor '*gentilshommes de verre*' never obtained that complete recognition in France that had always been granted to their brother craftsmen at Venice and L'Altare, and their claims at times exposed them to ridicule. There is an often-quoted epigram, directed against one of their number (it is probably by François Maynard, a follower of Ronsard), which

[1] In the west also, René, who we must remember was head of the house of Anjou, in consideration of the '*gentilesse et noblesse qui est l'ouvrage de verrerie, et que aussi c'est le bien du pays et de la chose publique,*' granted permission for the foundation of glass-works among the forests of La Vendée, with rights of cutting wood '*au lieu le moins dommaigeable*' (Gerspach, p. 196).

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Murano or L'Altare, appear to have had little influence. In Lorraine, as in the lower Rhine country and in the bishopric of Liége—closely related districts—the making of glass had probably been carried on continuously from Roman times. In the Ardennes, and especially in the forests of Argonnes and in the Vosges, the manufacture early took on a purely industrial character. At the end of the sixteenth century it was claimed by the glass-makers of the last district that they supplied Switzerland, the Low Countries, and England with glass; and we shall see later on that it was from glass-workers from Lorraine, more definitely from the western Vosges, that we in England learned so much in the later sixteenth century. These Lorrainers owed their chief fame to their skill in making window-panes and mirrors, and the old tradition may be held to be still carried on in the great glass-works at Baccarat, near Lunéville.

I have no space to follow the working of the new methods in Poitou and in the south, but a few words may be said of the glass-houses established at NEVERS in the sixteenth century. At that time the dukedom of the Nivernais was held by the Gonzaga family of Mantua, who had already acquired the marquisate of Montferrat, upon which the town of L'Altare was dependent. Louis of Gonzaga, who died in 1595, was as a patron of the arts quite abreast of his time, and we may note that besides his possessions in France and Italy he held much land in Flanders and the Liége country, and that he was married to a princess of the house of Cleves. The old town of Nevers became for a time an artistic centre of some importance. In the handsome renaissance palace built in part by this said Louis (his arms are to be seen carved in bold relief on the walls), there is now gathered together an important collection of the enamelled fayence for which the town is famous, and also a few examples of the local glass, but none of this last is, I think, of so

1 2 3

FRENCH GLASS OF RENAISSANCE

STATUETTE OF LOUIS XIV. COLOURED ENAMELS

2. MAN WITH MUFF. ON STAND OF DRESDEN PORCELAIN

3. BURETTE OF SPLASHED GLASS

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early a date as the sixteenth century. Altarists had doubtless come to Nevers before the time of the Duke Louis, but it was during his rule that the Saroldo family settled here, a family famous especially for their skill in the use of glass enamels. To the Saroldo succeeded the Ponta family; and in the seventeenth century Jean Castellano came from Liége: in addition to these Altarists, Venetian workmen were employed at times. It is, indeed, a noticeable fact that here in the very centre of France these glass-works should, for something like two hundred years, have been dependent upon Italian workmen.

The glass of Nevers acquired some general renown in the seventeenth century. Thomas Corneille, the younger brother of the great dramatist, calls the town a '*petit Murane de Venise*,' and praises the '*variété des divers ouvrages de verre qui s'y font et qu'on transporte dans toutes les provinces de la France.*' In this case—quite exceptionally as regards France—we can associate a special *genre* or application of glass—a somewhat trifling one, to be sure—with the local glass-houses. In the already mentioned museum in the Ducal Palace may be seen some of these '*gentillesses a'émail propres à orner les cabinets, les cheminées et les armoires.*' Here may be found landscape scenes with cows and shepherdesses built up of fragments of glass of various colours,—these childish compositions are apparently executed with the blow-pipe. We are told in the journal of Jean Héroard, the physician to Louis XIII., that when that king was a child he amused himself with certain '*petits chiens de verre et autres animaux faits à Nevers.*' Among the scanty specimens of French glass in the British Museum are some quaint little figures, about four inches in height, built up of coloured glass enamels. We see there a little statuette of Louis XIV. strutting along attired as a Roman emperor; there is another of St. James the Apostle. These characteristic examples of *verroterie* may very plausibly be referred to the glass-blowers

of Nevers at the end of the seventeenth century[1] (Plate xxxv. 1).

The province of NORMANDY has played a not unimportant part in the history of glass. It was from the Norman duchy and from Brittany, according to the tradition preserved at L'Altare, that the glass-workers wandered forth in the tenth or eleventh century to find a more peaceable home at L'Altare, in the mountains above the Ligurian coast. As early as the year 1302 we hear of the famous glass-house at La Haye, in the forest of Lyons, near Rouen. This is in a charter which mentions incidentally the bracken, the '*feucheriam ad faciendum vitrum*'—for all this early glass was, as I have said, *verre de fougère*—which was to be cut only at specified times. It was here, about the year 1330, that Philippe de Cacqueray is said to have first made the *plasts de verre*, otherwise known as *verre de France*,[2] for long the most important product of the Norman glass-houses. These *plasts* were indeed merely small sheets of glass, with a thickening or 'bull's-eye' in the centre; they were made by the familiar 'spinning' process, which, however, must surely have been known before the fourteenth century. In any case this *verre de France* was widely exported at a later time, and much of it must have found its way into England.[3] It would appear that the gentlemen of the *grosses verreries* where this window-glass was made, held their heads above those of the *petites verreries*

[1] The Abbé Boutellier has made a special study of the Nivernais glass, but I have not had an opportunity of seeing his *Histoire des Gentilshommes verriers et de la Verrerie de Nevers*.

[2] In distinction from the *Verre en tables quarrées* made in Lorraine. I am unable to say whether the latter was at so early a date made by the cylinder process, but the square shape renders this very likely.

[3] Among the documents relating to glass, collected by the Baron Davillier, was the report of the commission of inquiry appointed by Philip II. at the time (about 1560) when it was proposed to glaze the many thousand windows of the Escurial. Samples were sent from the glass-works of Spain, Burgundy, Lorraine, and Normandy. The Norman glass was declared to be the purest. (Quoted by Gerspach, p. 304.)

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and the decorative arts of the eighteenth century it is, however, one of no little importance.

I have been able to do little more than select a few examples that have seemed to me of especial interest from the well-filled records of the French glass-workers of the sixteenth and seventeenth centuries, and many important centres have been passed over without comment,—Nantes, for instance, frequented above all by the Altarists; and Poitou, the source, according to M. Fillon, of many of the finest extant examples of French enamelled glass. In both these districts members of the Saroldo family settled—in Brittany they were prominent for over two centuries.

In Paris, or rather in the Isle de France, the glass-works of St. Germain-en-Laye were for a time under direct royal patronage. It was there, soon after 1552, that Teseo Mutio made for Henri II. '*verres, myroirs et canons.*'[1] Although the king pronounced Mutio's work to be equal to that of the Venetians, these glass-houses had but a short life.

In 1604 a special commission was appointed in Paris to deal with the difficulty that arose from the obstinate refusal of the Altarists to teach the French apprentices the secrets of their craft. It was proposed to get over this obstacle by the naturalisation of the Italians, but to judge from the continued importation of fresh batches of foreigners, this measure had but little practical result.

But what examples, it may be asked, can we point to that would throw light on the nature of the glass made during these centuries by this succession of Italians, to say nothing of the production of the native *gentilshommes*? Nowhere in France, as far as I know, is there to be found anything in the nature of a representative collection to illustrate the history of native glass.

[1] These *canons*, I think, correspond to the Italian *canni*, the glass rods from which beads were made. We hear of these *canons* being supplied to the *Pâternostriers*, who take the place in France of the *Suppialumi* of Venice.

The nearest approach is no doubt to be discovered in the scattered examples in the Louvre, and above all in the Hôtel de Cluny, where there are many curious specimens of the French enamelled glass of the sixteenth and seventeenth centuries.

It is to the Venetian enamelled glass of the fifteenth century, to the goblets of the *coppa nuziale* class, that we must go back to find the prototype of what is by far the most interesting family of French glass. In France these *verres à pied*, enamelled with portrait-heads or symbolical figures, continued in vogue well into the seventeenth century, long after the fashion for such work had passed away at Venice. The enamelling itself on this French glass is not remarkable for brilliancy, but there is often some native *verve* in the treatment of the figures, and a true Gallic ring about the mottoes and verses that accompany them. Of these '*devises*, *souhaits*, *proverbes*, *dédicaces*, *vers et maximes*,' we may distinguish two classes: in the one case they are of a more or less gallant character, or contain personal references; in the other a religious sentiment or a pious quotation is found, generally of such a nature as to suggest that the original owner belonged to the reformed church. It is sometimes difficult nowadays to seize the connection between the device and the subject which it accompanies. Thus on a fine stemless goblet in the Musée de Cluny we see three halberdiers standing as on sentry duty; the accompanying motto, '*En la sueur de ton visaige tu mangeras le pain*,' has been interpreted as referring to the hard life of the soldier. Of a more gallant character are the figures and devices on a goblet of yellow enamelled glass in the British Museum (Slade, No. 824). A gentleman in the costume of the time of Henri II. offers a flower to a lady with the remark, 'JE SUIS A VOVS.' The latter—she holds a padlocked heart in her hand—replies 'MÕ CUER AVÉS.' In addition to these figures we see a goat (*bouc*) drinking from a vase, and this we may connect with the inscription that encircles the bowl—'JE SVIS A VOVS JEHAN BOUCAU

ET ANTOYNETE BOUC.' This is doubtless a marriage cup, and the name Boucau points, it is said, to a Provençal origin.

As in our country, though in a somewhat less degree, the Gothic feeling in design lingered long in France, at least in the more remote provinces. An enamelled glass basin, preserved in the museum at Rennes (figured by M. Gerspach, p. 199), bears round the margin in large Gothic letters the words—PRION : DIEU : QUI : NOUS : PARDON : 1597. On the ground of the style of decoration, to say nothing of the lettering, this bowl might well, in the absence of the date, have been referred to the fifteenth century.

Perhaps the oldest example that has been preserved of this French enamelled glass is the tazza in the Cluny Museum, with the arms of Louis XII. and Anne of Brittany. This cup must date from the early years of the sixteenth century.

There is one variety of enamelled glass, Venetian in its origin, which we in England generally associate with France, although there are scant references to it in the French authors who have described the glass of their country. I refer to the 'splashed' glass, an old method of decoration indeed, for we have found something very like it on certain little unguent vases of the ancient Egyptians. In the present case the enamels—red, yellow, blue, and white—lie in oval masses on the surface, reminding one in some cases of the sections of the pebbles on a piece of polished pudding-stone. How these enamels were splashed on to the unfinished *paraison* has been already described (p. 64). I may add that the little barrel-shaped flask (the *barillet* or *bariz* of the old writers) to which this decoration is sometimes applied, is a characteristic French form.

Among the French glass in the British Museum may be seen some little scent-bottles or burettes of moulded glass, decorated with *fleurs-de-lis* in relief. These are generally attributed to a certain Bernard Perrot of Orleans,

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CHAPTER XV

THE RENAISSANCE GLASS OF THE SPANISH NETHERLANDS AND OF SPAIN

BEFORE going on to speak of the glass made in Spain, it will be well to say a few words of that made in the Spanish Netherlands during the sixteenth and seventeenth centuries.

Here, as might be expected from the course of trade, the Venetian influence was early felt, and before long became predominant. In the northern provinces, on the other hand, the old Teutonic traditions, both as to form and material, continued on the whole unchanged to a much later period, so that the glass of the United Provinces will be best dealt with in connection with that of Germany.

Already in the fourteenth century the Venetian galleys brought the glass of Murano to the Flemish ports. In some cases this glass was held worthy of being mounted in silver. A goblet and an *aiguière* are mentioned in an inventory of 1379 as the property of Charles v. of France. These pieces are indeed described as '*voirres blants de Flandre*': it is, however, very probable that they came in the first place from Venice.

As early as 1541 Venetian glass-workers were settled at Antwerp, but, as in France, the great invasion took place shortly after the middle of the century. It must be borne in mind that what we know of the wanderings of these *gentilshommes de verre* from Venice and from L'Altare is derived almost exclusively from the researches of Belgian antiquaries and *archivistes*. In the already

quoted works of Houday, of Pinchart, and above all in the earlier and later letters of the Belgian judge, the President Schuermans, we have a wealth of information. M. Schuermans has traced these Italian glass-workers to Antwerp, to Brussels, to Namur, to Liége, Maestricht and Huy, and in the northern provinces to Bois-le-Duc, Middelburg, Haarlem, and Amsterdam. There was a great rivalry between the Muranese, who on the whole predominated at Antwerp, and the Altarists, whom we find for the most part at Liége: these were the two most important centres. The Low Countries indeed became before long a second home to these Italians, whence they wandered out again to France, England, and Spain.

While at Antwerp the true Venetian *cristallo* was imported free of duty, the imitations of that glass, the *voirre de cristal, à la faschion de Venise*, made over the French frontier at Mézières or in Germany, and often difficult to distinguish from the originals, were strictly excluded, and these fiscal regulations were enforced by the most tyrannical measures. The case is well put by Mr. Hartshorne: 'There were,' he says, 'in the Low Countries in the beginning of the seventeenth century, real Venetian glasses imported from Venice, Venetian glasses legally made in the Low Countries, those illegally made, and foreign imitations of Venetian glass' (*Old English Glasses*, p. 39). Apart from these varieties of *cristallo* glass, the old *verre de fougère* doubtless continued to be manufactured.

Before the end of the sixteenth century, the glass-houses of Antwerp where glass *à la façon de Venise* was made had acquired a European reputation. They stood quite apart from the other furnaces in France or in the Netherlands where Italians were employed. Lodovico Guicciardini, the historian of the Netherlands, speaks as early as 1567 of the '*vassella di vetro alla Veneziana*' made in Antwerp, and in the later editions of his work (*Descrizione di Tutti Paesi Bassi*) some further details are given. The testimony of another Florentine, Neri,

from whose little book on glass I have already quoted, is still stronger. It was at Antwerp, he tells us, not at Venice, that he had studied the processes of glass-making.

If Antwerp thus early held a commanding position in Spanish Flanders, in the Walloon country the glass-houses of Liége in the course of the seventeenth century grew to a position of even greater importance. This was due above all to the enterprise of the great firm of the De Bonhommes, who before the end of the century had almost a monopoly of the glass trade in those parts: they even established subsidiary works beyond the frontier in such places as Verdun. They were one of the first on the Continent to see the importance of the new English flint-glass; at all events it is recorded that as early as 1680 they made flint-glass *à l'Anglaise*,[1] and were thus able to withstand the Bohemian[2] competition which at that time was carrying everything before it.

In the seventeenth and eighteenth centuries the Bohemian engraved glass was copied in both the Walloon and Flemish parts of what is now Belgium. Indeed when the latter district fell under Austrian rule early in the eighteenth century, there was naturally a tendency to encourage Bohemian methods of decoration. Specimens of this engraved glass may be seen in the museums of many Belgian towns, but I have seen nothing to equal, in spirit and high finish, the contemporary engraved glass of the United Provinces. As for the earlier *cristallo* made at Antwerp, say from 1550 to 1650, the difficulty is to distinguish, in the case of the specimens that have survived, the local work from that imported from Venice, and we have evidence that even at the time the native experts could not always do so.[3]

[1] It seems to me, however, very doubtful whether flint-glass was at this time necessarily *glass of lead*. I return to the point in the chapter on English glass.

[2] I use the term Bohemian, here as elsewhere, for brevity's sake. The more correct expression would be—the frontier lands of Germany and Bohemia. This will be made clear in the following chapter.

[3] So in the important collection of the Musée des Arts Décoratifs at Brussels, especially strong in examples of 'winged' beakers, little attempt is made to separate the Venetian from the home-made specimens.

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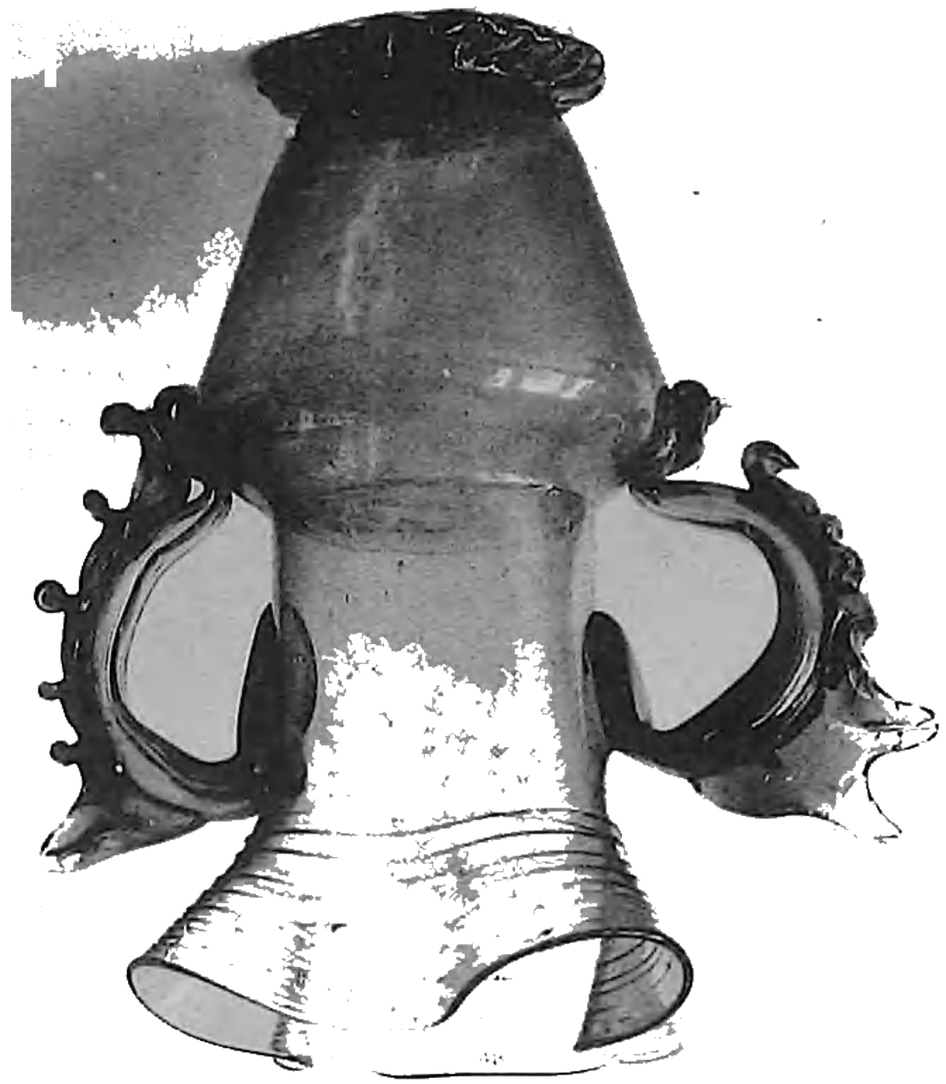
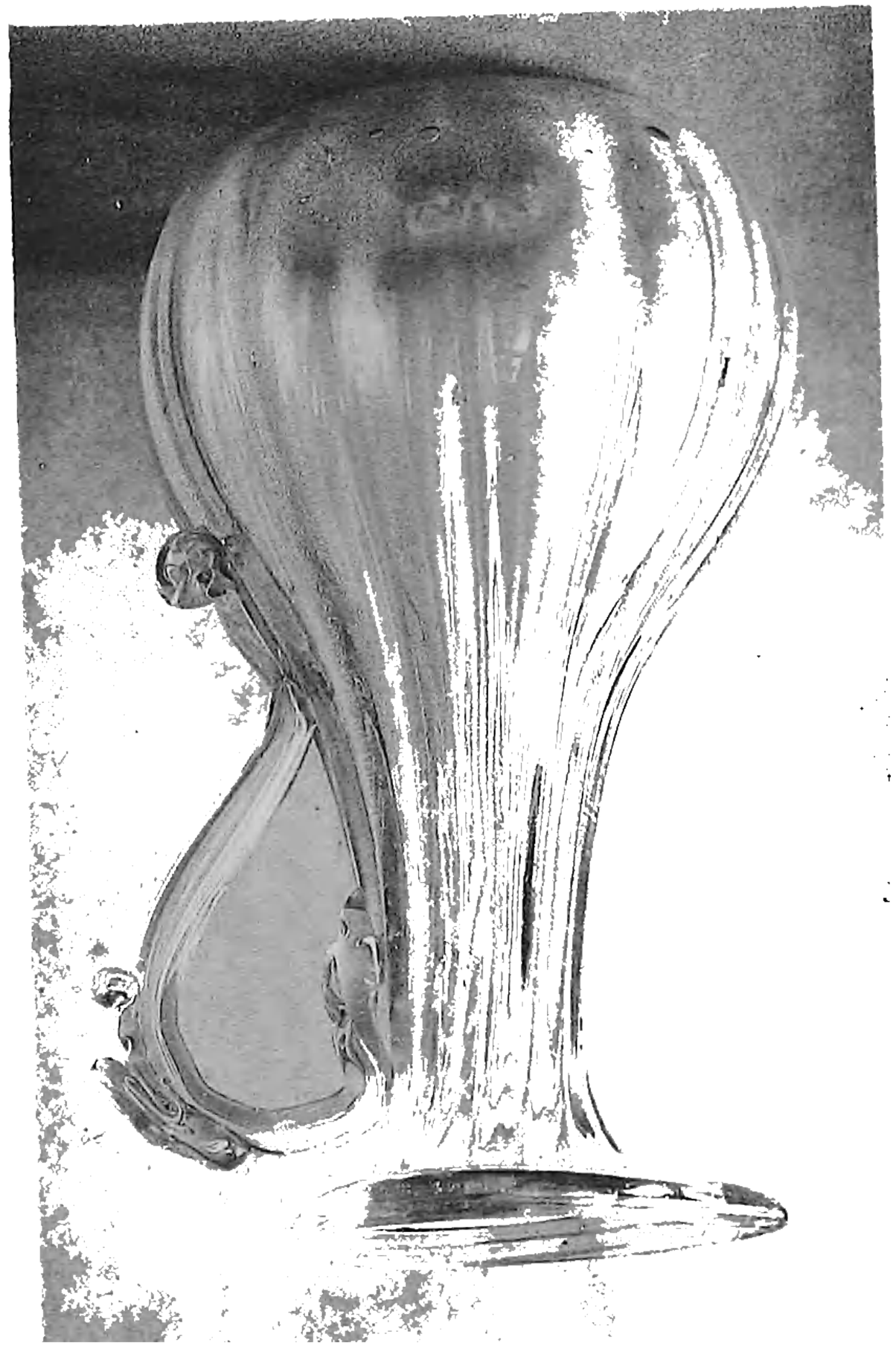
in humble surroundings. In the *cabaret* scenes of Teniers, the peasant drinks his beer from a tall hexagonal glass of thick whitish metal. The wine is kept in spherical long-necked flasks—a very old type which we have often met with in our history—a plug of rolled paper taking the place of a cork; it is drunk from wide-mouthed conical glasses of thin white metal. Similar glasses appear indeed in the pictures of the Dutch painters (as in more than one painting by Metsu and De Hooghe in the National Gallery). But in Holland, in the seventeenth century, the dark green or almost black prunted goblets of *roemer* type were apparently held in even greater estimation. In the famous terrace scene of Jan Steen (National Gallery, No. 1421), the wine, which is kept in a large pear-shaped glass vessel with a stopper of wood, is drunk from a small graceful *roemer*. In J. van de Velde's still-life in the same collection (No. 1255) we see again a magnificent *roemer*, of very dark glass, with prunted stem and threaded foot, half filled with Rhenish wine.[1] But if we turn again to the Flemish painters of this later time, we find that when in rich interiors they introduce specimens of glass among other *objets de vertu*, this glass is always of a Venetian type. There is one such painter, a follower of Jan Brueghel apparently, who loves to introduce among a wealth of plate and jewellery, piled on tables and shelves and even on the floor, the most elaborate specimens of the fine *cristallo* of Venice, proving in what esteem this glass was then held in the Spanish Netherlands. I might give many further examples, but enough has been said to show that as in the case of porcelain, of fayence and of plate, so for the history of glass, a mine of information may be found in the *genre* and other pictures of the Netherlandish school.

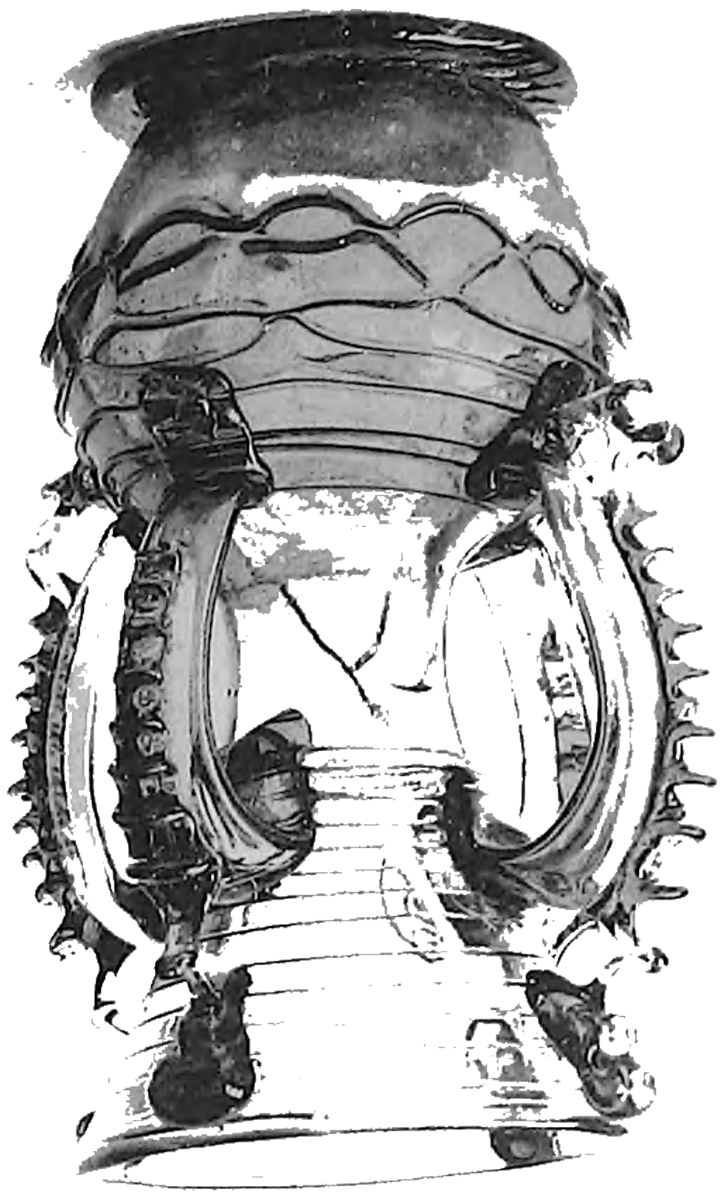
[1] I do not know why this essentially Teutonic form is described in the official catalogue as a 'Venetian green glass goblet.'

SPANISH GLASS

SEVENTEENTH OR EIGHTEENTH CENTURY







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Spanish Glass

In the case of France we have seen how vast is the amount of documentary evidence concerning the glass of the renaissance, and how comparatively scanty on the other hand the in every way more satisfactory evidence to be drawn from the examination of existing specimens. Now in the case of Spanish glass these conditions are in some measure reversed. We here find the documentary evidence almost entirely wanting, but we in England, at any rate, have in the British Museum, and more especially at South Kensington, fairly extensive collections of glass from the Peninsula. I will not say that most of the examples are of any great artistic, still less of technical merit. Far too many pieces in the latter collection are but sorry imitations of debased French and English models of the eighteenth century, and even later times. But as we shall see, not a few types, earlier in style if not in actual date, may be distinguished, and these have a distinct local flavour.

This is the case above all with a class of rudely executed vessels that are found in the south of Spain—in Murcia, Andalucia, and Granada. The metal itself is of a primitive type, of various shades of green and bluish-green. Indeed, one of the points of interest in this South Spanish glass is to be found in the fact that it is essentially a glass of the people: it is a survival from mediæval times, and it thus throws light upon the long extinct *verre de fougère* or *wald-glas* that was made all over the west of Europe before the introduction of the Venetian *cristallo*. Not that this Spanish glass is necessarily of the inland or potash family; we are here in a Mediterranean country, and the alkali has probably been found in the native soda-holding barilla. The shapes taken by this rude glass of the south of Spain often resemble those found in the local pottery; one is reminded at times of the graceful water-jars that are

indeed common to nearly all the Mediterranean coast. A Moorish origin has been found for some of these forms, but we may perhaps go further back and call them Byzantine. The most characteristic shape is a vase with spherical body and with a tall expanding neck in the form of a truncated cone; neck and body are united by a series of handles, often eight or more in number (Plate XXXVI.). Now not only these handles, with their upper and lower attachments worked while hot by the pincers into toothed and crested forms, but the whole of the *appliqué* ornaments of the vessel—the threadings and the rude floral reliefs—take one back to a very old plan of decoration. This was a style much in favour in later Roman times—it is one that is perhaps *per se* the most characteristic and natural of all methods of treating the surface of glass. A similar many-handled vase is a common type among the peasant pottery of the same districts of Southern Spain; on this we find the same ring of handles, while the *appliqué* threadings and rosettes of the glass are replaced by a similarly applied slip ornament. This pottery is still manufactured for local use, but I do not know whether any of the rude green glass is produced at the present day.

We have little or no information about the glass made in Spain during the Moorish domination. There is a vague tradition that the manufacture was carried on in Murcia and Andalucia, and Al Makari, the historian, states on the authority of an author of the thirteenth century, that Almeria was famous for its vessels of glass as well as for those of iron and copper.[1]

It is the district lying inland, some distance to the north of Almeria, that has long, probably from Moorish

[1] Riaño, *The Industrial Arts of Spain.* The little that we know, on the documentary side, of Spanish glass is derived for the most part from this work, one of the South Kensington handbooks. This may be supplemented by the information collected shortly before his death by the Baron Charles Davillier, which has filtered out through various channels; some of it may be found in M. Gerspach's work on glass (pp. 100-105). M. Schuermans also has not forgotten Spain in his records of the wandering Italian glass-makers (*Bulletin* xxix., pp. 133-147).

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in the flat opaque painting that we see on so many European wares. There are several pieces of this glass in the British Museum, but the most beautiful example that I have seen is in the Museo Civico at Venice. This is a little flask lately acquired from the Maglione collection at Naples; the dominant green enamel is here relieved by some yellowish foliage and by red and white birds.

I do not think that any existing example of this green enamelled glass could be safely referred to an earlier date than the end of the fifteenth century. But it is not improbable that the Catalans learned the use of these enamels not from the Venetians, but directly from Saracenic or Jewish glass-workers in some of the ports of the Levant. Such a distant source for this decoration, which is indeed somewhat Oriental in character, I think more probable than a local one in Spain, for we have no evidence that the Moors, when they held the Peninsula, ever practised the art of enamelling glass, nor indeed were the Catalans, after very early times, ever brought much into contact with their Mohammedan neighbours: their main dealings were with the Levant.

That the glass of Barcelona was widely known and held in some repute before the end of the fifteenth century, the following notices go far to prove. As early as 1491—so it is stated in a contemporary Latin manuscript—glass vessels of various shapes, resembling those made at Venice, were exported to Rome from Barcelona. Again, when Philippe le Beau passed through the latter town in 1503, we are told that he went '*en dehors de la ville veoire ung four ou faict voires de cristallin très beaus*' (Schuermans, *Bulletin* xxix. p. 138 *seq.*). Finally, Ferdinand of Aragon, about the same time, is reported to have sent to Queen Isabella a present of 274 pieces of glass manufactured in Barcelona. That this glass must have been possessed of some artistic merit we may infer from the fact that the Queen presented several pieces to the Capella de los Reyes at Granada. These we may

perhaps identify with the *vasi di vedro* seen among the treasures of this chapel a few years later by the Venetian ambassador (Andrea Navagero, *Viaggio in Spagna et in Francia*). M. Gerspach, I may add, calls attention to an inventory drawn up during the reign of Philip II., in which, under the heading of *bidrios de Barcelona*, 119 pieces of glass of various forms are catalogued; among other things—and this is a point of great interest—mention is made of some enamelled lamps.

At a much later date, not before the eighteenth century probably, a good deal of opaque white glass, in imitation of porcelain, was made at Barcelona. At South Kensington may be seen a series of quadrangular flasks of this material with bevelled edges, about six inches in height. These flasks—they probably served to hold essences and spirits—are somewhat rudely painted with floral designs in bright primitive colours—red, blue, and yellow. Both in India and Persia we come across examples of glass decorated with 'painted' enamels, almost identical in shape and size with these Spanish bottles. Not only these, but some of the sherbet-jugs and coffee-cups of this milky glass, that are still often found in many parts of the East, may well have come from this district. It will be remembered, however, that a very similar ware was made about the same time both in France and at Venice.

Other towns in Catalonia, as Cervelló, Almatret, and above all Mataró, became famous for their glass in the seventeenth and eighteenth centuries. There is more than one record of distinguished foreign princes who were conducted in royal galleys to visit the glass-works of this last town.

M. Schuermans has discovered the names of more than twenty Italians from L'Altare or from Venice, who found their way to Spain, in some cases by way of Flanders. At Lisbon, too, in the seventeenth century, there were many foreign glass-makers, Muranese, Altarists, and Flemings.

At Cadalso, in the province of Toledo, glass-furnaces were at work as early as the beginning of the sixteenth century; indeed they are said at that time to have supplied the whole kingdom of Castile. At these works, at a somewhat later time, the Italian influence became very strong, and no doubt many Muranese or Altarists were employed.

Before the end of the seventeenth century, the general decline so noticeable in all the industries of Spain spread, it would seem, to the glass-works. Workmen were now obtained chiefly from the Low Countries, and in addition much glass was imported by sea from Antwerp. To how low a state the glass industry had fallen at this time may be inferred from the fact that orders for 'Mexico and the Indies' had to be executed abroad. In the next century, when Spain had lost her Flemish possessions, their place as a source of glass-ware was taken by France. Philip v., about the year 1720, founded a royal glass manufactory near his summer palace of La Granja de S. Ildefonso, and workmen were gathered together from all sources—there were Germans and Swedes as well as Frenchmen. These works were above all established, in rivalry to St. Gobain (p. 235), for the preparation of large mirrors of plate-glass, but all sorts of 'hollow ware' were also produced there. This later Spanish glass, made to royal order, is, however, utterly devoid of any interest, and it need not detain us.

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fifteenth century. What is then found is not of much note, small tumbler-like vessels for the most part, of thick greenish glass decorated with threadings or studs, the latter more or less of the nature of prunts. There is, however, one fifteenth-century form which is of some interest: the metal-mounted wooden cups of mazer-like form, in use at that time appear to have been copied in glass; these may be recognised by their peculiar stunted and sometimes coiled handles.[1]

These somewhat primitive vessels of the fifteenth century are of interest as leading the way to the first important division of German glass, the 'Green Glass' of Western Germany and the Netherlands.[2] It is worthy of note that this family of glass, essentially of local origin not only as regards the nature of the metal but also in respect of the shape and the method of decoration, only reached its full development in the course of the sixteenth century, at a time when the new *cristallo* was being made by Italian workmen in the same district. There must have been something like a conscious reaction in favour of the native forms and materials. As to the pronounced green colour, we know that this was held to enhance the flavour of the wine drunk from the glass; as far back as the early sixteenth century, iron and copper scale were purposely added to supplement the pale tint given by the iron contained in the impure native potash (Mathesius, *Sarepta*, cxciv.).

In the decoration of this green glass recourse was

[1] A surviving vessel of this shape, as well as some examples taken from pictures by Bouts and by the so-called Mostaert, is illustrated by Mr. Hartshorne (*Old English Glasses*, p. 64). Other similar bowls were to be found in the Thewald collection (dispersed at Cologne, October 1903): in Germany such vessels are known as *halbe Wurzelbecher*. The form was imitated also at Venice, as we may see in a bowl, in this case duplicated, in the Waddesdon Room in the British Museum.

[2] Quite a number of little vessels of this dark green glass, ornamented with prunts and quillings of various forms, have been dredged up from the Scheldt at Antwerp, or found in the excavation of new docks. They may be studied in the museum now established in the Steen.

had to the old methods of threading, but above all to the more or less circular projections or bosses of varied forms that are found scattered over the sides. These are technically known as 'prunts'—the *nuppen* of the Germans. We have had something to say of one special form of these protuberances when describing the glass of the Anglo-Saxons.[1] These prunts fall into two groups: the *stechel-nuppen* or thorned prunts, of which the old Franco-Saxon form is an extreme type; and the *beeren-nuppen* or berry prunts, derived possibly in the first case from the moulded reliefs of bunches of grapes that we find so often on Roman glass. A third group might perhaps be made for another classical form where the projections take the shape of a medallion—a head stamped on the surface of the prunt while it is still soft.

These *nuppen* had a practical use,—so Mathesius, a contemporary writer, tells us.[2] They were to prevent the glass from slipping between the fingers of the drinker. With a similar object—for the *insertion* of the fingers in this case—these prunts are sometimes reversed, forming deep pits in the sides of the vessel. There is a late example of this form at South Kensington and another in the British Museum. The *stechel-nuppen* may assume less aggressive forms; the points may be smoothed down while the metal is soft, and we then have merely a series of disc-like thickenings on the sides of the glass. By this means, as in the more refined Dutch *roemer* of

[1] The term prunt should perhaps be restricted to those cases where the 'blob' is sufficiently large and hot to melt away the subjacent glass. When this is not the case, unless we adopt the German word *Warze* or wart, the term 'stud' applies better. If again the 'blob' of hot glass is merely dropped on the surface it may be termed a 'tear.'

[2] Every art, he says, must adapt itself to the country where it is practised; and so we Germans have set all kinds of knobs and rings on our glasses, so that they may be somewhat stronger and more lasting, and be more easily held in the hands of fuddled and clumsy folk ('*von vollen und ungeschicklichen Leuten*'). This quotation is from one of the Lutheran pastor's 'sermons' on glass (see below, p. 262). Mathesius lived in what has been called 'the classical age of German thirst,' and was ever ready to gird at the failings of his contemporaries in this respect.

the seventeenth century, effects of great beauty, due to the varying transparency of the glass, were obtained.

In colour this Rhenish glass may vary from a greenish-blue to a pale bottle-green, or again to a deep, almost black, tint of olive-green or violet. It is from glass of this description that the pale-coloured wines of the country have been drunk, perhaps without break, from late Roman times. This it is, as well as the fact that it has never been decorated with enamel, and rarely, in Germany at least, by the wheel or with the diamond, that has given to the green prunted glass of this family a position apart. I have called this glass Rhenish, inasmuch as the centre of the manufacture seems to have been around Cologne, whence some of it found its way down the river to the Low Countries, along with the wine that was drunk from it; but much green glass was, we know, made also in the Netherlands.

From the *cultur-historisch* point of view, perhaps the most striking claim to attention of this family of German glass lies in the fact that here we come across the one original and artistic form of wine-glass that has been developed in modern times—apart, that is, from the stemmed glass of Italian origin, about which there will be a good deal to say in a future chapter. The typical *roemer*—for this of course is the glass of which I am speaking—consists of three parts: a bowl of ovoid outline, shaped like the flower of a tulip; a hollow cylindrical stem, studded with mulberry-like prunts (often flattened out to discs); and a hollow conical foot, formed by coiling a rope of glass round a core of wood (Plate XXXVII.). Here we have the *roemer* in the fully developed form of the seventeenth century, as we see it in fact in the still-life pictures of the Dutch painters of the time, or again—this time in actual use—in the marksmen's banquets (*schuttersmaaltyd*) of Van der Helst and Frans Hals. In the earlier forms, however, the foot is either entirely missing or is present only as a zig-zag or toothed ring of glass applied to the base of the stem. In these early

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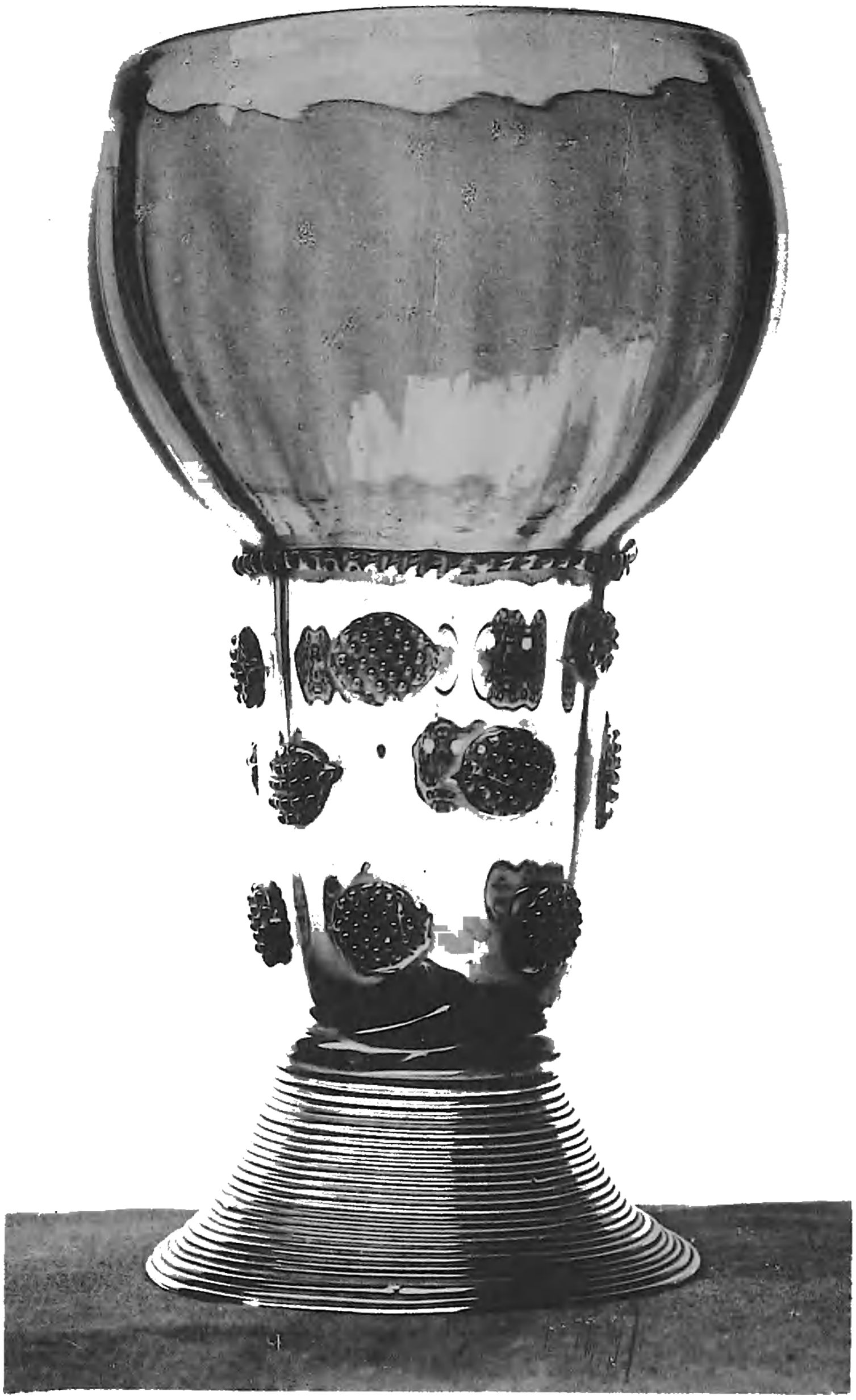

ROEMER OF GERMAN GREEN GLASS

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be traced upon that made in the north. This much we know—that in the fifteenth century, and perhaps earlier, the Venetian glass was largely imported into Germany, and this not only on the backs of hawkers, for the large Venetian firms had agencies in many German cities.[1] There were at that time depôts of the Venetian merchants at such comparatively remote places as the Silesian towns of Görlitz and Breslau, and early in the fifteenth century the Italian glass was sold in the market-place of Vienna. At this time, however, we are unable to trace any influence these importations may have had upon the local German glass—of this last, indeed, practically nothing is known. It would seem that it was not until the sixteenth century was well advanced that any attempt was made in Germany to compete with the Venetian *cristallo*. Like the mediæval glass of France and England, the earlier German glass was doubtless a mere household ware, of all descriptions the least likely to be preserved.

It was in Southern Germany—in Switzerland and Swabia, and still more in the wealthy towns of Augsburg, Regensburg, and Nuremberg—that the Italian influence, in the matter of glass as in the other departments of the arts, was most strongly felt. As early as 1531 the town council of Nuremberg granted a subsidy to promote the introduction of the Venetian methods of making glass. We are told that Augustin Hirschvogel (*d.* 1560), a member of the well-known family of glass-stainers, some of whom we shall meet again before long, was interested in the question, and, according to one account, he learned the secrets of the art at Murano. In any case, there exist specimens of what is undoubtedly German glass, decorated with coats-of-arms of local families, both the shapes and the enamelling of which carry us back to the Venetian enamelled glass of the early sixteenth century. Good examples of this ware may be found in

[1] Already in the fifteenth century the *vitra Veneciana* are distinguished from the *Vitrum silvestrum sive montanum*, otherwise *wald-glas*.

the richly enamelled pilgrims' flasks, of which there are examples in the Germanic Museum at Nuremberg and in the British Museum. In such specimens the Italian influence is seen not only in the beadings and the gilding, but in the nature of the metal itself. How strong this southern influence was in these parts in the second half of the sixteenth century we may see in the work of the contemporary goldsmiths. In the case of glass, however, the purely Italian forms seem to have been early abandoned, and the same may be said of the style of the enamels employed in the decoration.

Of a later time than these South German examples of enamelled ware are the even more definite copies of the sixteenth-century glass of Venice that were made in the neighbourhood of Cologne. Here we have deliberate imitations of the Italian models—tall-stemmed glasses of thin *cristallo* with wide-winged handles, the latter often of deep blue metal. There is a row of these *flügel-gläser*, as the Germans call them, arranged on an upper shelf in the British Museum; some of these may perhaps be referred to the glass-house at Dessau, where Italians were employed between 1679 and 1686, but as a whole such glasses must be of a somewhat earlier date than this. In any case, we must regard these *flügel-gläser* as exotic growths, which lie quite apart from the two great German groups of the seventeenth century—I mean, of course, the enamelled and the engraved glass.

In fact, the real influence of the new *cristallo* of Venice was exerted in another direction. People who had seen this clear white glass were no longer content with the thick heavy metal of varying hues of green, blue, and yellow, often full of bubbles and defects. Already early in the sixteenth century in various parts of Germany attempts were made to introduce the Venetian methods of working, above all the Venetian materials. Now the Germans of that day were a practical people, already well ahead in many of the technical arts, above all in those relating to mining, to the smelting of metals, and to the

arts du feu generally. After a moment of hesitation, instead of merely copying the formulas that they learned from the Italians, they adapted them to the conditions of their own country, and thus were soon able, in the central mountain districts among a population of miners and woodmen, to establish a glass industry quite independent of foreign aid. In France, on the other hand, and still more in England, up to the end of the seventeenth century, whatever glass of artistic character was produced was made for the most part by foreign workmen, and to some extent with foreign materials. Perhaps the most striking instance of the independent line taken by the German glass-workers may be found in the continued use of potash made from the beechwoods of their forests, and with this alkali they were soon able to produce a glass as brilliant and colourless as the soda-made *cristallo* of the south.

So far we have only got to the fringe of our subject; for the green glass of the Rhine and Holland can in no way be regarded as characteristic of German glass as a whole. Such glass I would rather class as Lotharingian, using that term for that central land that is neither French nor quite German. In so doing I am of course treading on delicate ground; but I am prepared to maintain that it is rather in a heavily enamelled *willkommhumpen* of plain cylindrical form from Saxony or Franconia than in a prunted *roemer* of green glass that we have a really characteristic type of the glass of Germany.

And this brings us to the question, to how much of this Central German glass the term Bohemian may be fairly applied? This at least may be safely said, that the expression 'German glass from the Bohemian frontier' would cover nearly the whole of it. What it is essential to remember is that with the exception of a small section of the engraved glass we have little to do with Prague and the Czecs of the central plateau of Bohemia. As a whole this glass was made by German-speaking people

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range was made much of the glass that supplied the rich Franconian and Bavarian cities.

And the mention of these towns brings us to this difficult question: How far was the enamelling and the engraving of the finer specimens carried out in the mountain valleys where the glass was made, and how far in the workshops of the cities to which the undecorated glass had been transported?

For the northern districts at least Herr von Czihak has brought forward much evidence to show that the artists in the local towns carried back to the mountain furnaces, to be there fired, the glass that they had painted with enamel colours, and that even the finer kinds of engraving were done in the upland villages where water-power was abundant. This was certainly the case in later days in the famous centre of glass-engraving that grew up at Warmbrunn, in the Hirschberg district of Silesia. On the other hand much glass was, it would seem, enamelled in Dresden, and in the south the finer work both of the enameller and the glass-engraver was probably executed in the studio of the artist—at Nuremberg, for instance, or in other Franconian or Swabian towns.

For the German glass of the sixteenth century we have fortunately the two already mentioned contemporary writers, both of them Saxons by birth—Georg Agricola and Johann Mathesius. Agricola, it is true, 'the founder of the sciences of mineralogy and metallurgy,' in his famous work *De Re Metallica*,[1] devotes only a few pages at the end of his last chapter to the subject of glass; but here may be found the first accurate drawing of a glass furnace that has come down to us. Agricola mentions that he had passed two years at Venice, and had seen much of the glass-working when there.[2]

[1] Published by Froben at Bâle in 1556; the dedication, however, is dated 1551.

[2] So Agricola states in the very last paragraph of his book. As this passage seems to have been sometimes misinterpreted, I will quote it in full from the original Latin edition. He mentions the various shapes that glass may be made to assume, and continues:—

'*Qualia opera multa praeclara et admiranda cum quondam biennio agerem*

GERMAN GLASS FURNACE.

SIXTEENTH CENTURY. GEORG AGRICOLA

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Indeed, what he says of the materials, of the source of the alkali above all, seems to have relation to the Italian rather than to the German glass.

But this is not the case with the furnaces, which he describes and illustrates. Agricola distinguishes three separate ovens: the fritting oven; the main oven, where the glass is melted in pots; and an annealing oven for slowly cooling the glass. These ovens, however, may be combined in various ways in smaller works, reducing the number to two or even to one. The fritting oven is a detached building of beehive shape, which is also used for annealing the pots. The main oven, eight feet in height and ten feet in diameter, is of a similar outline. The wood is burned on the floor of a lower chamber, without any grating of firebars; the flame passes through into an upper chamber, around which are arranged eight pots, each two feet in height, with a working-hole in front of each pot. From the back of this chamber a passage opens which conveys the heated gases to the quadrangular annealing oven.

Surely so much information has rarely been compressed into one print as we find in the main illustration to this part of Agricola's text (Plate XXXVIII.). Here at one working-hole (*fenestrella*) we see a workman gathering the glass at the end of his *fistula* or blowing-iron, another is shaping the gathering upon the marver at his foot, a third is vigorously blowing the *paraison* to the required size, and a fourth is swinging another round his head. On the ground lie scattered moulds of various forms, and here, too, we may discover the forceps (*pucella*) used in shaping the glass. To the right, in the

Venetiis contemplatus sum; in primis verò anniversariis diebus festis ascensionis domenicae cùm venalia essent apportata Murano; ubi vitrariae officinae omnium celeberrimae sunt: quas vidi cum aliâs, tum maxime cum certis de causis Andream Naugerium in aedibus, quas ibi habebat, uno cum Francisco Asulano convenerim.'

From this passage it would appear that there was a great sale of Muranese glass in Venice on the feast of the Ascension (cf. above, p. 216). Is this Naugerius, at whose house at Murano Agricola visited, to be identified with the famous poet and orator Andrea Navagero, from whose travels in Spain I have quoted on page 249?

foreground, lies a large wooden case closely packed with glass vessels of various shapes: we can distinguish, I think, bottles, alembics, and some prunted cylinders, which may well be the *Krautstrünke* of Mathesius. Above, to the right, the itinerant hawker marches off with a fresh supply of glass of all shapes arranged in an open-work crate strapped on his back. Finally, to the left, in a little office, the master discusses business with a customer over a foaming glass of beer—this last a truly German trait.

Our other source of information for the German glass of the sixteenth century is found, of all places in the world, in a collection of so-called sermons written by the friend, table-companion, and biographer of Luther—Johann Mathesius (1504-1565). Mathesius, after leaving Wittenberg, settled as pastor at Joachimsthal, a famous mining centre on the southern slopes of the Erzgebirge. These *Sermons for Miners*[1] are a strange mixture of what to us seem fantastic analogies drawn from the Bible, with matter of an eminently practical nature relating to the crafts and occupations of his audience. The title of his fifteenth sermon will give some idea of how he treats the subject:—'Of glass and the making of glass, and passages where it is mentioned in the Holy Writings, and how we may thereby call to mind both the fragility of our present bodies and the clearness and brilliancy of our bodies in the future state.'

A careful perusal of what both these writers have to say on the manufacture of glass leaves the general impression that in the first half of the sixteenth century Germany had not made much progress in that art. It is to Venice, in the first place, and then to Antwerp, that Mathesius turns for brilliant examples. At Murano, he tells us, they can actually make panes of glass 'through which from one's room one can see all that is passing in the street.' So too, he says, it is in that town and in Antwerp that is made the finest *schmelzglas* of all

[1] *Sarepta oder Bergpostil*, Nürnberg, 1562.

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Enamelling on German Glass

We are now able to form some idea of the processes by which glass was made in Central Germany about the middle of the sixteenth century, and when we come to examine the glass itself by the aid of extant examples, it will be found that this is indeed the date from which the start must be made, for there are few pieces in our collections that can claim a greater antiquity.

It was apparently not long before this time that the Germans began to apply enamels to their drinking-vessels whether of glass or pottery. Mathesius (1562) speaks of enamelling as a new art. 'The ready wit of man,' he says, 'is always finding something new; some have on the white glass painted all kinds of pictures and mottoes, and burnt them in, in the annealing oven,[1] as we find the "counterfeits" of great men and their arms *painted upon the panes that are set in our windows*.' This is an important passage which confirms what we might otherwise be led to infer—namely, that the origin of the enamelling that we find on the beakers of the German renaissance must be sought, not in the fifteenth and early sixteenth century enamelled glass of Venice, but rather in the new method of colouring window-glass that was at this time spreading all over Germany. I refer to the highly finished pictures, *painted in enamel colours* on white glass and subsequently burned in, which were now replacing, especially for secular use, the true lead-mounted stained glass of the old church windows. It was an easy step to apply this method of decoration to the cylindrical surfaces of the great tankards and goblets from which the German people drank their beer. Now it is not in Northern or Central Germany that we find the best specimens of these enamelled 'quarries.' The finest examples come from the south, from Nuremberg, from Swabia, and above all from

[1] A separate muffle-stove for this purpose was, it would thus appear, not yet available.

GERMAN GLASS.- WILLKOMM HUMPEN, ENAMELLED WITH THE EAGLE OF EMPIRE
SEVENTEENTH CENTURY

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Switzerland, at that time the home of a distinguished school of glass painters. And the same may be said of the glasses, though this is a point that has been somewhat neglected until quite lately. Both the *willkomm-humpen* and the *pass-gläser*—the broad and narrow cylinders—found in Swiss and Bavarian collections are, as a rule, much more carefully decorated than the quaint but rude glasses of what we must vaguely call the central district. Unfortunately we have no means of more definitely determining the place of origin of the latter class of beakers; in fact it may be said generally of the glass made on both sides of the mountains that encircle Bohemia, that there is little to distinguish the productions of the different centres, however far apart they may lie.

Now it is not too much to affirm that, as a whole, the enamelling on German glass is in every way bad. The colours are opaque; when not crude they are muddy and dull. It is almost too high praise of them to say that they look as if they had been painted on in oil-colours. Take, for example, an average *adler-humpen*, such a one as the big beaker in the British Museum (Slade, No. 835). A mustardy yellow, that takes the place of the gilding that is absent in the main painting, is predominant; there is then an opaque blue, crude and unpleasant, and a dull maroon, which—and this is universally the case on these glasses—is the nearest approach we get to red. Apart from these colours we find only browns and drabs of undecided tints. So much for the main decoration; but if we now look carefully we find round the neck something that takes us back to Venice—a delicate scale pattern of fine powdered gold, and above this a line of beading with little pearls of various colours. This band of exotic ornament is seldom absent, at least in the earlier specimens.[1]

[1] This part of the decoration we may indeed regard as a survival of the Venetian influence that was dominant in the middle of the sixteenth century. Of this I have already spoken.

There is no need to say much of the shapes of these enamelled glasses, for they are almost invariably of a more or less cylindrical form, with a foot of the simplest character; covered glasses are comparatively rare. They may be divided for our purpose into the broader beakers (often with curved sides and sometimes of great capacity) on the one hand, and on the other the narrower straight-sided tall cylinders. Much ingenuity has been devoted by German writers to the identification of the names by which these glasses were known in the sixteenth and seventeenth centuries, and they have attempted to distinguish between the *spechter*, the *bröderlein*, the *Kraut-strunk*, the *pass-glas*, the *humpen*, and the *willkomm*. On the other hand, the term *wiederkomm* or *vidrecome*, given by so many English and French writers to the large broad forms, is unknown in Germany, so that I think the expression may be definitely abandoned and replaced by the word *humpen* or *willkomm humpen*. *Narren-gläser*—fools' glasses—says Mathesius, would be a better name for these huge beakers that a man can hardly lift. The tall, narrow cylindrical form, when divided by horizontal lines, is known as a *pass-glas*. The *spechter* of Mathesius has been identified with a glass of this shape, sometimes decorated with square nail-headed studs. These *spechter* came from the Spessart forest district (west of Würzburg), and they form, as it were, a link between the prunted green glass of the Rhine and the enamelled beakers of Central Germany.

There is a small group of enamelled glass of very uncertain origin which claims attention here. We are concerned with certain little ewers, either of colourless or more often of deep cobalt-blue glass; they are generally mounted in metal, but the handle is always of glass. There are several examples of these ewers in the British Museum, many of which bear dates ranging from 1577 to 1618. The cobalt-blue glass has, by Dr. Brinckmann, been traced back to the glass-houses of Neudeck Platten, on the Saxon-Bohemian frontier. In

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ENAMELLED BEAKER

GERMAN, ABOUT 1600

ENAMELLED JUG WITH PEWTER LID

GERMAN, END OF SIXTEENTH CENTURY

the treatment, however, of the enamels on these little jugs, we are reminded of some of the work executed by the Altarists in France. The enamelling is of a somewhat more pleasing character than that which we find on the big beakers; white, yellow, green, and red are applied without shading. A favourite subject is a stag-hunt or the coursing of a hare, and at the side is often found a graceful lily of the valley[1] (Plate XL. 2).

To return to our broad cylindrical glasses—the huge *humpen* and the smaller *kanne*, both of which indeed sometimes take the form of a barrel or a truncated cone [illegible] usual, on the basis of the decoration, to divide these beakers into the following classes:—

1. The *Reichs-adler Humpen*. On these, the double-headed eagle, displayed, with imperial crown, occupies nearly the whole surface of the glass. A big crucifix covers the breast of the bird, though this is replaced in some examples by the ball of empire. The arms of the seven electors and of the forty-eight members of the *Heilige Römische Reich* are arranged in a definite order along the outstretched wing feathers[2] (Plate XXXIX.).

2. The *Kur-fürsten Humpen*. Here, on the upper zone, the emperor on horseback rides in front of the three spiritual electors—the four lay princes follow below. In other cases the kaiser sits on his throne, with the electors on either side.[3]

3. The Fichtelgebirge glasses, on which a mountain landscape is rudely indicated. None of these glasses can be attributed to an earlier date than the second half of

[1] This flower, the *Mai-glöcklein*, is frequently seen on German enamelled glass, and is the more conspicuous as it is almost the only flower realistically treated. I may note that M. Schuermans would appear to regard the presence of these *fleurs de lys*, executed in enamel, as essentially a sign of Low Country origin; they are, however, frequently accompanied by inscriptions in German.

[2] [illegible] heraldic right of the birds' heads a shield bearing a cross and the inscription [illegible] *Rom*.

[3] On a [illegible] *humpen*, or rather *kanne*, of this class in the British Museum, dated 1611, we find only three secular electors—those of Saxony, the Palatinate, and Brandenburg; the place of the fourth (Bohemia) is occupied by the imperial eagle.

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the seventeenth century. A good example in the British Museum shows the Ochsenkopf, one of the highest peaks of the district, as well as the four rivers that issue from its slopes. A padlock hanging by a gold chain over the mountain points to the treasures therein contained: as an often-repeated inscription says:—*An Eisen, Erz und Holz, thut mann viel von ihm ziehen.* Many of these beakers, and perhaps others of a similar character, may be referred to the glass-houses of Bischofsgrün, which are situated at the foot of the Ochsenkopf.

In spite of the crudity of the enamels and the rudeness of the design, it is impossible to deny that there is a certain attraction in the intensely German character of the decoration on these three groups of glasses, which thus form a class by themselves. They smack of the soil and of the simple German folk who made them. The earliest example known, an *adler-humpen*, is dated 1547, and differs little in the quality of the enamel from the later specimens, which range down to the beginning of the eighteenth century.[1]

There are in the British Museum two remarkable tankards which, though they do not fall under any of the above divisions, may well be mentioned here. On one we see an elaborate hunting scene: in the centre the net is spread and the game is being driven in by dogs and beaters (Plate XLI.). On the other is a strangely crude representation of the Last Supper, in the arrangement of which, however, Leonardo's famous design may still be traced.

Before treating of the big glasses painted at Dresden and of those of the South German school, I may well say something of the second class of cylindrical vessels,

[1] Herr von Czihak mentions that he has seen in the museum of Freiberg, in Saxony, a covered *humpen, painted in oil-colours*, protected apparently with some kind of lacquer. The glass is dark green, and the Gothic character both of the metal cover and of the painting points to a date not later than 1500. The subject, according to a quaint inscription, has relation to '*Eneaspius der Babst*' (the Pope Pius II., 1458-1464), and to the '*Roemischer Kaiser Friderich der dritt*' (*Schlesische Gläser*, p. 101).

GERMAN GLASS. WILLKOMM HUMPEN. ENAMELLED WITH HUNTING SCENES
ABOUT 1600, A.D.

the seventeenth century. A good example in the British Museum shows the Ochsenkopf, one of the highest peaks of the district, as well as the four rivers that issue from its slopes. A padlock hanging by a gold chain over the mountain points to the treasures therein contained: as an often-repeated inscription says:—*An Eisen, Erz und Holz, thut mann viel von ihm ziehen.* Many of these beakers, and perhaps others of a similar character, may be referred to the glass-houses of Bischofsgrün, which are situated at the foot of the Ochsenkopf.

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of which the most important sub-division is formed by the *pass-gläser*, the tall narrow beakers divided by stringings of glass or by enamelled rings into a series of zones. These glasses played an important part in the drinking contests of the time. It would seem—to judge from the lengthy verses, commencing and ending in all cases with the word *vivat*, found on many of them—that it was required of the drinker to swallow at one draught the liquid contents of each zone, neither more nor less. At other times the drinking was apparently regulated by the dealing of cards. There is a remarkable example of the typical *pass-glas* at South Kensington: it is divided into twelve zones by quilled threadings of glass. The simple decoration of hearts, roses, and wreaths, as well as the long inscription, is painted in white enamel.

A somewhat later group of enamelled glasses may be traced to Dresden, to the *Hof-kellerei* of the Saxon electors, whose arms these glasses bear. The painting on them, though of no great artistic merit, is somewhat less rude, more 'urbane,' in fact, than that on the previous examples. They form, indeed, a transition to the carefully executed Nuremberg glasses. There are several examples of these Saxon beakers in the British Museum. A fine covered *willkomm* (Slade, No. 843) bears the portrait of the elector John George as well as of the four Saxon dukes, all booted and spurred, and with plumed hats on their heads. This beaker is dated 1656, the year of the elector's death. Another, a *pass-glas* (Slade, No. 847), has the arms and initials of Augustus the Strong, king of Poland (1697-1733); the four zones into which this glass is divided, each holding about half a pint, are indicated by numerals, calling to mind, says Mr. Nesbitt, the peg tankards of the sixteenth century. Another example, dated 1658, also from the Slade collection (No. 851), a goblet with the arms of the elector of Saxony, encircled by the garter, is remarkable for the glass being externally striped with opaque white bands in obvious imitation of the *vetro di trina*. There is a

somewhat obscure reference to German glass so decorated in the often-quoted sermon of Mathesius, and of this passage much has been made by German writers.[1] I doubt whether the imitation was in any case more than superficial, and I do not think that, at least before the middle of the seventeenth century, any example of German glass can be pointed to which is really built up with rods as in the case of the true Venetian lace glass.

There is a large class of painted beakers on which the decoration has reference to the occupation of the original owner, and among these the *zunft-becher*, the guild or corporation glasses, hold an important place. These glasses date, without exception, from a comparatively late time, when among the upper classes the new engraved crystal glass had taken the place of the enamelled ware; already by the end of the seventeenth century the latter had come to be regarded as somewhat *bourgeois* in character. However that may be, these *humpen* bearing the arms of the guilds and quaint representations of the trades and industries are among the most interesting of their class. Many of these *Innungs gläser* are still preserved in the halls of the trade guilds. Herr von Czihak mentions several instances of this in Breslau and other Silesian towns.

In Southern Germany the Venetian influence was not only more early felt, but, what is of greater importance, it continued in play for a longer time, being continually renewed by fresh importations of the Italian glass. The art-loving dukes of Bavaria, Albrecht v. and his successor Wilhelm v., in the second half of the sixteenth century, did much to promote the manufacture of glass on improved methods. Strangely enough, however, we

[1] What Mathesius states is, 'The white [*i.e.* colourless] glasses have now become common over which white threads of white colour are carried; these glasses are made in Silesia.' Herr von Czihak (p. 96) says that he has seen many such glasses of somewhat rude make in that province. It will be remembered that some of the *vetro di trina* made at Murano is also only superficially decorated.

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differs in many respects from the heavily painted *humpen* and *pass* glasses of which I have been speaking. In the British Museum may be seen certain tall cylindrical beakers which may be taken as examples of this South German glass. The metal is colourless but somewhat grey, and, as in the northern glasses, a delicate scale pattern of gold with scattered pearls of enamel forms a ring below the upper margin. But now we find the gold used freely in the rest of the decoration also, replacing the coarse yellow enamel of the northern beakers. The colours are purer and more effectively combined, and we see among them a green of good quality. In the case of the two beakers from the Slade collection in the British Museum, the figure of Jacob Praun on one glass, on the other that of his wife, stand detached in the field; there is no other decoration apart from the heraldic bearings of this Nuremberg family (these are on the other side of the glass) and the above-mentioned gold band. I may add that the Nuremberg enamellers showed a superlative skill in the treatment of these elaborate coats-of-arms backed with fluttering mantlings.

Of the larger *humpen* and *pass* glasses painted with allegorical or sometimes comic subjects, we have no good examples in our English collections. A beaker in the Germanic Museum at Nuremberg, showing the ten ages of man in as many compartments, is an exceptionally good example of such work. The drawing and composition of the subjects on these larger South German glasses are carefully carried out—the colouring, however, is generally poor; in the later examples, indeed, it tends to pass over to the monochrome or *grisaille* class, of which I must say a word before finishing with these enamelled wares.

The school of *grisaille* painters on drinking-glasses, founded towards the middle of the seventeenth century by Johann Schaper, is in many ways closely associated with the contemporary engravers on glass. Like the latter, the *grisaille* painters followed the pseudo-classical,

the 'Italianising' style, rather than the old German traditions. Schaper, who came from Harburg on the Elbe, settled in Nuremberg in 1640, and died there in 1670. His manner of work, founded on copper-plate engravings, was much admired at the time, and he is in the next century mentioned among the famous artists of Nuremberg by Doppelmayr in his *Nachricht von den Nürnbergischen Künstlern.* Schaper, he says, '*auf die Trinkgläser . . . gar delicat mahlte,*' burning in his work afterwards so successfully that he surpassed all his contemporaries. He painted—round the sides of small tumblers and wine-glasses, for the most part—landscapes, figures, and heraldic bearings, either in black or a warm sepia, signing his work with his initials. There are some small examples of the glass enamelled by him at South Kensington. The large goblet in the British Museum (Slade, No. 860), painted with a cavalry combat, is of a considerably later date, but it shows that Schaper's influence continued into the eighteenth century; in this case, however, the *grisaille* is heightened in places by touches of colour. The tall *pass*-glass (Slade, No. 859), painted with an elaborate procession celebrating the birth of a Bavarian prince, belongs, on the other hand, to quite another school. It is dated 1662, and Schaper's influence had probably not reached Munich by that time.

Painted and Gilt Glass

Before passing on to the many-sided subject of engraved and cut glass, a word must be said of certain applications to glass of painting and gilding which were much in favour in Germany in the seventeenth century. I have here to deal with a miscellaneous class of objects; indeed the chief connecting-link between them is the fact that the decoration is in no case fixed by fire.

Single sheets of glass may be simply painted at the back, and 'fixed' by means of a transparent varnish. Such plates, painted with Biblical or allegorical subjects,

may be seen let into the panels of the elaborately carved and inlaid cabinets of the time. It cannot be said that the effect of this *pausch glas Malerei*, as it is sometimes called in Germany, is very satisfactory. It is indeed merely a debased variety of what used to be known in France as *verre églomisé*; the term *fixé peint* has also been used for work of this kind.

The gilding that was so plentifully applied to the German engraved glass of the seventeenth and eighteenth centuries was fixed by a 'cold' process, by simply attaching the gold-leaf by means of a varnish. For the most part it is only when applied to the sunk part of an *incavo* decoration that this gilding has survived.

The gilding, however, has been more effectually preserved in the case of another cold process which came into vogue before the end of the seventeenth century, and rapidly spread from Bohemia, or perhaps rather from Silesia, to various parts of Germany. In the case of these *zwischen gläser* we are taken back to an old process, already known to the Alexandrian Greeks. The plan adopted in no way differs in principle from that made use of in the decoration of the beautiful bowls from Canosa, now in the British Museum (see p. 46).[1] Very inferior to these in artistic merit are the little footless tumblers, with designs in gold, often hunting scenes, which seem to have been made on both sides of the Silesian-Bohemian frontier before the end of the seventeenth century. These are built up of two glasses, both somewhat tapering and both cut into an equal number of perpendicular sides, so that when the smaller of the two was inserted into the interior of the larger the glasses fitted exactly, and could not rotate one upon the other. The inner glass being somewhat the taller, we find the ring of junction, which is generally concealed by a band of gold, about half an inch or so below the top of the glass. The edges are so

[1] On the other hand, the technique of the cemetery glasses differs essentially, as in these the two plates of glass are fused together, on the edges at least (p. 92).

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CHAPTER XVII

THE GLASS OF GERMANY—*continued*

German Cut and Engraved Glass—The Ruby Glass of Kunckel—Milch Glass

I HAVE still to describe the origin and development of a method of decorating the surface which forms, I may almost say, the last main division in the artistic history of glass. For when I come in subsequent chapters to treat of Dutch and English glass—and with this my task practically closes—it will be found that this glass falls almost entirely under the head, and is in a general way an outcome, of the engraved or cut glass of Germany.

Here at the beginning I am confronted with a difficulty of a class only too often met with when treating of the technique of the minor arts—the difficulty of finding in our language suitable words to express, without danger of misconception and confusion, the practical details of the matter in hand. I have now to deal with the methods by which the surface of glass may be cut, polished, scraped, or eaten away, so as to form an artistic design. This, I may say at once, can be effected by any one of the following methods:—

1. By *scratching* with a diamond. I can find no other word; the term 'engraving' is vague and ambiguous; to use the word 'etching' is still worse, for though the result resembles in a measure the etched line on copper, this expression should be reserved for the process by which the surface is eaten away (the German *ätzen*) by acid.

2. By removing the surface by means of a small revolving wheel, or more rarely, of a cutting-tool, with the aid of emery or other hard powdered stone. The term 'engraving' may well be used here, if it is understood in the sense in which we speak of an 'engraved gem,' for small hard stones have been cut in this way from ancient times.

3. When, however, by means of a large wheel, the surface is deeply cut away, we may better use the words 'cutting' or 'carving.' The grinding down of the surface and subsequent polishing, as in the case of glass cut into facets, would fall into this division. It is, however, often difficult to say which of these terms—engraving, cutting, or grinding—it is preferable to use; nor is the use of the German words '*schleifen*' and '*schneiden*' much more definite.

4. By exposing parts of the surface to the fumes of hydrofluoric acid, the only acid that will attack glass. This process may well be called etching.

We have already spoken of the use of the diamond by the Venetians for scratching lace-like designs upon the surface of their thin glass, so unsuitable for other forms of engraving. The diamond point was early used in a similar way in Germany. Mathesius, after speaking of the imitations of the *vetro di trina*, made in his day in Silesia, proceeds to say that it is also the practice to draw (*reissen*) '*auf die schönen und glatten Venedischen gleser mit demand* [diamond] *allerley laubwerck und schöne züge.*'

This decoration with the diamond point was carried to great perfection in Silesia. Herr von Czihak has reproduced in his work on the glass of that country (p. 122) two tall cylinders of this '*gerissene glas*' (so it is called in contemporary inventories), which cannot be later than the sixteenth century. So, again, much of the glass of *cristallo* type made at Hall in the Tyrol was thus decorated.

But this process of drawing designs with a diamond

point on the surface of glass required the sure hand of an artist; there was no room for any '*pentimenti*'—moreover, the result was not effective.[1] Before long, in Germany at least, except here and there by amateurs, it came to be used merely as supplementary to the newly introduced processes of cutting, engraving, and polishing—that is to say, to the combination of methods concisely indicated by the Germans as *schliff und schnitt*. This was, indeed, a return to a very old treatment of the material much in favour in later Roman times. We have recognised in the so-called Hedwig glasses the last efforts of an art already extinct in the West and decadent in the East; but we have no link with which to connect these rude, deeply carved goblets with the engraved glass of the German renaissance. The Germans were, indeed, familiar with the processes employed in polishing the surfaces of hard stones, especially of their native agates (as in the Hunsrück district). This they effected in early days by rubbing on a board, the *schleif-platte*, and already by the middle of the fifteenth century by means of a grindstone (*schleif-stein*) turned by water-power. There is, however, no evidence to connect this industry with the new art of engraving glass, which arose, it would seem, full-fledged at Prague and at Nuremberg just before the commencement of the seventeenth century.[2]

There is, indeed, every reason to accept the origin of this art given by contemporary writers—that it was learned from the Italian carvers of rock crystal, who in the last years of the sixteenth century were working for the Emperor Rudolph II., that moody recluse and most un-

[1] This art was carried to the highest perfection in Holland by a group of cultured amateurs in the seventeenth century (see p. 295).

[2] We hear, it is true, of water-wheels for grinding glass at Schwäbisch Grund, in Bavaria, in the second half of the sixteenth century. In these mills large beads (perhaps we may think of the chevron beads from Murano in this connection) were ground for exportation to the Indies by way of Antwerp (Von Czihak, p. 125). I may note that there is no reference to the cutting of glass in either Agricola or Mathesius.

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Lehmann has informed us, that now some years since, with great strivings, with busy reflection, and not trifling cost, he discovered the art and practice of glass-cutting. And let it be known that the same C. L. shall have full liberty to carry on his art and work free and without let; and that no one, whoever he be, shall, without his consent, practise or deal in such art or work. And we request all the Electors, Princes, etc. etc., of the Empire to punish any infraction of this privilege with a fine of twenty marks of gold of true alloy.'

Lehmann, indeed, continues Sandrart, well deserved these privileges. Both he and his comrade Zacharias Belzer (they were both friends of Hans von Achen and Paul von Vianen, and for the most part they were lodged at court in one apartment) executed such excellent and artistic works in crystal and glass (some of which are still preserved in the Imperial Schatzkammer and also in the palace of the Elector at Munich) that they command the admiration of all connoisseurs.[1]

George Schwanhart the elder, says Sandrart, was the son of Johann, a skilful cabinet-maker and armourer, who made, among other things, exceptionally beautiful inlaid work of mother-of-pearl. George, who in his youth had learned cabinet-making and other arts from his father, acquired from the above-mentioned Lehmann a thorough acquaintance with the new art of glass-cutting. So much was he loved by Lehmann on account of his ingenious parts that the latter, before his death, bequeathed to him his privileges and rights as well as other property.[2] Schwanhart, after this time, further cultivated the art and much advanced it by various inventions, especially by the new 'smooth or polished cutting' (*hellen oder blancken schneiden*). His industry and skill obtained for him the praise and love of emperor, kings,

[1] The Schatzkammer at Munich is rich in examples of carved rock crystal of this period, but I can find few examples of carved glass in it. In the Imperial Museum in Vienna may be seen a superb series carved in both materials—the finest of these come from the Schatzkammer.

[2] Lehmann died in 1622, and the elder George Schwanhart in 1667.

and princes, as well as of all those who cultivated the arts and sciences. The late Emperor (Ferdinand III., 1637-1658) continued these privileges to his sons, Henry and George the younger, and gave to both of them appointments at court.

Now although, continues Sandrart, these artists had brought to perfection the art of glass-cutting as far as it depended upon judgment and drawing, yet in consequence of the too powerful and clumsy machinery made use of by them, even they were unable to give grace and charm to their work. When we consider the big heavy wheels that they were fain to employ—turned by those still flourishing weeds, their loutish assistants—we may well marvel at the work they turned out. Since that time the discovery of more convenient and efficient tools has brought it about that nowadays the art of glass-cutting is no longer a strenuous task, but rather a pastime. So that with intelligence and industry all the charm and softness of nature, whether trees, landscapes, animals, or portraits, may be by this art expressed. And yet these glass-cutters of to-day, with all their advantages, might obtain from their patrons still greater praise, were they to devote themselves more to the practice of drawing and to travelling about instead of marrying early and, as a consequence, having to work in the kitchen.[1]

Henry Schwanhart—I am still dependent upon Sandrart—who with his brother George inherited his father's privileges, has not only distinguished himself as a philosopher and a poet, but has carried the art of glass-cutting to greater perfection. He has succeeded in tracing on glass, landscapes and complete views of towns—the city of Nuremberg above all—in correct proportion and cunningly retiring perspective, as in a painted picture. Nay, with his subtle wit he has done what before was held to be an impossibility, he has discovered an acid (*corrosiv*) of such a nature that the hardest crystalline

[1] Compare with this the complaints, made at this time or a little later, of the artistic and social decadence of the glass-engravers in Bohemia and Silesia (p. 285).

glass yields to it, and like metals and stones, suffers itself to be corroded and eaten into.[1] He has quite lately given a complete proof of his skill in this art by etching all kinds of ornamental designs and inscriptions with the greatest neatness and precision. He has engraved, too, the human figure both nude and draped, and has brought it, as well as all kinds of animals and flowers, into high relief (*in erheben zehr hoch gebracht*).[2]

So far Sandrart, who was a contemporary of the younger Schwanhart, and I think that this long extract will give the reader some idea of the high esteem in which the art of engraving on glass was held at that time, as well as of the relation of the glass-engravers to the workers in other branches of art. The works of the Schwanharts are now, I believe, only to be identified in the case of certain examples of engraved glass in the Museum at Hamburg. Here may be seen a *roemer*, signed 'G. S. 1660.' The delicately engraved landscape on this glass, where the work of the diamond and that of the finest wheel are skilfully combined, would point to this being probably the work of the younger of the two Georges.

That even before the end of the sixteenth century there were engravers of glass in other parts of Germany, above all in Silesia, is very probable, but there can be no doubt that it was the connection of Lehmann and of the Schwanharts with the Imperial Court that first brought this style of decoration into favour with people in high station. In fact, for some time this engraved glass was made for the most part to the order of wealthy patrons. Besides those named by Sandrart, the Archbishop-Elector of Mainz and the Bishops of Würzburg and Bamberg are mentioned as patrons of the new art, and

[1] On the early use of hydrofluoric acid I shall have something to say a little further on.

[2] This is rendered in the Latin edition '*inque illarum exaltatione ad magnum ascendit gradum.*' It should, perhaps, be translated 'to a high pitch of excellence.'

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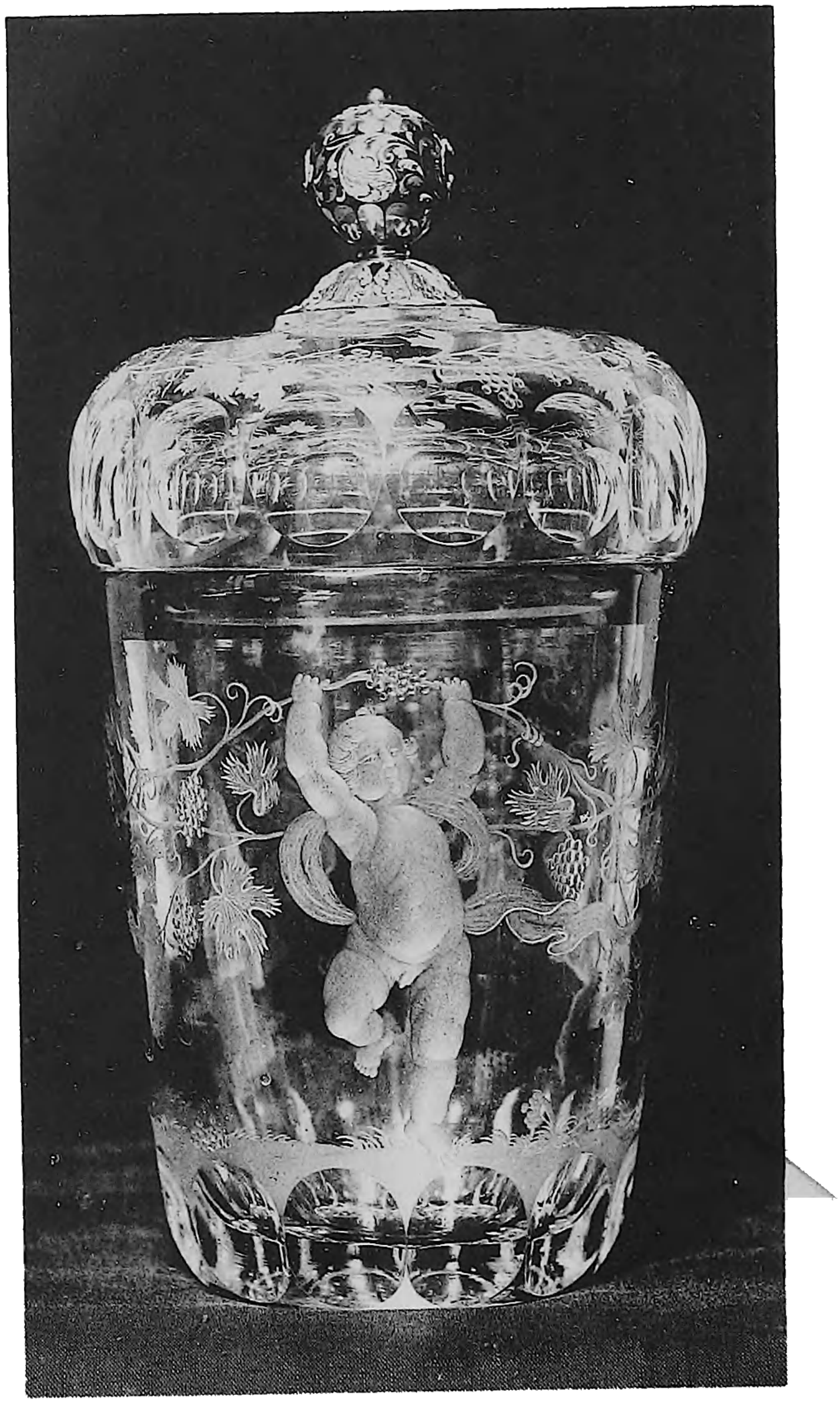

ENGRAVED BEAKER THE COVER WITH ENAMELLED METAL KNOB

large prices were given for the specimens of engraving.[1] One immediate consequence of the new fashion was to cause a demand for [illegible] glass, and this led to such [illegible] manufacture that the glass of [illegible] was recognised as the best in Europe.

From other [illegible] Schwanhart the elder [illegible], Hans, and Suzanne, who [illegible] engraving on glass of [illegible] especially of those examples of [illegible] Sandrart [illegible] these ladies, who were his contemporaries.

Many other names of engravers have been handed down to us,[2] but I will [illegible] Hermann Schwinger (1640-83), who was [illegible] and engraver on copper. We have in the [illegible] Museum (Slade, No. 883) a tall cup of thin [illegible] engraved with a Bacchic subject. [illegible] the diamond in small characters, [illegible] *Schwinger, cristall schnider zu Nürnberg.*

There has been much discussion as to the nature of the improvements effected by the Nuremberg in the glass-cutting machinery. But before the end of the seventeenth century the arrangement of the wheels and the dividing of labour were probably as the whole established much in the manner that we find in local works in Bohemia at the present day. In a general way we may say that there has always been a distinction between the mechanical processes of grinding and polishing and the more delicate and artistic work of the engraver. In the latter case the work is done by pressing the glass against the edge of a minute copper wheel. On the other

[1] There is an exceptionally engraved covered tankard of this period at South Kensington bearing the [illegible] of the Elector of Treves [illegible].

[2] Especially by [illegible] in his [illegible] *von der Nürnbergischen Mathematici* and [illegible] Nuremberg, 1732. A pretentious work, written in the French fashion of the [illegible] and very inferior as an authority to Sandrart.

PLATE XLII

ENGRAVED BEAKER. THE COVER WITH ENAMELLED METAL KNOP

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hand, the glass is ground down on a wheel of iron from three to eighteen inches in diameter, it is smoothed upon a stone wheel and finally polished upon one of wood, with the assistance in each case of suitable abrading mediums, whether emery, quartz sand, tripoli, or putty-powder.

As early as the seventeenth century these *glasschleifer* were divided into several more or less independent groups. The *eckigräber* did the coarser work. It fell to them, in the first place, to remove all irregularities on the surface of the glass—for example, the rough projections left on the foot where the pontil had been attached—and more especially to make the cross cuttings required to form the facets, which at a later time were so much in vogue. The *kugler* were another class of workmen, who prepared the shallow circular or oval pits which play so important a part in the decoration.

The work of the actual engraver belongs more to the domain of art. The cutting in this case is effected by a little wheel of copper from a quarter inch to an inch in diameter, revolving rapidly at the end of a horizontal spindle, moved by a treadle. These little copper wheels are of various forms, and not the least part of the skill of the artist lies in the selection of the form most suitable for the work in hand. The decision as to the depth of the engraved line, and again as to which part should be polished and which left dull depends also upon his judgment. His difficulties are increased by the fact that he is unable to follow the progress of the work in hand, for not only has he to press the glass against the under surface of the wheel, but the part of the surface on which he is working remains covered by the emery or other abrading material employed (Von Czihak, pp. 136-139). It will be noticed that as a rule the incised parts are left unpolished and dull as they come from the wheel, and that the polishing is reserved for the little circular depressions, the *kugeln*, which then show out like jewels cut *en cabochon*.

We are apt to associate this engraved glass with Bohemia, but to say nothing of the highly finished and artistic work done at Nuremberg and Regensburg, it is probable that in no other district has the engraving and cutting of glass become so much a distinct industry as in the Silesian valleys that descend from the highest peaks of the Riesengebirge towards the town of Hirschberg. As early as the commencement of the seventeenth century we come across an Italian engraver on rock crystal in the service of the Freiherr von Schaffgotsch at Schloss Kynast, and at the same spot towards the end of the century, in the employ of the same family, we find Friedrich Winter, who has the credit of being the first in this district to apply water-power to the cutting and polishing of glass.

Soon after this time there are many complaints of the decadence and vulgarisation of the art. Thus in 1708 a writer in a commercial paper complains that the engraved glass, which formerly was only to be found on the table of people of quality, had now become 'dirt-cheap,' and that the art of the glass-cutter was brought into contempt by the hawkers of glasses who scoured nearly the whole of Europe with their engraved wares. Whole chestsful of these commoner glasses, the writer says, were sent to Spain, and found there a good market (quoted by Von Czihak, p. 129). Sandrart, it will be remembered, some years before this, had uttered a protest against the *stimpler*—the bungling, ignorant workmen—who were ruining the art, and now we find the same expression used in the diploma of the monopoly that was granted to the above-mentioned Winter in 1687 by Count Christoph Leopold of Silesia.

Thanks in a measure to the energy of Winter and to the support given to him, the little town of Warmbrunn soon became known all through Germany as well for its cut glass as for the warm springs to which it owed its name. As in other parts of Silesia, the glass industry, after the separation from Bohemia, suffered from the

fiscal regulations of the new Prussian régime. Frederick the Great took an interest in the manufacture of glass, but this was shown rather in the encouragement and patronage accorded to the new glass-works that had been established nearer to his capital.

On the other side of the mountains also, at the end of the seventeenth century, some of the great Bohemian landholders were active in promoting the manufacture of glass on their estates. Of the Kinsky family and the town of Steinschönau (even to-day a great centre of the glass industry), we hear something in the curious account of his life left by a wandering glass-cutter, one Kreybich, who was born in that town in 1662. Kreybich, who had mastered the arts both of enamelling and engraving glass, carried his wares on his barrow all over Southern Germany. In his later journeys he pushed forward as far as Poland and Russia. As early as 1688 he is found in London, where, in spite of the competition of many new glass-furnaces (these, he confesses, turned out better metal than that which he had with him), he found a good demand for his engraved glass. When the wandering retailers of glass—we can hardly call them hawkers—returned to renew their supplies, then, says Kreybich, there was an eager demand from the glass-houses, and no less from the glass-cutters, the *kugler*, and the polishers. But not a few of these wandering glassmen carried, it would seem, their engraving-wheel and their tools with them, and engraved on the spot the arms or the initials of the purchasers of their glasses.

We may indeed regard the first half of the eighteenth century as the most flourishing period of the glass industry in Bohemia and Silesia. At the end of that time the Bohemian town of Haida—at the present day the centre of more than one branch of the glass manufacture—rose to importance, thanks to the fostering care of Count Kinsky. But the industrial and commercial element now came more and more to prevail. Enterprising manufacturers like Franz Weidlich of Steinschönau ex-

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that his contemporary Henry Schwanhart engraved glass by means of a '*corrosiv*,' and the statement is repeated with picturesque details by Doppelmayr. By covering part of the glass with a varnish and exposing the rest to these acid fumes, Schwanhart produced a smooth pattern on a dead ground. Certain calligraphic inscriptions on plates of glass, preserved in German museums,[1] were probably engraved in this way, but at the time the process did not come into general use. At a much later period hydrofluoric acid has been largely employed in England and elsewhere for engraving on glass. Still more recently this method has given way to the sand-blast. These are both, however, purely industrial processes that have little to do with art.

We have seen how close was the relation in early mediæval times between the quest of the alchemist and the art of the glass-maker—that part of the art above all that was concerned with the production of coloured pastes. So again at the end of the seventeenth century, when the search for the philosopher's stone, the universal medicine and other such nostrums, had again come into vogue in Germany, the glass-maker's craft is once more found in close relation with these ambiguous researches. This intimate connection is well illustrated in the history of Johann Kunckel, a man whose career in more than one aspect reminds us of that of Böttger, the discoverer of the secret of making porcelain. Böttger may indeed be regarded as Kunckel's successor at Meissen and Dresden, for both for a time held official positions as alchemist or arcanist at the Saxon court.[2] Kunckel was born in 1638 (or perhaps somewhat sooner) in the duchy of Schleswig. At an early age we find

[1] A circular plaque of this character, with a pious inscription, in the Germanic Museum at Nuremberg, has been ascribed to Henry Schwanhart. It is dated 1686 (reproduced by Gerspach, p. 266).

[2] We must remember that at this time little distinction was drawn between the researches of the chemist and the alchemist.

him in the service of the Saxon Elector engaged in the search for the philosopher's stone. He lectured, too, on chemistry at Wittenberg before a numerous audience. After the year 1677 he entered the service of Frederick William, the *Grosse Churfürst*. It was at Berlin about this time that his researches upon the transformation of matter led him to make inquiries into the colouring of glass, above all into the mysterious process by which glass could be stained of a crimson or purple tint by means of gold. That such a colour could be thus obtained had long been a tradition among the alchemists. In the old books the secret was dangled before the eyes of the student without being fully explained. The Saracens were probably acquainted with it; Agricola mentions the *ritzle*, the '*aurum quo tingitur vitrum rubro colore*,' and Neri refers to the red tint derived from gold.[1]

Not a little of the mystery that so long surrounded this ruby colour had its origin, no doubt, in the following facts:—1. The full tint is only to be got when an extremely minute quantity of gold is present. 2. The colour is not developed until the glass is reheated; on first cooling the metal is nearly colourless. It is scarcely necessary to point out how both these properties of the gold pigment must have appealed to the imagination of the alchemists, and have furnished them with arguments in favour of their transformation theories. Here, then, we have one explanation of the interest taken by these early inquirers in the processes of the glass-maker.

In 1679 Kunckel published his *Ars Vitraria Experimentalis*, a work which is indeed merely a retranslation into German of Merret's edition of Neri (see p. 219), with supplementary notes.[2] Not that Kunckel here fully

[1] The ruby glass of our old Gothic churches was, however, without exception obtained from copper. But the belief that it contained gold led in France to the destruction of much of this glass at the time of the Revolution.

[2] This book may be best consulted in the French translation, said to be by the Baron D'Holbach (Paris, 1752). Here we have in its final form the little book of

discloses the secret of his famous ruby glass—he draws back at the last moment. Orschall, however, his rival, a man of whom we are told that 'he took to polygamy and other irregularities, and died in a monastery in Poland,' in his famous tractate *Sol sine Veste*, first printed in 1684, is somewhat more explicit. *A propos* of his experiments with certain 'handsome vases in the style of porcelain,' he tells us that the milkiness of the glass with which the Oriental porcelain was imitated was only developed on reheating, and the same, he mentions, is the case with *the ruby colour of the glass containing gold.*[1]

Kunckel was settled by the Great Elector on the Pfauen-Insel, near Potsdam, and it was in the glass-houses already erected on the island that, surrounded with the greatest secrecy, he first made his famous ruby glass. After a time, however, constrained by what he calls '*die lüderliche Verkrämerung des Rubin-Flusses,*' otherwise by lack of gold, he passed over to the service of the Swedish king. He died at Stockholm as Baron Löwenstjern in 1702.

Kunckel's name has become attached to certain large ewers and beakers of ruby glass. He made, too, glass of a deep emerald tint, but specimens of this are rare. Some of his glasses—and these are perhaps the oldest—are carved in high relief; others are blown with great technical skill. Large sums were given at the time for examples of his work. The vases of blown glass took on classical forms, and were set in scroll mountings of silver

Neri, which has passed through the translator's crucible as many as four times—from Italian to English, then to Latin, to German, and finally to French. For there was, too, an Amsterdam edition in Latin (1668) which came between the English and Kunckel's version. But, unlike the gold of the alchemist, the work really increased in value during these transformations. Several curious treatises, in the manner of the time, half alchemistic, half scientific, are to be found at the end of the French translation, including a rendering into French of Orschall's *Sol sine Veste.*

[1] The somewhat obscure relations of these two men, Kunckel and Orschall, with Cassius, the reputed discoverer of the purple that goes by his name (as well as with the son of the latter), is explained by Beckmann (*History of Inventions*, vol. i. p. 126).

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gilt. But these mounted pieces are for the most part of later date than Kunckel's time, for glass of this kind was made at Zechlin and other places near Berlin up to the middle of the eighteenth century and perhaps later. A tankard of ruby glass in the British Museum (Slade, No. 869) bears the cipher of Frederick I. (1701-1713); in the same collection is another fine example (Slade, No. 868), a graceful ewer, set in a rococo silver-gilt mounting.[1] Among other specimens of this ruby glass in Lord Rothschild's collection is a tumbler-shaped beaker, 'frosted' on the outside.

As in the case of the porcelain made at a later time in Berlin, the Prussian glass as a whole is distinguished by its technical excellence and, compared at least to the bulk of the contemporary work, by a certain severity of form and decoration.

Much opaque white glass was made in Germany, as in other countries, in the first years of the eighteenth century. By this means it was hoped to find an equivalent for the Oriental porcelain, which had not yet been successfully imitated. At South Kensington may be seen a covered beaker of this *milch-glas* elaborately painted with a baroque design; more often, however, the decoration on such ware is in a pseudo-Chinese style. Von Czihak has extracted from the contemporary work of a certain Kundmann, a learned doctor and dilettante, a recipe for making this glass with human bones; this formula, the author states, he obtained from Kunckel (*Rariora Naturae et Artis*. Breslau, 1737). Kundmann claims for this glass, prepared from bones found in heathen burial-urns, that it surpassed in whiteness the best porcelain. On one of his glasses preserved in the museum at Breslau, there is a quaint Latin inscription. You are asked to offer a libation to those poor heathens

[1] If in the case of the bottle of ruby glass, with the arms of Saxony and the initials J. G., also from the Slade collection (No. 870), these letters are to be referred to the Elector John George (1656-80), Kunckel must have perfected his invention at an early date.

for whom, after suffering both on the field of battle and in the furnace of the glass-maker, the pains of hell are reserved. Kundmann had too, in his cabinet, some little glasses on which were engraved the tobacco-plant and other designs relating to smoking. These, he declared, were prepared solely from sand and tobacco ash (*Schlesische Gläser*, p. 62).

There is one important branch of the Bohemian-Silesian glass industry, of which before ending a word must be said. This is the manufacture of beads and other kinds of *verroterie*, as well as of glass pastes for artificial jewellery.

Paternoster Kügelchen were probably made from an early date: the art may have been learned from wandering Venetians. In Bohemia, *Betel-Hütten* ('bead furnaces') are mentioned early in the seventeenth century. At Winterberg, of eight glass-furnaces four are so described. Here we have the very word (*Betel*, from *Bete*, a prayer) from which we have formed our term 'bead.' But nothing quite equivalent to this last convenient word ever came into use in Germany. From the word *Paternoster-Kugel*, when at a later time the demand came rather for beads for personal ornament or for export, the Germans passed to the ambiguous expression *Perlen* or *Glas-Perlen*.

The manufacture of the more elaborate forms of beads by means of the blow-pipe—the *suppialume* process of the Venetians—spread slowly in the north. Doppelmayr (*op. cit.*, p. 226) states that the use of 'a little copper pipe fixed over a burning lamp' for making small objects of glass was first taught at Nuremberg by one Abraham Fino, who came from Amsterdam in 1630. The Dutch, he says, had been taught the art by a Venetian. Kunckel, on the Pfauen-Insel, was occupied in making beads for exportation to West Africa by the newly founded Brandenburg African Company. In the early years of the eighteenth century the competition with Venice was keen, but in this branch the Italians seem to have held

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CHAPTER XVIII

DUTCH GLASS OF THE SEVENTEENTH AND EIGHTEENTH CENTURIES

IN Holland the War of Independence does not seem to have interfered with the work of the glass furnaces already established in several of the towns by Altarists or Venetians. M. Schuermans, who has devoted a section of one of his letters to Holland (*op. cit.*, vol. xxix. pp. 147-66), finds traces of the Italians at Bois-le-Duc, Middelburg, Haarlem, and Amsterdam. But by the beginning of the seventeenth century there were already at Amsterdam glass-houses managed by Dutchmen. M. Henri Havard has found in the registers of the States-General mention of two Dutch glass-makers who obtained at this time a privilege for fifteen years to make 'glasses for Rhine wine in the shape of *roemers* as well as beer glasses' by certain new processes (*Oud Holland*, i. 182). For a time there was an active rivalry between the glass-makers of Amsterdam and Antwerp: at a later period the enterprising Liége family of the Bonhommes obtained a footing in several Dutch towns. But, as I have already said, the 'green glass' of the Rhine (not always necessarily green or even coloured) was from early times in favour in Holland, if indeed we are not to regard it as indigenous in the country. At a later period there is no doubt that most of the finer specimens were made there. It is glasses of this class, *roemers* in the first place, but also tall 'flutes,' that we see so often in the works of the Dutch painters of the seventeenth century. Those of a Venetian type, on the

other hand, though by no means absent, are much rarer than in the contemporary paintings of the Flemish school.

The Dutch seem above all to have esteemed the *ruimer* or *roemer*; on glasses of this shape the finest engraving and diamond-scratching were expended, and it was these glasses that they selected to mount on tall silver stands of elaborate workmanship. There are the *bekerschroeven* (beaker-screws), which may at times be seen on the buffet in a seventeenth-century Dutch interior. There are several fine examples of these trophy-like arrangements in the Rijks Museum at Amsterdam.

For us, seeing that we must confine ourselves to points of real artistic interest or historical significance, the glass made by the Dutch in the seventeenth and eighteenth centuries is of importance mainly under these two aspects: 1. That here the art of engraving, or rather scratching, with the diamond was carried to greater perfection than in any other country. 2. That starting from the close of the seventeenth century, the forms and methods of construction of the Dutch drinking-glasses (apart from the *roemer*) first greatly influenced, and then in turn were influenced by, our English glasses.

As in Germany, where the Emperor Ferdinand III. learned the art, drawing with the diamond on glass was in Holland practised as an elegant accomplishment by people in good position, and above all by ladies. Indeed we are here brought into contact with a cultured literary set, a *coterie* of which the members held a higher social, and perhaps intellectual, position than we can allow to the majority of the great painters of the day whose names are better known to us. Typical frequenters of this circle were the three sisters, daughters of Roemer Vischer, who were immortalised in the songs of Huyghens, Cats, and Hooft (Don Henriques de Castro, '*Een en ander over Glasgravure*,' *Oud Holland*, i. 286; see also Hartshorne, p. 48). A still more famous literary lady was Anna Maria van Schurman, who among so

many other accomplishments had, as Cats has recorded, mastered the art '*met een diamant op het glas gheestigh to schrijven.*'[1] Several good examples of the work of these ladies, which took the form for the most part of mottoes engraved with scrolls and flourishes on the bowls of *roemers*, are preserved in the Rijks Museum: some of these have been admirably reproduced by Mr. Hartshorne in his work on English glasses.[2]

Another interesting class of diamond-scratched Dutch glass is well represented in the British Museum. Here we find portraits of contemporary celebrities, of members of the house of Orange in many cases, together with coats-of-arms, scratched on the bowls of wine-glasses—either conical glasses of Venetian forms or tall narrow 'flutes.' Sometimes, indeed, designs of this character are found on winged glasses of purely Venetian type. Mr. Nesbitt was of opinion that these were made in Venice (Slade Catalogue, No. 891), but we now know, thanks to M. Schuermans' researches, that such glasses may well have been produced at this time in the north. The similarity in form of the bulbs or knops on the stems of all the glasses of this series should be noted: in no case is there any trace of cutting with the wheel on this part, still less of any facetting. On a thin funnel-shaped glass (Slade, No. 889) we have on one side the arms of England and Orange-Nassau impaled, on the other is a portrait of a lady in the costume of the middle of the seventeenth century, doubtless the 'counterfeit' of Mary, Princess of Orange, the daughter of Charles I. It is to her that we must refer the inscription in Gothic letters, '*Het Welvaren Van De Princes.*' In these Dutch glasses scratched with the diamond may be found per-

[1] There is a portrait of her in the National Gallery by Jan Lievens. See, for some account of her strange life, the note in the Official Catalogue (p. 305). Another supposed portrait of this lady in the same collection is by Gerard Dou.

[2] The 'Beaker with the seasons' in the British Museum (Plate XLIII.) is an example of the more elaborate work of these Dutch designers with the diamond. For though the inscription on this glass is in English, the decoration is undoubtedly by a member of the school of Roemer Vischer. The beaker is dated 1663.

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BEAKER WITH THE FOUR SEASONS IN MEDALLIONS

DESIGN SCRATCHED WITH DIAMOND. DATED 1663. PROBABLY NETHERLANDISH

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an eccentric genius who lived at the Hague. We know little of him except that he married in 1787, and died young in 1808. Glasses stippled with graceful designs by this master, somewhat in the manner of Bartolozzi, are perhaps less rare than those of Greenwood or Schouman. Some of his engravings are found upon goblets of flint glass with facetted stems, of English make, probably. On an example of his work in the British Museum a graceful female figure bears a scroll with the words, '*Werken van het genootschap. K.W.D.A.V.*'

The tradition of Wolf was carried on by Daniel Henriques de Castro, who died as late as 1862. The son of the latter artist, in an article on the subject in the first volume of *Oud Holland*, has collected some traditions bearing on the methods of execution of this now lost process. The author relates how he had come across an old man who had watched Wolf while at work on one of his glasses; according to his report, his only tools were an etching-needle and a small hammer. This is a matter of some importance, as both the late Mr. Nesbitt and Mr. Hartshorne appear to have taken it for granted that this delicate film-like engraving was produced, in part at least, by means of acid. But the two processes can hardly have been combined, and the effect is quite unlike that produced when the surface of glass is eaten away by hydrofluoric acid. It would, indeed, be quite impossible to produce such delicate work by any etching process of this latter kind.[1]

I shall have something to say of the Dutch wine-glasses of the late seventeenth and eighteenth centuries when I come to speak of the English glasses that were in a measure founded on them. Suffice to mention that already, before the end of the seventeenth century, we find on these glasses the welted foot and the baluster stem moulded and uncut, enclosing one or more 'tears'—forms that somewhat later passed over to England.

[1] For this Wolf's glass, as it is called in Holland, see the catalogue of the Rijks Museum. In this Museum, too, a portrait of Greenwood may be found.

CHAPTER XIX

ENGLISH GLASS OF THE SIXTEENTH AND SEVENTEENTH CENTURIES

IN an English work treating of glass, or rather of certain descriptions of glass, and that chiefly from the artistic point of view, what position in the book and what relative amount of space should be given to the glass of England?

The position is, indeed, readily defined, for our country has but slight claims to recognition as a producer of artistic glass until the commencement of the eighteenth century—indeed we may perhaps say until that century was well advanced. The consideration, then, of the glass of this country must be kept back until that of all the other European States—Italy, France, Spain, Germany, and the Netherlands—that have at one time or another produced glass of artistic importance has been dealt with.

As to the relative importance of our English glass and the amount of space to be allotted to it, this is a question difficult to answer. For a moment, no doubt, towards the end of the eighteenth century, it held the premier place in Europe, on the ground, above all, of the excellence of the material. Advantage was taken of certain exceptional qualities in the English flint or lead glass to produce a deeply cut, facetted ware, solid and brilliant, something undoubtedly *sui generis* and suitable to its place on the sideboard, or on the well-polished mahogany table when the cloth was removed. The flashing fire of the lights cast back from the skilfully arranged facets of the decanters and glasses, combined with the softer reflections from the silver plate to give

an undeniable charm and an individual stamp to these late Georgian dinner-tables. This play of lights has appealed to, and has been not unsuccessfully reproduced by, more than one painter of the present day. But this facetted ware, the one glory of our English glass, came late into vogue, at a time when the prevailing fashions allowed little room for any freedom of treatment, so that it is only rarely that we can find any merit in the forms and decorations of individual examples.

It is, however, to a somewhat earlier period that the modern enthusiast turns. His interest lies in the air-twisted stems, the folded feet, and the bell-shaped bowls of the drinking-glasses of the eighteenth century. Now these, though made of flint glass, belong mostly to a time before full advantage had been taken of the dispersive power of that material upon the rays of light. Here the question may well be asked—putting aside all matter of historical or sentimental interest—what can we say of these endless rows of glasses, classified and sub-classified on the ground of variety of stem or bowl, as *objects of art*? But this is a point upon which I should prefer not to deliver a definite judgment; I have said enough to indicate my personal standpoint. I can only refer the reader to the copiously illustrated work of Mr. Hartshorne on English glass, of which the larger part is occupied with this branch of the subject.[1]

It may be said that the history of English glass divides itself into two periods. For the first we have abundant documentary evidence—patents for new processes and petitions for or against these patents, to say nothing of notices in contemporary journals and memoirs—but against this an almost total absence of examples of the glass actually made. This period extends from the early days of Elizabeth almost to the end of the seventeenth century. In the second period, on the other hand—and this includes nearly the whole

[1] A more recent work—the *English Table Glasses*, by Mr. Percy Bate—is concerned with little else than a minute classification of these wine-glasses.

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There was another centre of the glass industry in East Sussex, in the country to the north of Hastings. In a mediæval document concerning Beckley, in this district, the name Glassye Borough occurs. At these woodland glass-houses, for many generations, the wandering pedlars, the 'glass-men,' had been wont to renew the stock of 'vrynells, bottles, bowles, cuppis to drinck and such lyke,' that they hawked along the country-side. You may send, says Thomas Charnock in his *Breviary of Philosophy* (1557), to Chiddingfold, to the 'glassemaker,'

> 'And desire him in most humble wise
> To blow thee a glass after thy devise.'

That is to say, that the glass-blower, as we have seen in other cases, worked from the patterns provided by his customers.

Camden says of the Sussex glass that in his time it was only used 'of the common sort.' Possibly the Sussex glass-blowers made quarrels and bull's-eyes for windows also;[1] this, however, was an industry that centred rather in London, especially in Southwark. Now it was above all the demand for larger and better made panes for use in the new mansions with spacious windows—the 'glass houses' of the proverb about throwing stones—that were now springing up on every side, that gave the most powerful impulse to the introduction of the newer methods of working glass that had already taken root in France and in the Low Countries. It must be remembered that in the preparation of the stained glass for church windows large pieces were not required. Considerable artistic skill in this branch would be quite compatible with a very primitive method of blowing and

[1] But it is recorded that a Chiddingfold glass-maker (*à propos* of the introduction of Lorrainers) confessed that he could not make window-glass — only 'mortars, bottles, and orinaux.' I cannot accept the explanation of the last word as 'water globes placed in front of rushlights' (see *Sussex Glass*, by Charles Dawson, *Antiquary*, 1905); like the vrynells mentioned above, it came through the French from the mediæval Latin *urinalia*. Compare the list of objects given on p. 134.

'flashing' the glass. At this time the new industry—the making of large sheets of broad-glass, that is to say—was centred in Lorraine, in the country stretching from the Vosges to the Ardennes; in a lesser degree in Normandy. It is uncertain in what the superiority of the '*verre en tables quarrées*' made by the Lorrainers consisted; there is no positive proof that they had as yet adopted the German cylinder process (see pp. 129 and 234 *note*), though this is in every way probable.

The French glass-workers who came to England belonged, for the most part, to the old noble families. We find in our English documents some of the very names—Hennezel, for instance—that occur in the famous *Charte des verriers* granted by John of Calabria, son of King René, in the year 1448 (see p. 230).[1] When these foreigners are mentioned in our English documents they are invariably described as gentlemen or esquires.

We must remember that in the sixteenth century Antwerp held a commercial position something like that taken later by Amsterdam and London: the town was, above all, the centre of the glass trade. It is not surprising then to find that it was through the medium of an Antwerp merchant, one Jean Carré, that the French glass-makers were now introduced into England.[2] Carré, in association with a certain Briot, brought over both Normans and Lorrainers, and the quarrels and disputes that soon broke out appear to have had their origin in the fact that the men to whom the first patents were

[1] According to the Rev. A. W. C. Hallen (*Scottish Antiquary*, 1893) there were four noble stocks of glass-makers in Lorraine. These were the families of Hennezel (which claimed a Bohemian descent), of Thietry, of Du Thisac, and of Le Houx. So in Normandy we find the names of De Bongar, De Caquery, Le Vaillant, and De Brossard. Representatives of nearly all these families appear to have come to England before the end of the sixteenth century, and their names, often strangely corrupted, have been unearthed from parish registers and other documents in many parts of England. The Lorrainers, at least, seem to have been all of them Calvinists.

[2] There had been an earlier unsuccessful attempt at introducing Italian methods, of which I shall have to speak shortly. The Frenchmen do not seem to have come into contact with Verzelini, who was at the time making Venetian glass in London (see below).

granted were not practical workers themselves, and that they were therefore dependent on others.[1] In any case, before the year 1570, gentlemen of Lorraine bearing the well-known names of Hennezel, Du Thisac, and Le Houx, as well, probably, as representatives of the Le Vaillant and other Norman families, were making glass in more than one spot in the Weald as well as in London.

But these proud, hot-headed foreigners do not seem to have been popular in Sussex. There were frequent petitions against the destruction of the woods to supply the fuel for their glass-houses, and we hear of an attempt made to rob the 'outlandish men' that made glass near Petworth and to burn their houses. Before 1576, then, the Lorrainers were already in search of forests where they could work without hindrance; they began that long peregrination that took them by way of the Hampshire woods to the Forest of Dean, and finally to Stourbridge and Newcastle.[2]

Some remains of a glass-house at Buckholt Wood, on the line of the old Roman road between Salisbury and Winchester, had long attracted the attention of antiquaries before a satisfactory explanation of their origin could be found. Large quantities of broken window-glass, as well as fragments of glass of many other kinds, including some of distinctly Venetian type, had at times been dug up. These remains, doubtless, represent a store of 'cullet' or old broken glass destined to be remelted, and therefore not necessarily all of it made on the spot. Fragments, too, of the glass-pots were found, of a greyish-white clay not of local origin. It is only quite recently that with these discoveries have been associated certain entries in the registries of the Walloon Church at Southampton (these were published a few years ago by the

[1] We may, however, probably identify the Antwerp merchant, Jean Carré, with the 'John Carry, M^r^ of ye Glashouse,' who was buried at Alford, in Surrey, in 1572.

[2] The history of their wanderings has been pieced together chiefly through the researches of Mr. Glazebrook (see his privately printed *Collections for the Genealogy of the noble families of De Hennezel, etc.*, 1877); of Mr. Hallen in the *Scottish Antiquary*, 1893; and of Mr. Holmes in the *Antiquary*, 1894.

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for the windows of the new renaissance houses,—somewhat later, perhaps, for the windows of 'glass-coaches' also.

Already early in the sixteenth century not a few examples of Venetian and, perhaps, even of Oriental glass, may have found their way into the houses of the wealthy. But we must regard as quite exceptional—the result, probably, of some passing whim of the king—the collection of 371 pieces of glass that were in 1542 in the possession of Henry VIII. These are described under the head of 'Glasses and sundry other things of erthe' in an inventory of certain valuable effects in the Palace at Westminster (*Archæological Journal*, vol. xviii., 1861). Among them there is mention of flagons, basins, ewers, standing-cups, cruses, layers, spice-plates, and even forks and spoons of glass. Many of these pieces are described as 'jasper-colour'—these were probably of a kind of *schmelz*—and there is frequent reference in the list to 'blue glass' and 'glass of many colours.' A 'layer' with the initials 'H and A engraven on the cover,' as well as a cup with 'Quene Annes sipher engraven on it,' had doubtless belonged to Anne Boleyn. The following items are of some interest:—

'One thicke glasse of christall with a case of lether lined with crymson vellat.'

'Three aulter Candlestickes of glasse.'

'Oone Holly-water stocke of glasse with a bayle.'

'Twelve bottles of glasse with oone cover to them all wrought with diaper work white.' By this last expression are we to understand some kind of *vetro di trina*?

Finally, 'One rounde Loking Glass sett in a frame of wood, vj cornered, painted under glass with the armes of Ingland, Spayne, and Castile' carries us back to the days when Catherine of Aragon was queen. Of this method of decorating the frames of mirrors with inlay of glass painted on the inner surface I have already spoken

I would again refer the reader to the mirror in the Arnolfini Van Eyck at the National Gallery.[1]

The earliest notice that we have of Venetian glass-workers in England carries us back to the year 1550, and it takes a form that is characteristic of the times. This is a petition to the Council of Ten, that has been found among the Venetian state papers. It is signed by no less than eight Muranese glass-workers, imprisoned in the Tower of London: they declare that they are threatened with the gibbet if they fail to work out their contract. These poor men were indeed between the devil and the deep sea; for did they delay their return to their homes they were liable, by a newly issued edict, to a long term in the Venetian galleys. It was only by the personal intervention of the young king that some arrangement was finally made that allowed of these Muranese glass-workers returning unmolested after working off part of their contract. One of these men indeed elected to remain behind, but he before long made his way to the Low Countries, and this first influx of Venetian workmen seems to have led to little as far as English glass was concerned.

Cornelius de Lannoy, from whom Cecil hoped so much, was perhaps as much an alchemist and a universal schemer as a worker in glass. He was set to work at Somerset House in 1564, but with little result, it would seem. He attributed his failure to the clumsiness of the English workmen and to the want of a suitable clay for his glass-pots.

It is to Jacopo Verzelini, a man evidently of some energy and resource, that we must give the credit of first successfully making the Venetian *cristallo* in England.

[1] It is just possible, remembering the many exchanges of presents between Henry and Francis, that a part at least of this collection may have had some connection with the '*quatre cens beaux verres de Venise gentillisez des plus jolies gayetez que verriers sçauroient inventer*,' which were in 1532 in the possession of Robertez, treasurer to the French king (Nesbitt, *South Kensington Catalogue*, p. clix).

When in 1575 he obtained a patent 'for the makinge of all manner of counterfayt Venyse drinkinge glasses' (but not, it would appear, of glass for windows), he was already established in London. Stow, writing a little later, says: 'The first making of Venise glasses in England began at the Crotchet Friars, about the beginning of the reign of Q. Elizabeth, by one Jacob Vessaline an Italian.' The Friars Hall, he tells us, 'was made a glasse-house, wherein was made glasse of divers sorts to drincken.' It was in this same hall probably that the unhappy craftsmen of Edward VI.'s time had been set to work. Verzelini, like other glass-workers of the period, reached England, it appears, by way of Antwerp. At any rate he was married to a lady of that town, of good family, who bore him twelve children. This we know from the monumental brass to his memory that may still be seen in the little church of Down in Kent, where in the year 1606 he was buried.

We see, then, that before the death of Elizabeth the making of both hollow ware and window-glass by the new methods was firmly established in London and in the provinces. Great complaints had already arisen of 'the making of glass by strangers and outlandish men,' and we hear of 'the timber and woods spoiled by the glass-houses.'[1] The same difficulty arose as in France. It was argued that the foreigner should be required to take native apprentices. But there is evidence that as late as the first quarter of the seventeenth century, the making of the better kinds of glass, the 'Christalline Morana Glass,' was still in the hands of Italians. This we have seen was for long the case in France as well. But we in England were in a measure dependent upon the foreigner for our window-glass also, this time upon the Lorrainer.

Of glass made in England during Elizabeth's reign I can point to a goblet now in the British Museum.

[1] For example, in an abortive act brought into the House in 1585, but not passed. Quoted by Mr. Hartshorne, p. 159.

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in 1610, but this was a very general document, vaguely worded. More precise was the patent granted the next year to Sir Edward Zouche, Thomas Percivall, and others. It was under this patent that the process was perfected, probably at the glass-house at Lambeth, under the charge of Percivall. Only a few years later, in 1616, English coal was brought into use at the glass-works of St. Sever, near Rouen, very likely through the mediation of one of the Norman glass-workers settled in England.

There were many difficulties to be overcome before this pit-coal could be used with success. Greater care had to be taken in the selection of the materials for the pots —perhaps without the Stourbridge clay success would not have been attained—and it was found to be necessary to 'close the pots,' that is to say, to use a covered crucible so as to protect the glass from the smoky, sulphurous gases given off by the coal. The credit of the invention of these closed pots, with the mouth at the side facing the opening of the furnace, is also to be given to Percivall.

I dwell on these practical details for a special reason. In the first place, the use of coal and the consequent change in the form of the crucibles mark the beginning of English glass as a distinct *genre*. Again, this change is closely connected with a further and still more important step—the use of lead as an essential constituent in a new kind of 'metal,' the famous English flint-glass of later days. It is these two novelties that form our contribution to the technique of glass-making. Not that I can find any proof that lead-glass was made in England at so early a date. But on the one hand the use of a covered pot rendered it more difficult, at that time at least, thoroughly to melt the contents, and therefore favoured the use of a more fusible mixture; on the other, in the case of a glass containing lead, it is above all essential to protect the 'metal' from the fire.

The history of the progress of glass-making in England from the early days of Elizabeth to the outbreak

of the Civil War in the next century, is chiefly concerned with the licences and patents granted to a succession of English and foreign 'adventurers.'[1] No doubt there were many abuses in this system; but it is impossible to overlook the fact that the Cecils and the other advisers of the Queen were enabled by such means to encourage the foundation of many industries, and this chiefly by the help of foreigners. For at the beginning of Elizabeth's reign we had fallen sadly behind in the matter of the industrial arts. Not only France and Italy, but Germany too and the Netherlands, had much to teach us.

Already, however, before the death of the Queen and still more in the next reign, there arose, as I have said, a great popular outcry against the monopolists, and this feeling of indignation found an echo in more than one of James's parliaments. It is the more strange, therefore, to find that it was during this reign that the whole glass industry of the country fell for the first and last time into the hands of one man. But this was no other than Sir Robert Mansell, Admiral of the Fleet, a man of exceptional energy and a born fighter, one who had in early life had more than one brush with the Spaniards. King James, when approached on the subject of Mansell's glass monopoly, marvelled that 'Robin Mansell being a seaman, whereby he hath got so much honour, should fall from water to tamper with fire.'

The first we hear of Mansell in this connection is in the year 1615, when we find him associated with Sir Edward Zouche, Thelwell, Percivall, and others in a patent for making glass with sea-coal. But before this he had probably for some time been interested in certain London glass-works. And now before two years had elapsed he had bought out all his partners[2] and com-

[1] The most important of these documents are given in full in the Appendix to Mr. Hartshorne's *English Glasses*.

[2] On the other hand, Howell in a letter dated March 18, 1618, quoted in part below, speaks of Mansell as working his patent with 'My Lord of Pembroke and divers others of the prime Lords of the Court.' He had, it would seem, replaced the early adventurers and schemers by men of wealth and of influence at court.

menced his reign as 'glass-king.' This monopoly, in spite of frequently renewed opposition, Mansell succeeded in maintaining up to the time of his death in the days of the Protectorate. He hunted down the local glass-houses where wood, now forbidden by law, was still employed. He granted licences to some of the Lorrainers working at Stourbridge and elsewhere, while—as at Newcastle, where he had glass-works under his direct management—he took others of these foreigners into his employ. In London, on the other hand, at the glass-furnaces of Winchester House, which he now took over, Sir Robert employed Italians.

We here come into contact with another and not less interesting man, James Howell, like his master Mansell, a Welshman.[1] Howell was in 1618 'steward of the glasse-house' in Southwark, but he was glad to change this position for that of traveller for Mansell in Spain and Italy; for, so he writes to his father, 'I should in a short time have melted away to nothing among these hot Venetians.' His duties were now to obtain workmen from Italy, and the raw materials, especially the 'barillia,' from Spain. In the following year he brought over one of the famous Miotti family from Middelburg, and not long afterwards we find him writing from Alicante an interesting account of the 'Barillia, a strange kind of vegetable that grows nowhere upon the surface of the Earth, in that perfection as here.' 'The Venetians have it hence,' he continues, and he proceeds to give a detailed account of the method of preparation (Book I. section I. xxv.). Howell's letters from Venice are most interesting, and have provided many 'elegant extracts' for later writers. For instance, there is a passage in which he speaks of 'lasses and glasses,' and of the

[1] Beside the passages quoted above there are many references to glass, including an interesting account of Murano, to be found in his *Epistolæ Ho-Elianæ*. Howell edited these early letters of his while confined (for debt, it would seem) in the prison of the Fleet, at the time of the Civil War. We may note among other things a reference to a 'curious sea-chest of glass,' and again we hear of a lady writing to Murano for 'a complete cupboard of true crystall glass.'

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in rivalry with the Venetians; finally, with English materials, window-glass and 'green-glasses.'

There is nothing in all this, or indeed in any of these patents and petitions, to point to the existence of lead-glass at this time. The use of barilla, I may add, is incompatible with the preparation of a lead-glass; in such a glass it is essential that the alkali should be potash. On the whole, during the long period of the Mansell monopoly (from 1615 to, say, 1655) little progress appears to have been made in the manufacture of glass, but of course we must make allowance for the times of civil strife that filled the latter part of this period.

After the Restoration the issue of patents began again. Everything points at this time to a renewal of interest in Venetian glass. When, however, in 1663 the Duke of Buckingham obtained his licence, his claim was based upon the improvements he had made in the looking-glass plates and in the plates for the glass-coaches. As in France, sheets of large size and good material were now in demand for both purposes. It was somewhat later, it would seem, that he turned his attention to making hollow ware in the Venetian fashion. Although nitre, a salt of potash,[1] played an important part in the glass made by the duke, there is no proof that any use was made of red lead or of litharge. Evelyn, who in 1673 visited the duke's 'Italian glass-house at Greenwich where glasse was blown of finer metal than that of Murano at Venice,' says nothing about such substances being employed.

But in spite of this progress in the home industry, the importation of chests of glass from Venice was at its height in the reign of Charles II. This we see from the correspondence of a London glass merchant, one John Greene (1667-1672), with a Venetian firm, which has fortunately been preserved.[2] Along with these letters

[1] I am not sure, however, that when at this time the word nitre is found we are always justified in understanding by it saltpetre or nitrate of potash.

[2] *Greene-Morelli Correspondence*, Sloane MSS. Mr. Hartshorne has reproduced eight of these letters (*English Glasses*, Appendix xxix.), and has devoted three plates to the reproductions of Greene's patterns.

were found the 'office copies' of the patterns which Greene sent out to Venice as a guide to the glass-blowers. Here we have mention of 'clouded calsedonia glasses' for beer, claret, and sack, 'creuits with or without feet, brandj tumblers,' and 'glasse floure potts.' Not the least interesting item is the 'Rhenish wine glasse,' which is illustrated by a typical roemer with prunts on the stem, almost our only evidence of the use of these goblets in England. Greene advises his Venetian correspondent that the looking-glasses and the coach-glasses are to be packed at the bottom of the cases to escape if possible the search of the custom-house officials. What especially strikes one in examining the patterns of the drinking-glasses, which form the bulk of the orders (Hartshorne, Plates 30-32), is the fact that the stem or shank, so important a part of the eighteenth-century glass, is not yet developed; the conical bowl is separated from the foot by a simple or fluted bulb, or sometimes by two such bulbs or knops.

But this Venetian trade had now seen its best days; there are some hints of a falling off in Greene's last two letters (1671-1672). On the other hand, during all this period the enterprising glass firms of the Netherlands kept up a close intercourse with England. As early as 1662 a patent for making various kinds of glass was obtained by one John Colenet, whom Mr. Hartshorne has very plausibly claimed as a member of the great glass-making family of Ghent and Namur, the De Colnets, so often mentioned in the letters of M. Schuermans. A few years later the tables were turned, for now the De Colnet firm was fain to engage an Englishman to produce '*verre à l'Angleterre.*' In 1680 the great rival firm of Liége, the De Bonhommes, according to a document quoted by M. Schuermans (Letter vii.), was already making '*flint-glass à l'Anglaise.*'

Now this statement brings me face to face with what is the great crux in the history of English glass—the question, namely, when and where lead-

glass was first applied to the manufacture of hollow ware.

But first I must say a word of a little book published in 1662. This is the already-mentioned translation by Christopher Merret of the *Arte Vetraria* of Antonio Neri (see p. 7). Merret, who was a man well abreast of the science of his day and an early, if not an original, member of the newly founded Royal Society, has supplemented Neri's series of recipes with certain 'Observations' of his own. Here may be found some curious information concerning the materials used in the manufacture of the *cristallo*, for it is with this glass that the author is chiefly concerned. Merret does not appear to have had much acquaintance with the glass made in England in his day. For the practical details of the furnace and for the processes of glass-blowing he takes us back to Agricola. Both Neri and his translator are indeed for the most part occupied with the nature and preparation of the materials, and with the various methods by which glass may be coloured.[1] Neri, like all the old writers, knew of the merits of lead-glass in the preparation of pastes for the manufacture of artificial gems; in his sixty-first section he tells us: 'Glass of lead, known to few in this art, as to colour is the finest and noblest glass at this day made in the furnace. For in this glass the colours imitate the Oriental gems, which cannot be done in crystal. But unless diligence be used all sorts of pots will be broken, and the metal will run into the furnace.' Upon this passage Merret observes: 'Glass of Lead! 'Tis a thing unpractised in our furnaces, and the reason is because of the exceeding brittleness thereof.' Lead, he continues, is indeed the principal ingredient in the glaze of the potter, 'and could this glass be made as tough as Crystalline, 'twould far surpass it in the glory

[1] The same may be said of the treatise on *The Art of Glass* by Haudicquet de Blancourt, of which the English translation appeared in 1699. There is little or no advance on Merret in this book, and nothing is said of the application of lead-glass to hollow ware. An interesting plate showing the implements used by the glass-blower may, however, be found here.

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example of this lead-glass to which an earlier date than the first or second decade of the eighteenth century can be attributed. Indeed everything points to the English flint-glass of the last quarter of the seventeenth century being a form of the Venetian *cristallo*.

In any case it is essential to bear in mind that both in chemical composition and in physical properties no two things could be more unlike than the *cristallo* on which the early flint-glass, properly so called, was founded, and the lead-glass which afterwards usurped the name.[1] The one is a typical soda-lime, the other an equally definite potash-lead glass, and the materials had to be sought for from entirely different sources.

The above-mentioned Mr. John Houghton, who every week, in the commercial paper edited by him, published an article on some technical or scientific subject, in the spring of 1696 devoted a series of these 'leaders' to the subject of glass. After some general reflections on the substance, when we are told, among other things, that 'Vitrification is the last mutation of bodies of which Nature is capable and from which there is no going back,' in his issue of May 2 he takes up the main subject. 'According to my information,' he tells us, 'we are of late greatly improved in the art of *Glass-making*. For I remember the time when the Duke of *Buckingham* first encouraged *glass-plates*, and *Mr. Ravenscroft* first made *Flint-glass*.[2] Since then we have mended our Window-glass and outdo all abroad. And what e'er may be said against *Stock-Jobbery*, yet it has been the Means to raise great Summs of Money to improve this Art.' Again, on May 16 we are given a carefully classified list of ninety glass-houses existing in England. Of these, twenty-four were in London, nine

[1] The confusion is increased by the fact that on the Continent the term 'cristal' was now transferred to the lead-glass.

[2] This was the Ravenscroft who took out a patent in 1674, and together with an Altarist, a De Costa (the sole representative of that Ligurian town, says Mr. Hartshorne, that we meet with in English records), made glass from calcined flints, nitre, and borax. There is certainly no question of lead in this case.

at Bristol, seventeen at Stourbridge, and eleven at Newcastle. These glass-houses he divides into those for looking-glass plates, for bottles and for '*Flint, Green, and Ordinary*.' Now the rational inference from all this seems to me to be that Houghton, *who was in a position to know*, knew nothing about lead-glass. The flint-glass houses are classed together with the 'green' and 'ordinary,' and flint-glass for him was glass made from flints.

So, as we have seen, Haudicquer de Blancourt, writing in France a few years earlier, knew nothing of lead-glass other than that used for objects of *verroterie*. It is at least evident that if our own glass-makers had mastered the art before the end of the century, the secret was well kept.[1]

But before proceeding further, it may be well to form some definite idea of the composition of lead-glass and of the physical properties that led to its replacing in great measure the soda-lime glass of Venetian type. In the first place, as I have said, it is essential that the alkali in this glass (in the manufacture of hollow ware, at least) should be potash, and it was, perhaps, the fact that the lead was at first used along with soda that so long delayed the production of a 'metal' suitable for the manufacture of blown-glass. Again, the potash in the case of lead-glass must be something quite different from the impure material employed for the old green glass; this crude alkali contained, among other bases, a large percentage of lime. Saltpetre appears to have been used in the first place, and then a more carefully lixiviated form of vegetable ashes known as pearl-ash. The amount of lead oxide may vary from 28 to 40 per cent., and the specific gravity of the resultant glass from 2·8 to 3·6.

[1] Mr. Hartshorne, I should add, while acknowledging that there is no definite allusion to the use of lead in any document of the seventeenth century, traces an indirect reference to it in a patent taken out by one Tilson as early as 1663; in this document, however, I can find nothing pointing in that direction.

The great merit of lead-glass lies in its absolute transparency and brilliancy, combined with a certain darkness in the shadows. This brilliancy and fire, it is well to point out, are only indirectly dependent upon the refractive power exercised by the glass upon the rays of light that pass through it; in this respect lead-glass differs little from rock crystal or from the Venetian *cristallo*. But one quality it has which distinguishes it from all other kinds of glass as well as from nearly all transparent natural stones, the diamond, of course, excepted. This is the power possessed by it of *dispersing* the rays of white light: the elements of which this light is composed in passing through lead-glass are bent aside in *different degrees*, so that the issuing ray is broken up into its component colours. This it is that gives fire, but this fire is only fully brought out by means of facetted or angular surfaces. On this point—the distinction between refraction and dispersion—a good deal of confusion exists. The following table, which I borrow from a little book on gems by Professor Church, may help to clear up this point:—

	Refractive Index.	Comparative Dispersing Power.
Diamond, . . .	2·75	44
Flint-glass, . .	1·57	36
Rock-crystal, . .	1·55	14
Plate and crown glass, .	1·52	15

We here see that lead-glass or flint-glass has little greater refractive power on light than rock crystal or the ordinary plate and crown glass of commerce which belongs to the same family as the *cristallo* of the Venetians. In dispersive power, on the other hand, it stands apart from both these substances and rivals the diamond in scattering the component rays of white light.

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prunts, may be as old as Charles II.'s reign. When one calls to mind the picturesque pottery—the slip-ware—that was made at the time, it would seem not unlikely that in the local glass-houses something similar may have been attempted in glass.

We have, of course, plenty of glass wine-bottles, a few of which may date as far back as the reign of Charles I. These bottles are mostly of a black impure glass and of a globular form, squat and compressed at the sides, reminding one of the leather *botel* from which our word bottle is derived. Similar bottles are found in the Low Countries, and they may often be seen in Dutch pictures. The introduction of the practice of bottling wine, as far as England is concerned, is generally connected with Sir Kenelm Digby, that universal genius who, in the reign of Charles I., was occupied with so many branches of the arts. Drinking-bottles of this description, dating from the seventeenth and eighteenth centuries, are often dug up while excavating the foundations of houses. An extensive collection, chiefly of local origin, may be seen in the Guildhall Museum, and Mr. Hilton Price has a representative series derived also from excavations in the city. The surface of these bottles is often covered with an iridescent scale giving them an appearance of great age. A circular stamp bearing the maker's name is sometimes found on the shoulder, but these stamped bottles are in all cases, I think, of later date. There is a small collection of these stamps in the British Museum.

I have already pointed out that during the reign of Charles II. the prevalent form of the drinking-glass was still of the old Venetian type. The stem was almost non-existent; it was at best represented by a spherical bulb connecting the two cones—the upper one often truncated, the lower very shallow—that formed respectively the bowl and the foot. In the Spanish Netherlands, before the end of the century, another form became prevalent: the stem now assumes more or less a baluster

form, divided from the bowl by a distinct shoulder; the knop of this stem is often hollow, and generally duplicated. In some cases a silver coin is found lying loose in this hollow bulb. Such a form we may perhaps regard as the starting-point for the vast and varied series of English drinking-glasses which constitutes the principal element in a collection of English glass.

Since the drinking-glass forms so important a part in the history of our native glass, perhaps it may be well to turn for a moment to consider the process by which a vessel of this sort is made, the more so as we are told by a high practical authority that in the manufacture of a wine-glass every principle of glass-blowing is illustrated (H. J. Powell, *Principles of Glass-making*, 1883). Wine-glasses, says Mr. Powell, may have either a 'straw shank or stem' pulled out from the substance of the bowl itself, or more often a 'stuck shank' made from a separate piece of glass subsequently added to the bowl; again, the foot may be either blown or cast.

I will take as an example a wine-glass with a 'straw shank' and a blown foot. 'The glass for the bowl is first gathered and blown to the required shape. Upon the centre of the base of the bowl, which is still attached to the blow-pipe, a small quantity of molten glass is skilfully dropped from the end of a working rod [the pontil]. Part of the added glass is formed into a small button by the grip of the spring tool [procello], and the residue is pulled out into the stem. In the meantime a smaller bulb has been blown and its extremity fixed to the end of the stem from which the button has previously been removed. The smaller bulb is severed in the midst and the cup-shaped remnant adhering to the stem is reheated, opened by the insertion of one point of the spring tool, and by rapid rotation thrown out into a disc or foot by the agency of centrifugal force.' The pontil is now attached to the foot by means of a seal of molten glass, and the upper bulb (the future bowl of the glass) 'wetted off' from the blowing-tube by the application of

a moistened iron. The glass, held by the pontil attached to the foot, is completed by reheating the severed edges of what is now the bowl, cutting them even with the shears and rounding them by a second exposure to the fire. The now completed wine-glass is finally separated from the pontil by a jerk and taken to the annealing oven. A rough edge remaining where the pontil was attached is at the present day invariably smoothed by grinding; not so, however, in the case of the older glasses, and this is a point to be noted by the collector. In Germany and Bohemia the rough edge of the bowl after shearing is ground even on the wheel instead of being rounded off in the furnace, and foreign-made glasses may be often distinguished by their more angular rim.

We shall now be in a better position to attack that extensive and complicated series, the drinking-glasses of the eighteenth century. Mr. Hartshorne, who in his *Old English Glasses*[1] has treated the subject in great detail, mentions incidentally that he has made more than a thousand full-sized outlines of glasses that have passed through his hands. We must be content, then, to accept the classification of such an authority, although some of the divisions may seem a little arbitrary to one who has no claim to be an expert. Thus out of sixteen families of English eighteenth-century glass there are only two that contain any objects other than drinking-glasses in the narrower sense of the word; again, four or five of the groups are based chiefly upon the liquor—wine, beer, mead, mumm, syllabub, cider, cordial water, or punch—that these glasses were presumably made to contain. In a division of glasses from this latter point of view I

[1] In this work there are more than a hundred quarto pages devoted to the eighteenth-century drinking-glasses. Perhaps of greater interest to the 'average man' is the information given in the final chapter concerning the liquids drunk from these glasses, to say nothing of the apt quotations from old letters throwing light on the social habits of the time to be found in the notes. Another vast series of eighteenth-century glasses, more than seven hundred in number, I believe, has been collected by Mr. J. Webb Singer, chiefly in the neighbourhood of Bristol. These are well illustrated in a paper by Mr. E. Wynn Penny in the *Burlington Magazine* (Sept. and Nov. 1903).

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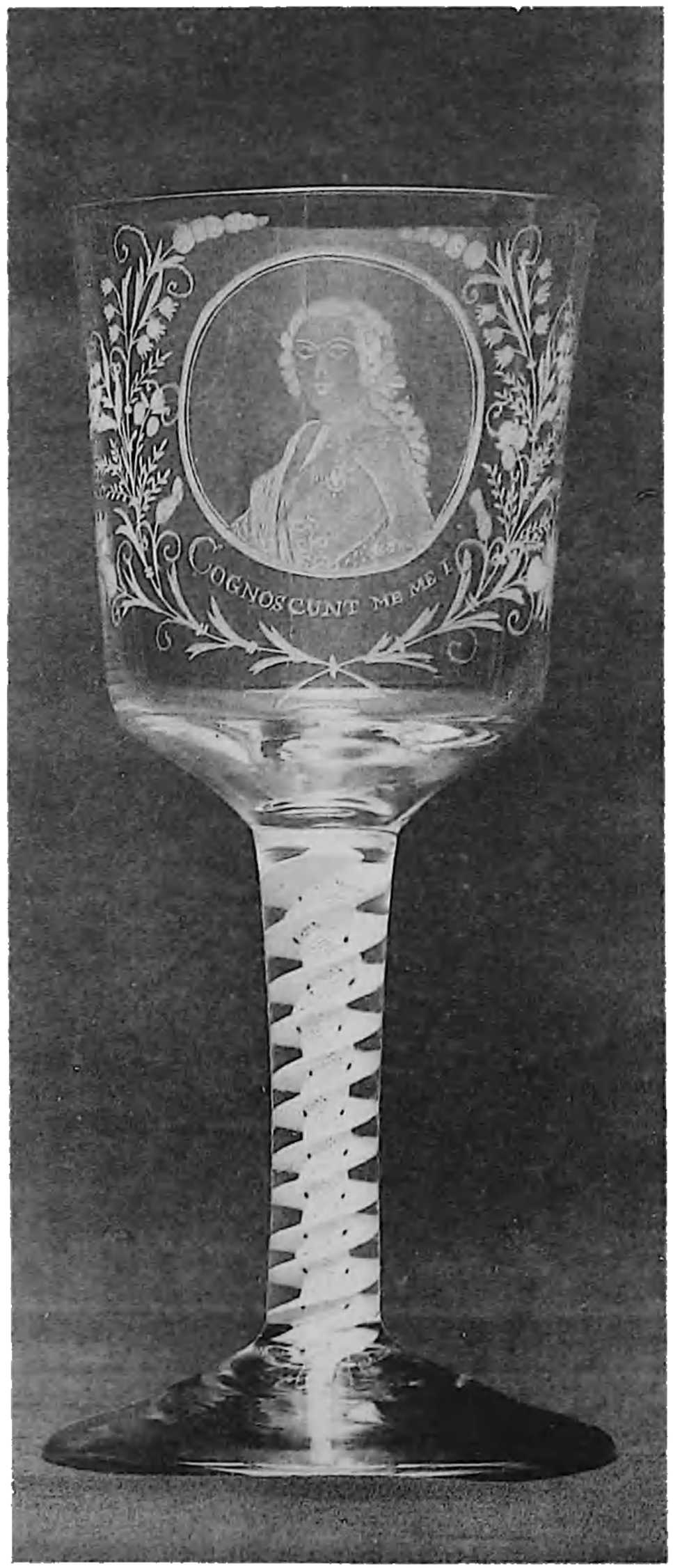
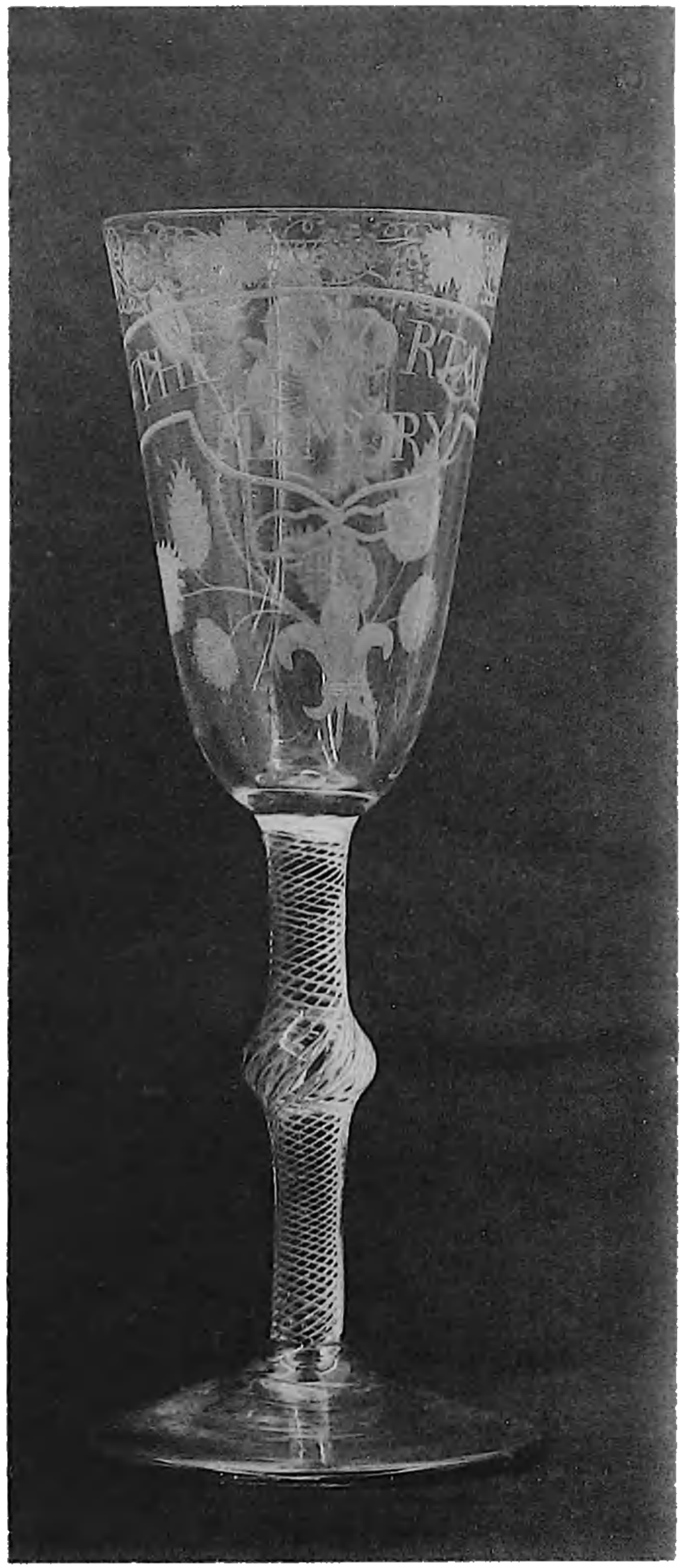
only variation of importance in the shape of the foot depends upon its greater or less flatness; in the earlier glasses the central part generally rises up to form a dome, upon which rests the base of the stem. The square bases with plinth-like steps belong to a much later time and are generally associated with facetted ware. It may be noted that the glasses of the eighteenth century stand on the whole on a relatively wider foot than those now made.

The first point of importance in considering the stem is to distinguish those that are drawn—these are the 'straw-shanks,' formed of the same piece of metal as the bowl—from the 'stuck-shanks' that are made of a separate piece of glass. The latter form by far the larger class. As regards the outline, the stem may be either a plain rod or cylinder, or again of baluster shape—this last but a modification of the double knops that constitute the whole shank of some seventeenth-century glasses. In other cases the stem is marked by spiral lines in relief—that is to say, it is 'rib-twisted,' or, finally, it may be cut into flat facets. But perhaps the most important division of the stems of our English glasses is that based upon the nature of the spiral lines of greater or less complexity so generally found in the interior of the cylinder of glass. These lines may be formed either by strings or bands of opaque white, or more rarely of coloured glass, or again by empty threads formed by drawing out a bubble of air. These are the opaque-twisted and the air-twisted stems respectively.

If now we turn to the outline of the main division of the glass, the bowl, this has been made the basis of a division that classes these bowls as straight-sided, waisted, bell-shaped, and finally, bowls with a curve resembling either the ogee or the double ogee of the architect.

The air-drawn stem, if not an English invention, was certainly brought to great perfection here at an early period. We must seek the origin of this device in the





1 3

ENGLISH WINE GLASSES

EIGHTEENTH CENTURY

WITH SIXPENCE OF QUEEN ANNE WITHIN THE HOLLOW KNOP 2. ENGRAVED WITH PORTRAIT OF THE PRETENDER AND JACOBITE MOTTO 3. THE ULSTER "IMMORTAL MEMORY" GLASS

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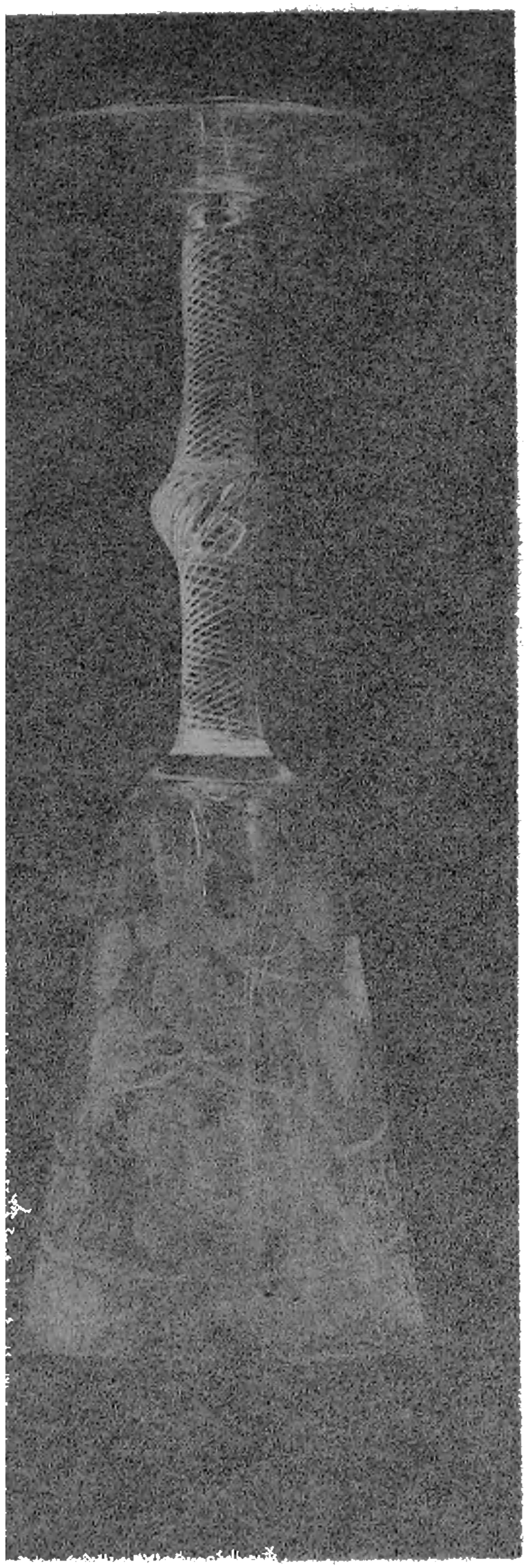

large 'blows,' often of very irregular shape, that fill the knop or bulb on the stems of earlier glasses.[1] This 'blow' is sometimes prolonged into a sort of tail which passes down nearly to the foot. In other cases we find several smaller 'tears' in the same bulb, formed, it appears, by puncturing, while it is still soft, the little mass of glass destined to form the bulb, and then covering it with a second gathering. These air-headed stems are mostly of Low Country origin; but they are of interest to us, as we may probably regard them as the starting-point of the air-twists which are formed by drawing out and twisting the original spherical mass, containing one or more of these bubbles or tears. It may be mentioned that in a general way a loose, widely spaced spiral is characteristic of the earlier glasses, while the tightly twisted stems are only found on late examples. This applies also to the spirals on the rib-twisted stems of plain glass. There is another point that should not be overlooked: this is that the twist on eighteenth-century glasses always descends from right to left, while in modern imitations the reverse direction is generally taken.

Perhaps the earliest type of English glass is one with a waisted bowl, engraved with a full-blown rose, and supported on a rib-twisted stem; but those on stems loosely air-twisted may sometimes be as old.

There is a glass in the British Museum with a bell-shaped bowl engraved with a rose, a pink, and a third flower of undetermined species; this we may take as a good type of the earlier drinking-glass. The bowl is divided from the air-twisted stem by a hollow bulb containing a sixpence of Charles II. dated 1679. It will be noted how closely the berry-like stamps on the bulb resemble the prunts on the stem of a *roemer*; they occur again on the already mentioned posset-cup from Chastleton. Such decoration may, perhaps, be regarded as

[1] This drawn-out 'blow,' or inverted tear, is often found in the stems of the solid tavern glass of the first half of the eighteenth century (Hartshorne, p. 265).

characteristic of the English glass of the end of the seventeenth century.

The opaque-twisted stem formed, on the same system as the Venetian *vetro di trina*, from rods containing threads of opaque white glass or *latticinio*, is on the other hand not a specially English type. Such stems were in great favour in the Low Countries and in the north of France, and it is even possible that the rods of glass from which our English examples are formed may have been imported from Venice or from the Netherlands.[1] The white lines are sometimes combined with air-twists to form complicated patterns.

The glasses with straight-sided bowls may, on the whole, be attributed to an early period, and together with the contemporary bell-shaped glasses they constitute an essentially English class. Those again with the so-called ogee bowls are especially associated with the Bristol glass-houses. Glasses with bowls of this outline form nearly one-third of the extensive collection of Mr. Singer, which was formed for the most part, as I have already mentioned, in the neighbourhood of that town.

I now turn to the engraved designs that are found upon the bowls of most of these eighteenth-century glasses. There is not much to be said for the inventive powers or for the technical skill shown by the engraver. Indeed, considering the general low level of the engraved work, there is some temptation to find a Dutch or Flemish origin for any specimen of engraving that shows superior technical or artistic qualities; and there is little doubt that in the case of the earlier pieces at least, such an attribution would be justified.[2]

The design that we find most frequently on our

[1] Mr. Hartshorne, however, thinks that our English workmen, especially at Bristol, were capable of turning out opaque-twisted stems as good as, if not better than, those made in Holland. On the other hand, the stems with interlacing ruby and white threads, so characteristic of the latter country, never form part of typical English glasses.

[2] The famous Royal Oak glass, with the portrait of Charles II., now belonging to Mr. Festing (Hartshorne, Plate 29), is certainly a case in point, whatever may be the origin of the glass itself. But this goblet is scratched with a diamond.

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over-the-waterism,' is nowhere better exhibited than in the almost devotional tone with which this subject is approached by more than one of our authorities. The more important of these glasses, especially the large ones with drawn stems, and those with baluster or rather double-knopped stems, are probably of foreign origin; at all events they were engraved in the north of France or in the Low Countries. Of the rare examples with the head of the young Pretender surrounded by a wreath of laurels, there are very few specimens in our public museums: I can only call to mind a small glass from the Schreiber collection at South Kensington and one or two examples lately presented to the British Museum (Plate XLIV.). The most frequent emblem is the rose with two buds, traditionally, I believe, regarded as symbolical of James II. with his son and grandson, although to one not in the inner circle of the cause the relation of the equipoised buds to the central flower would seem rather to point to the old Pretender and his two sons Charles Edward and Henry.[1]

As to the inscriptions on these glasses, we find in one instance four stanzas from the Jacobite version of 'God save the King' engraved on the bowl. But in most cases the allusion to the cause is of a more disguised character. The commonest of all is the single word 'FIAT,' the motto of the Jacobite society known as the Cycle, which flourished in the west of England during the greater part of the eighteenth century.

I may note that among the Jacobite glasses treasured up in many an old house in the west and north of England, one rarely comes across any example that cannot be classed more or less accurately as a wine-glass. Quite exceptional is the decanter engraved with a circular compass-card pointing to a star, between oak

[1] It must be remembered that 'James III.' did not die until 1766; his 'reign' of sixty-five years exceeded that of any other English prince. Although most of these Jacobite glasses date from a period rather after than before 'the '45' there was still a long interval during which the attribution I have suggested would be justified.

leaves and roses (Hartshorne, Plate 64). This decanter is one of a pair preserved, along with as many as eleven of the above mentioned 'Fiat' glasses, in the early Jacobean house at Chastleton, on the borders of Oxfordshire and Worcestershire.[1] Here also are many other pieces of old English glass to more than one of which I have already referred.

Although the history of English glass during the eighteenth century—it would be more accurate perhaps to say from about 1670 to 1770—tends always to fall back upon the drinking-glass, yet during that time the material was applied also to the manufacture of many other objects. We find in the earlier records frequent reference to large vessels of glass, blown or cast; this was indeed the case as far back as the time when Chiddingfold was the centre of glass-making. A favourite form at the end of the seventeenth century—but here again a drinking-glass—was the 'yard,' an exaggerated outgrowth of the Venetian or Low Country 'flute.' Thus Evelyn, describing the ceremonies on the occasion of the proclamation of James II., says that at Bromley the king's health was 'drunk in a flint glasse of a yard long.' Some time before this, in 1669, on the occasion of a visit to the glass-house at Blackfriars, the same writer mentions the 'singing glasses' that he there had made for him, and which 'make an echo to the voice . . .' but 'were so thin that the very breath broke one or two of them.' At a later time trumpets were made of glass, and some of these have survived.

But few examples, however, of what may be called miscellaneous glass of an earlier date than the seventies of the eighteenth century have been preserved. It was about this time that a great change must have come over the manufacture, though on this point we have strangely little direct information. This period, we know, was a critical one in the history of the minor arts both in

[1] This house has remained in the hands of the same family since the time it was built by Walter Jones, in the reign of James I.

England and in France. In the latter country, the simpler and more classical style associated with the reign of Louis XVI. replaced the more unrestrained forms of the *Louis Quinze* period some years before the death of the latter king. In England we see the new shapes first in the work of the silversmith about the year 1770, and soon after they are well represented in the Chelsea-Derby porcelain. In the case of glass this change is above all to be associated with the increased use of facetting. Flat facets divided by obtuse angles may indeed be found at times on the stems and shoulders of drinking-glasses almost from the commencement of the century. But now these facets take a purely geometrical form. The dishes and basins of the time simply bristle with sharp-pointed pyramids, so that these heavy, solid vessels can scarcely be lifted with impunity.

Now for the first time full advantage was taken of the power possessed by the heavy lead-glass of dispersing the rays of light, for only by the use of these facets was the full fire of the glass developed. This is indeed—so at least it seems to me—the one really important period in the history of English glass. It was not long after this time, towards the end of the century, that use was for the first time made of machinery for driving the grinding-wheels. The glass, whose general outline had been previously determined in the mould, was now quickly channelled with intersecting furrows. There is at South Kensington a small collection of the earlier facetted glass, presented by Mr. H. B. Lennard, which contains some pieces of real artistic merit. This was the period when the square plinth-like base was in fashion—not perhaps in itself a very desirable form. In the Lennard collection are two carved cups with these square feet: the bowl in each case is surrounded by deeply cut gadroons curving as they descend; on other parts the usual facets are found (Plate XLV. 1). There is a fine sculpturesque feeling about the treatment of these standing cups that carries one back to far earlier days—

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STANDING CUP, WITH COVER, ON SQUARE FOOT

ENGLISH, END OF EIGHTEENTH CENTURY

BOWL ON SQUARE FOOT

ENGLISH, END OF EIGHTEENTH CENTURY

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renown of English glass through the length and breadth of Europe.

At that time the famous English flint-glass was made by mixing three parts of pure sand, well washed and burned (from Alum Bay, Lynn, or Reigate), with two parts of red lead or litharge and one part of carbonate of potash. A small fraction of saltpetre and a little oxide of manganese were subsequently added to cleanse the metal. The potash, up to the middle of the last century, was introduced in the form of pearl-ash imported from Canada or Russia, and the litharge came from the refineries where silver was extracted from the native lead. In fusing the glass, great importance was attached to the quick melting of the materials at the full heat of the furnace, and to the subsequent rapid working of the pot. Our English glass industry was nearly ruined by the enormous excise duties, collected on the most arbitrary and artificial system, to which it was subjected both before and after the close of the great war. When on the repeal of these taxes the industry 'rose from its ashes,' it was conducted on a purely commercial basis.

I have already called attention to the important part played by Bristol in the manufacture of glass during the eighteenth century. That town obtained at this time a unique distinction in the history of English glass, as the one spot where a distinct kind of ware—a special *genre*—was made. It cannot be precisely stated when the opaque white glass decorated with enamel colours was first made at Bristol; what record we have does not take us further back than the latter half of the eighteenth century. This glass was apparently very brittle, and would not stand heat, a fact which may account for the few examples that have survived. In general character the Bristol *lattimo* closely resembles the other imitations of porcelain made with glass, which were so much in vogue at the beginning of the century. I have already mentioned the opaque white glass of Orleans, of Barcelona, and of Venice. Mr. Hugh Owen has collected at

the end of his excellent work on Bristol porcelain (*Two Centuries of Ceramic Art in Bristol*, 1873) some curious information about this glass, from the account-book of a local enameller, one Edkins. The ledger in question contains entries from 1762 to 1787. According to an analysis made by Professor Church, the opaque Bristol glass contains an exceptionally large quantity of lead—as much as 44 per cent., it would seem—and, what is certainly remarkable, less than one per cent. of tin. It is to this substance, however, seeing that neither phosphate of lime nor arsenic[1] is present, that we must attribute its opacity.

Mr. Owen thinks that in whiteness and in softness of texture this Bristol ware exceeds all other opaque glasses of the kind, and comes nearer than any of them in aspect to the soft-paste porcelain of the day. According to the papers left by the above-mentioned Edkins, the better kinds—these were above all tea-poys, enamel-painted in the manner of the contemporary Bristol porcelain—were decorated in the usual way with coloured fluxes melted on in the muffle-stove. But the common articles 'were simply painted with oil colours mixed with a desiccator and dried hard by artificial heat.'[2]

In the Schreiber collection at South Kensington may be seen a pair of candlesticks with twisted stems made of this white opaque Bristol glass. They are well painted with flowers and butterflies on a white chalky ground. At a later time some passable imitations of Venetian glass decorated with white threads in a ruby ground were made at Bristol, as well as bottles splashed with purple, black, and white, after the manner of a French and Venetian ware of the seventeenth century that has

[1] This is the more strange, as in all the recipes of the time for making the white enamel, even in one relating apparently to this very Bristol glass, arsenic plays an important part.

[2] Dossie, in his *Handmaid of the Arts*, 2nd ed., 1764, tells us that at that time much white opaque glass, in imitation of porcelain, was made near London. The glass, he states, was rendered opaque by tin, by antimony, or by arsenic. Much of this material was doubtless employed for enamelling on metal.

already been described. The glass-works at Nailsea, nine miles south-west of Bristol, were established in 1788 and survived to the middle of the last century. To the earlier years of these works may be attributed some jugs of yellowish-green glass, with large splashes of white, that turn up at times in the west of England.

James Tassie (born 1735), the Glasgow stonemason, applied the experience he had gained in the modelling of portrait heads in wax to the reproduction of antique gems in coloured pastes. The bright colours of these compare unfavourably with the delicate hues of the glass intaglios that have come down from classical times. But Tassie, both James and his nephew William, also made portrait medallions of a comparatively large size, using a nearly opaque glass paste or frit, more or less resembling porcelain. This paste was formed, it is said, of 'a finely powdered glass and finely powdered pigments, annealed by being placed in a reverbatory furnace.' This is a substance of some interest to us, and we may perhaps find in it points of resemblance to the '*pâte de verre*' employed lately by M. Henri Cros (see Chap. XXII.).

I can only mention one other local variety of glass. In Ireland, towards the end of the eighteenth century, more than one attempt was made to encourage the manufacture. Some large fruit-dishes of heavy cut-glass, and others in the form of open baskets adorned with festoons, have been traced back to glass-houses established at Waterford about the year 1780. This glass is distinguished by a more or less faint blue tinge derived from a minute quantity of cobalt in the 'metal.' The gilding that was largely applied to these vessels was burned in by means of borax, and where the gold has come away the surface of the glass is rough and pitted.

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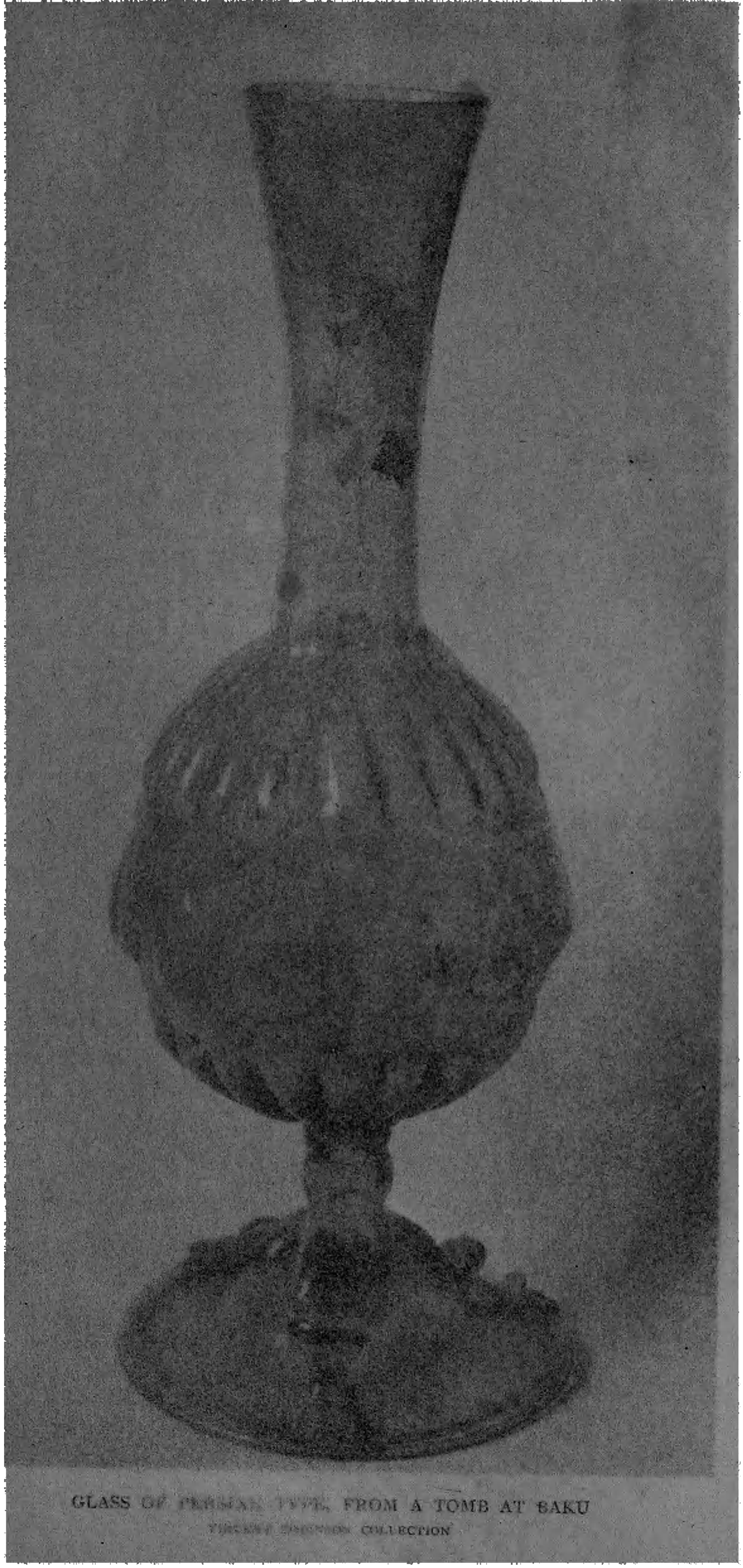
I have given some account in a former chapter, was already a thing of the past before the end of the fifteenth century. This was at least the case in Syria and Egypt, where alone the art as we know it had flourished. I have attributed this sudden decline, as regards the first country, to the invasion of Timur early in the century. On this occasion a whole army of craftsmen was transferred, it is said, from Damascus to Timur's new capital at Samarkand. In Egypt the narrow-minded fanaticism of the later Memlûk Sultans and the troubles that preceded the Turkish conquest were doubtless factors in the artistic decline. As far as the Mohammedan East is concerned, there is thus an obscure period in our history extending to the end of the sixteenth century for which there is little or nothing to show. Glass of some sort doubtless continued to be made in Syria, and perhaps in Egypt, but little that is distinctive or of artistic interest was produced.

When we again come upon specimens of Oriental glass, it is no longer in the Mediterranean countries but in Persia, and to a less extent in Northern India, that we find them. Not only so, but the glass that we now have to deal with is of an entirely different character. With a few rare exceptions, the thick jewel-like enamels of the Syro-Egyptian school are now as much a thing of the past as the carved glass of a still earlier time.

The PERSIAN GLASS of the seventeenth and eighteenth centuries is, as a whole, thin and transparent, either simply blown or in part moulded. In spite of the purely Oriental character of the outlines of this glass, the influence of Venetian methods in the preparation and modes of working is in most cases apparent. As I have said, it would be out of the question to treat of this later Oriental glass, little of which is probably earlier than the seventeenth century, before we had acquired some knowledge of the renaissance glass of Italy.

Whether Timur or his successors succeeded in



GLASS OF PERSIAN TYPE, FROM A TOMB AT BAKU

THE [illegible] COLLECTION

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establishing the Syrian glass industry in the Khanates of Turkestan we do not know. There is a vague tradition that in the fifteenth century the glass of Samarkand was the finest in the East. It is, however, to a much later time that the earliest specimens of what I may call the Veneto-Persian family of glass belong—to the time of the Sufi dynasty in Persia and to that of the Moguls in Northern India.

Of Persian glass there indeed still exist a few rare examples which may perhaps date from an earlier time. I have already referred (p. 172) to the little drinking-bowl of honey-coloured glass in the British Museum decorated with enamels of good quality—turquoise, red and white (Plate XXVII. 1). The figure of an angel upon it is thoroughly Persian in character; not only in the enamels, but in the horny quality of the honey-coloured metal, this little bowl closely resembles the spherical lamp ornament mentioned on p. 156, that has very properly been placed beside it on the shelf of the Museum.

Among the few pieces of later Oriental glass in the Slade collection is a small covered bowl, probably of Persian origin, with a formal design of iris and other flowers. In spite of the somewhat modern air of this bowl, due perhaps to the solid and rather crude gilding, the thick, semi-transparent enamels, blue and pale green, take us back to the earlier Saracenic work.

But such examples are quite exceptional. As a rule, on the glass brought back from Persia—there is quite a large collection at South Kensington and a few choice pieces in the British Museum—the enamelling, if present at all, is of the poorest description—it belongs essentially to our 'painted' class. This enamelled decoration, as on some little bottles at South Kensington, appears to be but a rude imitation of the floral patterns that we see, for example, on the lacquered bindings of Persian books.

On the other hand, the tall-necked flasks of thin glass —scent-sprinklers and wine-bottles—give proof of considerable manipulative skill (Plate XLVII.). To judge by

the patterns in low relief on the sides, many of these vases, in spite of the thinness of the glass, must have been blown into a mould. The tall neck ends either in a flat-spreading lip or is bent over into that characteristic Persian form—not unlike the head of a bird with large beak—of which we may see an imitation or at least a kindred shape in certain Venetian double-necked cruets. At one time a fashion prevailed of fitting into the interior of these thin flasks elaborate bouquets of flowers built up with coloured enamels of opaque glass, a somewhat childish fancy, reflecting the weaker side of later Persian art.

Of more interest is the ruder glass, often decorated with a profusion of *appliqué* strips, quilled and worked up with the pincers. In such examples we are strikingly reminded both of a class of peasant glass from the South of Spain, and again of the late Roman glass from the Rhine and other districts.

On the other hand certain bowls and vases of deep blue glass, decorated with floral designs in a solid gilding, have an almost unpleasantly modern air. A pair of vases so decorated, now in the British Museum, came, however, from the Strawberry Hill collection, and they may well date from the early eighteenth century.

Finally, I will mention a remarkable variety of glass worked generally into the form of tall, thin-necked flasks; within the greenish transparent metal float irregular masses of an opaque deep red. We have here, in fact, the elements of which the famous Chinese glazes—the *flambé* and the *sang-de-bœuf*—are made up. As in these glazes, so in this case in the glass, the effect doubtless depends on the partial reduction of the incorporated copper-oxide.

I should add that engraved glass seems never to have found much favour with the Persians. On the few specimens that we have in our collections—they are decorated with birds and flowers rudely ground on the wheel—the work is of the poorest description.

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GLASS MADE IN PERSIA

SEVENTEENTH OR EIGHTEENTH CENTURY

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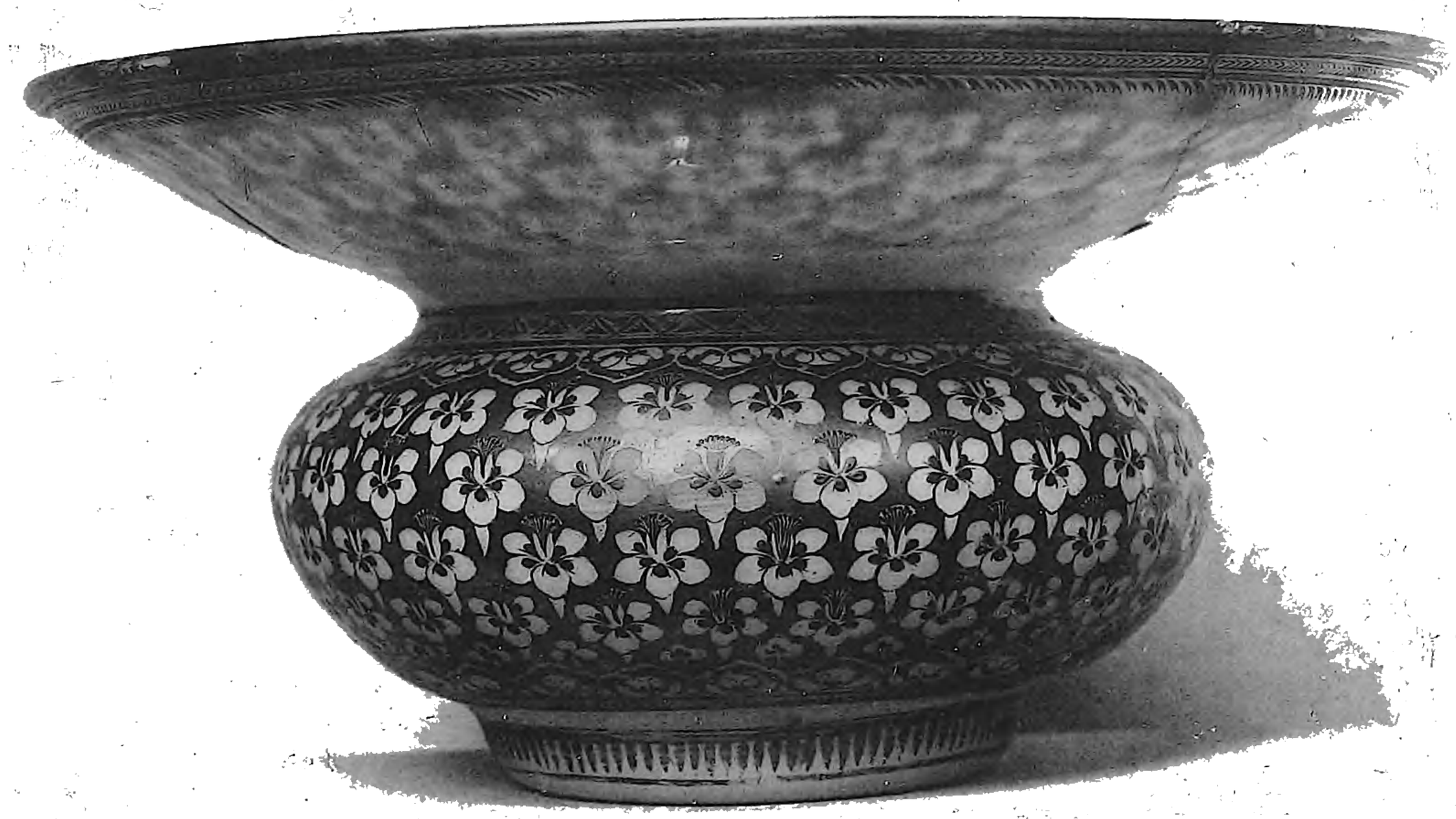
work just mentioned: *If broken glass be restored again, how much more may Man be restored again after his Dissolution in the Grave?'*

Closely connected with this Persian glass is the deep amber or honey-coloured glass, said to have been made in the island of RHODES. A small collection of rudely executed bottles, pilgrims' flasks and bowls, obtained in that island and in Cyprus, may be seen at South Kensington; they are there ascribed to the sixteenth century, I do not know on what grounds. These little vessels are all of the simplest shapes, such as could be formed directly from the *paraison* at the end of the blowing-iron, without removing the glass to the pontil. Some small hand-grenades of greenish black or of opaque jasper glass in the British Museum, come for the most part from Cyprus.

I may here say a word of the glass still in use in the Mohammedan East. At the present day the glass-works at Hebron, which I have already more than once mentioned, supply most of the common native glass in use both in Egypt and Syria[1]—of that of European origin three is no need to speak. Edward Lane describes the small conical lamps of thin glass 'having a little tube at the bottom in which is stuck a wick twisted round a piece of straw.' This is an old type of lamp that I have dwelt upon in a former chapter. Perhaps the most interesting form of glass vessel now in use in Cairo and Damascus is the covered sherbet-jug or bowl—the *Kulleh*. I have before me an example from Cairo made of a nearly opaque white glass, decorated with floral designs rudely painted on and perhaps not fired. Where

[1] At Vienna, in the Museum for Art and Industry, there is a small collection of glass from Hebron. Besides the bangles of opaque glass which belong to the old primitive family, there are some small vessels of a deep amber-coloured glass similar to that brought from Rhodes, and finally a few vases of Persian type of a bluish-green metal; among the last group may be found some lamps with glass tubes similar to those mentioned in the text.



BASIN, ENAMELLED WITH WHITE FLOWERS ON GOLD GROUND

INDIAN, SEVENTEENTH OR EIGHTEENTH CENTURY.

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this glass is made I do not know. We may perhaps regard the ware as a survival of the *lattimo* of the early eighteenth century (cf. Lane, *Modern Egyptians*, 1842, vol. i. p. 224).

INDIAN GLASS.—The classical writers had a tradition that the best glass in the world was made in India, thanks above all to the use of a pure rock crystal in the manufacture. There are some vague references to glass in the later Sanscrit literature, and in one of the older, but not the oldest, of the Hindu books, a distinction is made between a vessel of glass and one made of crystal. But it would be useless to search in the Hindustan of to-day for any examples of so early a date. Apart from a few beads which may be assigned to Buddhist times,[1] I can point to no examples of Indian glass of earlier date than the Mogul dynasty. It is to that period—hardly, indeed, before the later seventeenth century—that we must attribute certain remarkable examples of glass, found for the most part in Delhi, which are now in the Indian Department at South Kensington. There may be seen an example of enamelled glass of great beauty (Plate XLVIII.). This is a vase of somewhat milky glass with spreading mouth, some eleven inches in diameter; it is described as a washing-basin; the gilt ground is *semé* with little white flowers, each with a red pistil. Of no less interest are the two hookah-bases of engraved white glass. On these the technique of the engraved work—but not the Oriental design of conventional flowers—much resembles that of the Bohemian cut-glass; there are no incised lines, and the oval depressions representing the leaves are carefully polished. Unlike the engraved

[1] The miscellaneous beads, found chiefly in the neighbourhood of Benares and Cawnpore, are associated for the most part with Buddhist remains of the time of the Gupta dynasty, which reigned in Northern India shortly before our era, but very few of these beads are of glass. Of great interest are the spindle-shaped beads, decorated with intersecting lines of enamel—black, grey, or white—on a ground of quartz, or sometimes of carnelian. A series of these beads may be seen in the 'Gallery of Religions' in the British Museum. They are described by Mrs. J. R. Rivett-Carnac in the *Journal of Indian Art*, vol. ix.

glass of Persia, the work shows signs of a complete mastery of the process. It will be noticed that in the case of one of these vessels the clear *cristallo* is unchanged, while in the other the glass is, as it were, frosted, apparently by the incipient decay of the surface. In the same case may be seen some tall vases of thin white glass, of a type very similar to the Persian sprinklers. These also come from Northern India.

It would be useless to search for an early native origin for work of this kind. Were it, however, possible to find in India any glass that we could connect with the Turki Khanates of Bokhara and Samarkand, the old homes of the Mogul family, we should thereby be provided with a connecting link that would not unlikely carry us back to the Syrian enamelled glass of the fourteenth century (see above, p. 168). But nothing of the kind, as far as I know, has so far turned up in Hindustan. On the whole, this Mogul glass, in spite of the exceptional artistic and technical qualities of the specimens just described, belongs to that bastard school of Saracenic art that is prevalent generally in the north of India. Its artistic parentage may probably be traced back to Venice by way of Persia. Equally Persian in character are the four-sided bottles painted with figures and flowers, somewhat in the style of the Cashmiri lacquer. A remarkable series of little flasks of this character, formerly in the Marryat collection, may be seen in the Indian Department at South Kensington, where, however, they are described as 'Indo-Dutch.'

It is certainly disappointing to find in India such a total absence of native glass with any claim to antiquity. But some consolation may be derived from the discovery —for discovery it may be called—made not many years ago, that in more than one part of Hindustan, native craftsmen were turning out vessels of glass by a strangely primitive method. Sir Purdon Clarke, who has always had at heart the maintenance of the native industries of the country on the old lines, tells me that

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In the Indian Department at South Kensington may be seen a most remarkable collection of this native glass, obtained in part from Patna and in part from Hoshiarpur, in the Punjab.[1] This glass is of the greatest interest and should be closely examined. It is for the most part of various shades of blue and green, but these shades seem to be due to copper rather than to iron; at least we do not meet with the well-known olive greens derived from the latter metal. But the most striking peculiarity—the charm, I may say—of this glass is due to the presence of minute bubbles, so numerous and closely packed that the glass is little better than translucent. To the presence of these bubbles is also due the peculiar waxy aspect of the surface, and this with the irregular outline lends to this simple ware a plastic appearance as if moulded by the hand. Some use is made also of an opaque yellow glass, and among the examples from Patna are some decorated with bands of *lattimo*. The shapes call for no special comment: I will only point to certain curious little scorpion-shaped scent-bottles with twisted tails, and to the large torque bangles, as worthy of notice. Of greater interest is the primitive arrangement for distilling—a combination of aludel and alembic that calls to mind the illustrations to the Syriac manuscripts that I have mentioned in a former chapter. Perhaps the principal charm of this native Indian glass arises from the violent contrast that it affords to the impeccable *cristallo* and to the flint-glass that have tyrannised over us so long in Europe. It is beginning at length to dawn upon us that there are other qualities than absolute transparency and absence of colour to be looked for in our material, and it is the attempt to bring these qualities into prominence that has led to the

[1] Through the kindness of Mr. Forrest, ex-Director of Records at the India Office, I have been enabled to examine a collection of small glass vessels obtained by him in the Kaira district of Guzerat. Among them I noticed some graceful little cruet-shaped ewers of a pale pinkish glass—the colour apparently obtained from gold—and also some glass lamps of rounded conical form similar to those used in Cairo.

development in France within the last few years of quite a new treatment of glass.

GLASS IN CHINA.[1]—There are frequent references in Chinese literature to a substance called *liu-li*, which the best authorities tell us may be regarded as a more or less opaque variety of glass. This *liu-li* is, in the old books, always closely associated with rock crystal and jade, and was, indeed, like these stones, classed among the 'seven precious things'; we also find it described as 'thousand year old ice.' When towards the end of the first century of our era an attempt was made by the emperors of the Han dynasty to establish commercial relations with the Roman West, this *liu-li* was one of the substances most sought after. The Chinese of this time were, it would seem, acquainted with the Roman Empire, but probably only with the eastern provinces. The Ta-tsin of their early writers has been identified by Dr. Hirth with Syria, and its capital Antu with Antioch: in these parts at that time they would have had no difficulty in obtaining the glass that they were in search of. It is indeed not impossible that it may have been this new and exotic material that first turned their attention to the glazing of their pottery, for it is doubtful if they were acquainted with the process before this time.

Again, in the fifth century some merchants who visited North-west India are said to have learned there the secrets of glass-making, and on their return to China to have produced *liu-li* of all colours by the smelting of various minerals. Once more, in the thirteenth century, we hear of glass being made by the melting together of certain stones and drugs, and the word *po-li*—the name given generally to transparent glass, in opposition to the more or less opaque *liu-li*—is now used for the first time.

[1] My chief authorities for the early history of Chinese glass are the works of Dr. Hirth, especially a paper on the subject in his *Chinesische Studien*, and some casual remarks in Dr. Bnshell's *Oriental Ceramic Art*. [I have at the last moment been able to add a few notes to what I have written, based on the chapter on glass in Dr. Bushell's *Chinese Art*. June 1906.]

On the other hand, in the annals of the Sui dynasty (581-617) we are told that China had long lost the art of making glass, but that a high official of the court succeeded at that time in fashioning vessels of green porcelain that could not be distinguished from *liu-li* (Bushell, *Chinese Ceramic Art*, p. 20). The inference that we must draw from these contradictory statements is probably that, in spite of many assertions to the contrary,[1] the art of glass-making was never thoroughly acclimatised in China till much later times. And this conclusion is confirmed by the total absence in our collections of any examples of glass of native manufacture that can be referred to a date earlier than the eighteenth century.[2] For although we know that after the return of Marco Polo both the Venetians and Genoese found in China a market for their beads, if not for more important objects of glass, and that early in the fifteenth century specimens of Saracenic enamelled glass found their way to the Chinese ports, the evidence that any true glass was at that time made in China is of the vaguest character.[3]

When we come to the eighteenth century we are on firmer ground. Before the end of the seventeenth century glass-works had been established under the superintendence of the Jesuit missionaries, within the precincts of

[1] Thus we have the statements of the missionaries Ricci and Du Halde, in the sixteenth and seventeenth centuries respectively, that the Chinese made glass. As far back as the twelfth century, the Arab writer Edrisi speaks of glass-workers in the Chinese town of Djan-ku, wherever that may be.

[2] Dr. Bushell, however, thinks that there is evidence that in the fifth century glass of Indo-Scythian origin reached Northern China by way of the great trade route through Chinese Turkestan. About the same time it was brought from the West, by the sea route, to the southern capital (the modern Nanking). The manufacture was at that time established in both North and South China, and 'has been carried on with indifferent success ever since' (*Chinese Art*, vol. ii. pp. 60-61).

[3] The very absence of native enamelled glass might indeed be used as an argument against the otherwise plausible theory that it was from the Saracenic glass that the Chinese first learned how to enamel their porcelain with fusible colours over the glaze. See on this point my book on Porcelain in this series, p. 87. Dr. Bushell mentions 'the recent discovery in mosques of the western provinces of China of a number of hanging lamps of characteristic shape, enamelled in colours,' with Arabic motives and script. Some of these have been taken to America. *Chinese Art*, vol. ii. p. 69.

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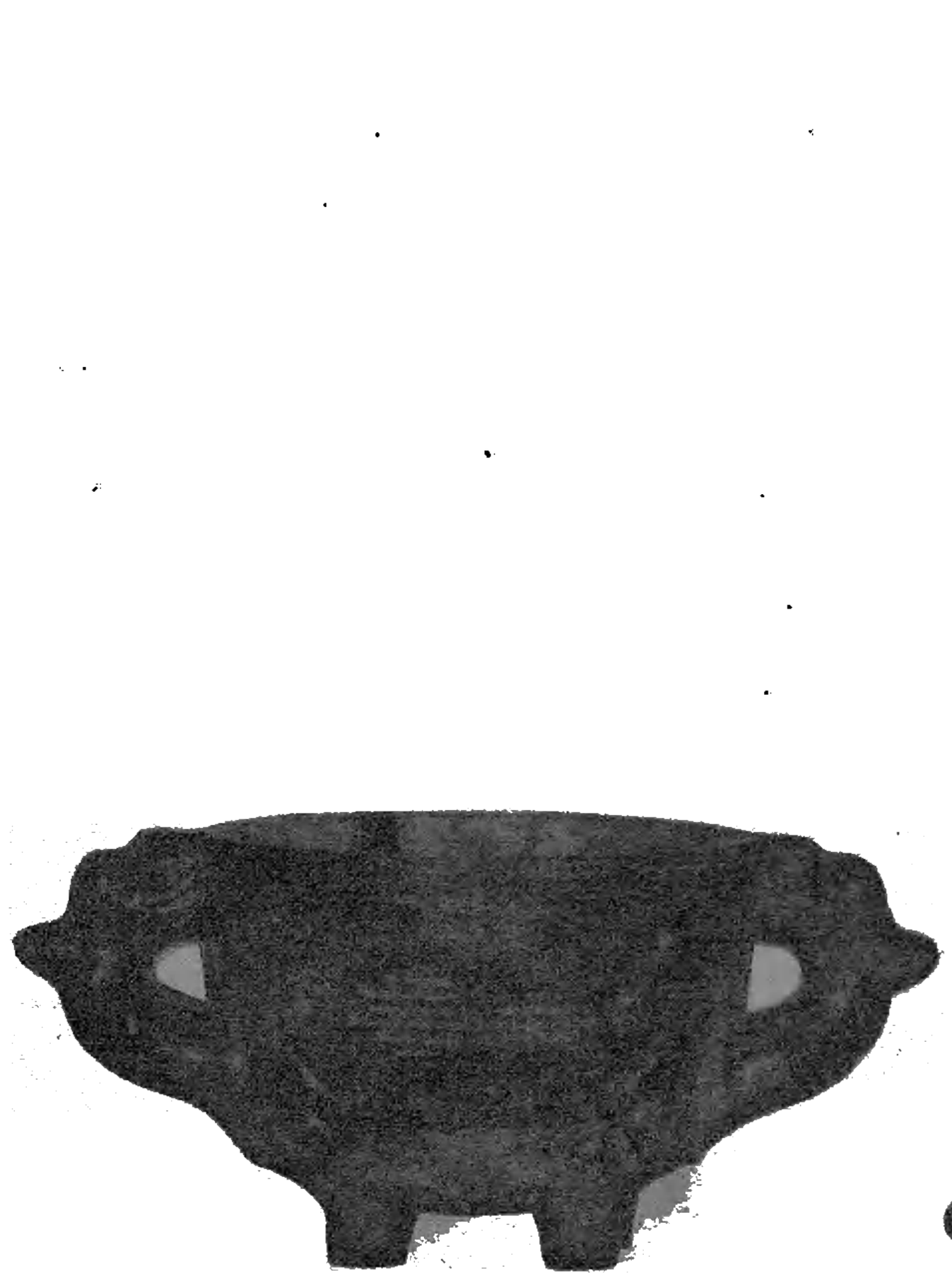
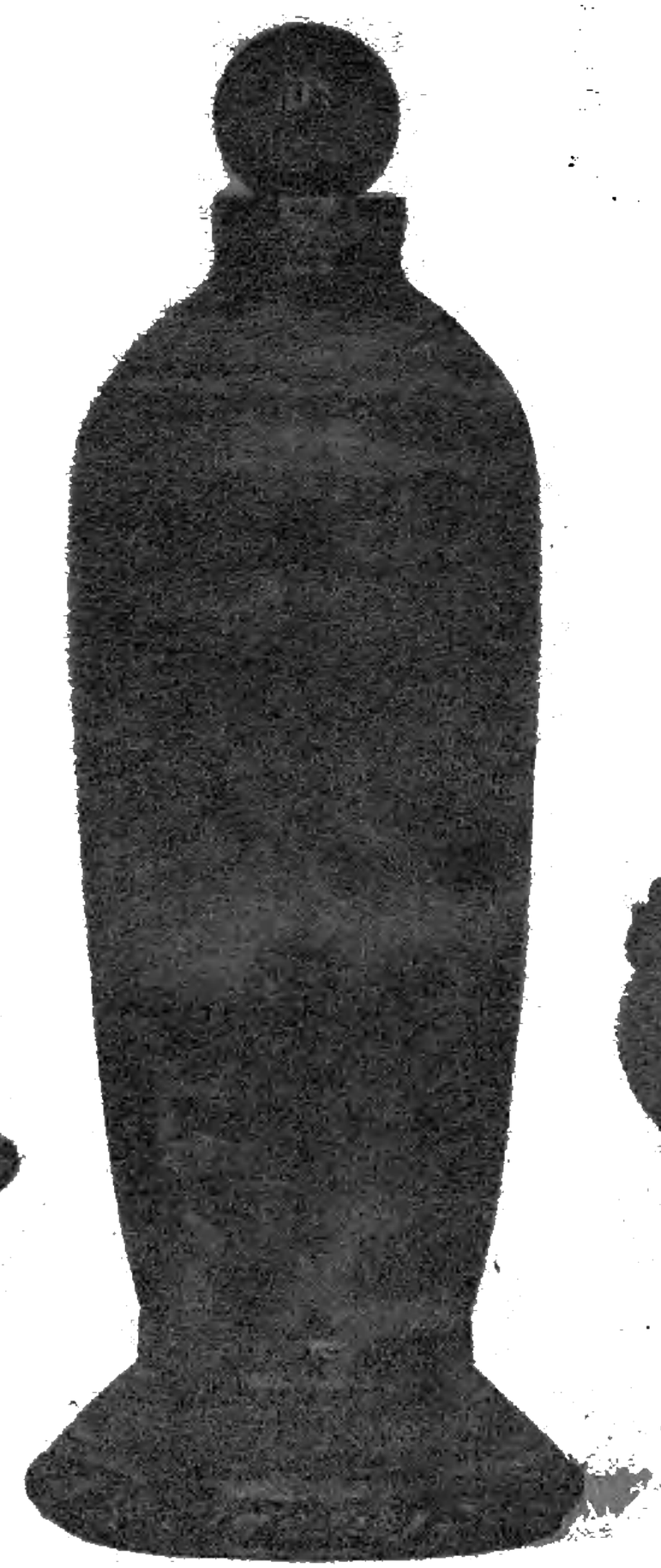
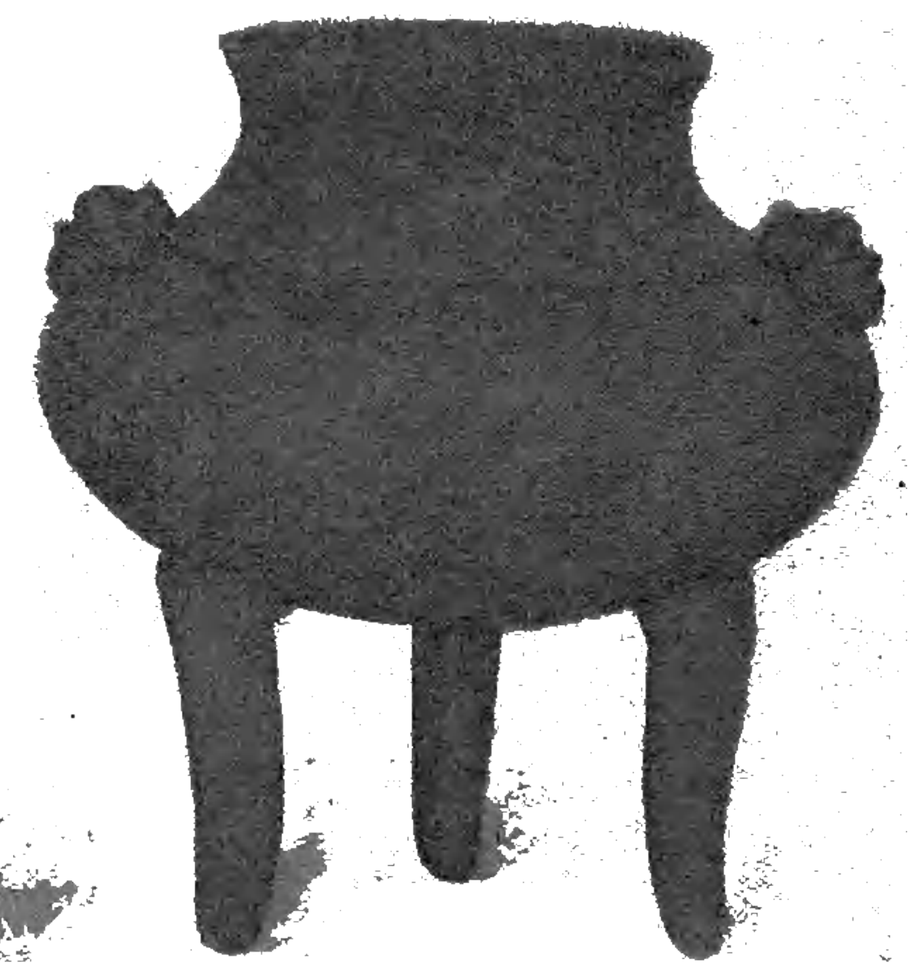
the Arabic inscriptions found on one or two of them, as a result of the teaching of the Jesuit missionaries; they were perhaps made by remelting imported glass. Notice especially the huge bowl or flower-pot with scalloped edge, built up, by some sort of 'casing' process, of two layers of glass, the inner, nearly opaque, of pale blue, the outer, dark blue and transparent. This bowl bears the date-mark of Kien-lung and is a triumph of technical skill. Not less remarkable are the two large vases of deep purple glass, bearing on the sides and necks large medallions with Arabic inscriptions in relief on a ground apparently chipped with a tool.[1] Of even greater interest are the two covered bowls of transparent cobalt glass with a quaint design built up of the smooth Chinese dragon or salamander and of the character for 'long life.' The part not engraved is curiously wrinkled or pitted, so as to form a sort of epidermis on the surface—by what means I do not know. The Chinese succeeded in making a yellow glass of a fine deep tint; a variety of this with opaque spots—the 'rice-grain' structure—is apparently much prized. Of the mottled red and yellow glass, made it would seem in imitation of tortoise-shell, there are many examples in our collections. We are reminded by it of some of the effects of the *flambé* glazes; the prevailing colour given to this glass is, however, of an orange rather than a blood-red tint (Pl. XLIX. 2).

But in spite of these early technical triumphs, blown glass has always remained something of an exotic in China. To the Chinese mind, glass—a material never held in much esteem—is above all a substance to be employed in the imitation of precious marbles and gems. Lacking itself all classical and literary associations, glass can only find a reflected honour from these more noble substances. With this object in view, the skilled Chinese craftsmen were soon able to produce the most marvellous *tours de force*, and indeed to develop an entirely new

[1] Dr. Bushell hints that such inscriptions may in cases have been added by modern curio-dealers in Pekin, as a bait to European collectors.







CHINESE GLASS

EIGHTEENTH CENTURY

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treatment of the material—a method of handling which, at all events since the best Roman times, had been elsewhere completely neglected. Their aim above all was the imitation of jade: half-molten masses of glass, of two or more colours, were worked up and dragged through one another; the glass was then carved into the old traditional forms. Objects of the native stone were thus imitated with the most marvellous accuracy. This was a process much resembling that adopted by the Alexandrian Greeks and the Romans for one class of their agate glass bodies; but the Chinese showed greater restraint in the blending of the colours, and were at greater pains to imitate closely the natural stones. As I have said, the forms taken by this glass follow those into which the Chinese had been wont from time immemorial to carve their jade, their agates, and their milky chalcedonies; but we may note that their carvings in rock crystal were not copied in glass. Besides the little tripod bowls and cups with archaic designs in relief, natural objects were imitated, fruits and flowers especially—the opening calix of the lotus, the 'Buddha's hand' citron, or again the almond-shaped peach, symbol of long life.

We must now turn to the little glass snuff-bottles, in the decoration of which the Chinese carried their original methods to the highest perfection. We have indeed in these the only form of Chinese glass that has found any favour with European collectors.

The lid of these snuff-bottles is often of another material—metal, coral, or carved lac—and to it is attached the little ivory spoon with which the snuff is extracted. I may point out that little flasks of similar shape, made generally of porcelain, the *yao-ping* or medicine-bottles, have long been in use in China for pills, rare drugs, and eye-medicines. These *yao-ping*, whether for medicines or for snuff, were often carved out of various stones—the moss-agate and the red and white carnelian were special favourites—and it was above all these many-coloured varieties of the quartz family that were copied

in glass, in the first place probably by the above-mentioned Hu. The infinite variety in the technique and in the decoration of these little flasks—this may be seen in any large collection, such as that formed by Mr. Salting[1]—is at first overwhelming, but most of them will fall under one or other of the following classes:—

1. Snuff-bottles imitating a natural stone, as amianthus, malachite, or chalcedony, formed by the simple *interpenetration* of masses of glass of different colours. Such bottles are generally not carved on the surface.

2. Those of the nature of an onyx, built up by the *superposition* of two or more layers of glass of different colours, the under surface being exposed in places by the carving away of the upper layers as in a cameo. We thus get a carnelian red or a deep blue design on a milky white ground. In other cases a jade-green passes by gradation through a pink layer to a pure white. Such an arrangement may be skilfully made use of to obtain a blend of colours on the petals of a lotus or other flower.

3. In this class the superficial colours do not enclose the whole core, but lie scattered on the surface. By this means green, red, blue, and yellow patches, all standing on the same level, may be made use of in the design. In such work we may see the climax of the Chinese technique in this *genre*, and the result has apparently been brought about by placing these patches of coloured paste on the sides of the mould before the introduction of the core of plain glass. Though this is technically a triumph of ingenuity, the flasks thus decorated are by no means the most beautiful of the series.

Besides these, many other methods of decoration may at times be found on these snuff-bottles; we see elaborate designs painted in enamel on the interior, showing through the transparent glass, or again an opaque paste resembling porcelain may be decorated with colours on the surface. Avanturine glass is probably of late intro-

[1] As arranged now at South Kensington, the carved glass may be compared with the companion series in agate and other stones.

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Finally, we may say of this Chinese glass that it can lay claim to a prominent and distinct place in any general history such as this, on the ground not only of the originality of its technique, but also because of the influence which, as I have already pointed out, it has had of late years upon the 'new glass' of France.

The position of JAPAN with regard to glass is a unique one. It is perhaps the only country that in past or present times has taken an important place in the world of art where the use of glass, whether for practical or æsthetic purposes, has remained almost absolutely unknown. I make this statement, of course, of the country as it was before the late revolution. Nowadays the art of glass-making, like other Western arts, is practised with some success, but without, I think, any original developments which would call for notice. The name they have for glass—*bidoro*—is evidently derived from the Spanish *vidrio*, or the Portuguese *vidro*. But the Japanese never appear to have taken even that sporadic interest in the material that they showed for other exotic productions that at times filtered in from the West.

What I have said applies to feudal and recent times. If, however, one goes back to the period that preceded the dawn of Japanese history, one finds that plain beads of clear glass, both blue and white, have been discovered in the dolmen tombs.[1] Examples of these beads may be seen in the Gowland collection in the British Museum. Again, in the famous Shoso In Treasury at Nara are two vessels of glass:—(1) a shallow bowl of transparent green glass, carved in relief with a design of fishes and water-plants; (2) a cup of white glass, carefully executed, the surface carved with a diaper pattern made up of shallow

[1] In some of the Imperial tombs of the sixth and seventh centuries of our era glass jars have been found. One of these is described as of white glass ornamented with round knobs. In the grave of the Emperor Nintoku (fifth century) were found fragments of blue and white glass. It is very unlikely that any of this glass was made in Japan.

hexagonal hollows. There is no reason to doubt the well-authenticated record that these glass bowls were deposited with the rest of the collection by the Emperor Shomu in the year 756 of our era. There are in the same Shoso In, and in other Imperial collections among objects dating from this time, examples of metal ware and of silk brocade that show evidence of a Western Asiatic, probably Sassanian, origin. These and other objects that are undoubtedly of an exotic origin may perhaps many of them have been presents from the Chinese emperors on the occasion of embassies from Japan. It is certainly a fact that in the previous century the sons and retainers of the last Sassanian ruler of Persia had fled before the Arab invaders and taken refuge with the Chinese court, bringing with them such treasure as they had been able to save from the general wreck. This fact may give a hint as to the origin of the Shoso In glass. At any rate, in China at this period there is no evidence of any skill in glass-working.

CHAPTER XXII

CONTEMPORARY GLASS

THE history of glass in the nineteenth century is mainly concerned with improvements in mechanical processes, by means of which it is now possible to turn out a perfectly clear white glass in large quantities at greatly reduced cost.

Meantime little heed has been given to the artistic merit of individual pieces. In fact, thanks in no small measure to one widely applied mechanical 'improvement,' the process namely of pressing into a mould, the highly trained skill of the glass-blower has been less and less called into play, so that now a complaint is heard, both in England and in France, of the difficulty of finding workmen thoroughly masters of the art. The last stage, indeed, in the decline of our English cut-glass was reached when 'passable imitations' of the facetted work were turned out by this 'pressing' process.

And yet from time to time attempts have been made on the one hand to give fresh life to old methods of work and schemes of decoration, on the other to develop the application of the material along new or previously little explored paths. Of what has been effected in Venice in the first of these directions something has already been said. In England, and we may add in Germany also (at Berlin, for instance, and at Ehrenfeld, near Cologne), these attempts have for the most part taken the direction of revivals, as when by the skilful use of the blowing-iron table-glass has been produced of graceful but rather

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M. P. Brocard as far back as 1867.[1] But since that time glass, as a material capable of artistic applications, has been attacked upon new lines. When speaking of the glass of the Chinese, I have more than once pointed to the influence that the work of these people has apparently had upon certain new developments in France. Something of the sort—in the way, I mean, of treating glass as if it were a stone of varied colours, carnelian or onyx—was indeed attempted here in England as long ago as 1878, in the case of the cameo glass of Webb of Stourbridge. Contemporary with him, Eugène Rousseau was working in France with his *verres doublés et triplés.*

But these strange new methods of treating glass are above all associated with Émile Gallé, who at Nancy (where he was born in 1846) has built up something like a school. The material was attacked by him, as it were from every side. Advantage was taken of the facility with which, by means of powerful machinery, glass can now be rapidly cut into any desired shape. As in the case of the decoration of the modern porcelain of Sèvres and other places, a source of more than one heat-resisting colour has been found in chromium, and even such rare elements as thallium and iridium have been experimented with. By the skilful application of reducing and oxidising flames, local variations of colour are brought about, and (in this unconsciously following the Indian glass that I spoke of in the last chapter) the possibilities of artistic effect to be found in the presence of numberless minute bubbles have not been neglected. The Chinese have been surpassed in the strange pitted forms—in some cases recalling cork or other kinds of bark—that the surface of the glass has been made to assume. But above all, in the varied markings, in the *mouchetage* and the arborescent forms, that loom out from the interior of the glassy mass, M. Gallé has outdistanced all his predecessors. Lately he has introduced pieces of metallic foil, or again crystalline masses of amianthus or mica,

[1] Now in the British Museum; it is referred to on p. 152.

into the body of his glass; or again insects, realistically rendered in enamel—dragon-flies are a great favourite—are seen caught up within the mass.

Both Gallé and others have made frequent use of an incrustation process by which fragments of glass are worked into the surface of a soft paste—but this was a means of decoration known in Egypt in the days of the Ptolemies. Endless gradations of colour are obtained by laying or 'soldering on' successive thin layers of glass until the desired effect is obtained. To some such process are also due, it would seem, the delicate shades seen in the Tiffany glass. Finally, by the use of rapidly revolving boring-tools—some of them worked on a vertical axis—the hardest Bohemian glass may be quickly brought to the desired form.

Apart from the yearly exhibitions, examples of the glass of the Nancy school may be seen in Paris at the Luxembourg and at the École des Arts et Métiers. It cannot, however, be said that the general effect of this glass is, as a rule, either brilliant or decorative.

M. Gallé himself is something of a poet—of the *symboliste* school, I should judge. What it is that he aims at expressing by means of this often sombre glass cannot indeed be better presented than in his own words:—'Mist and dews half shroud and half reveal the fine veinings and splashings in a grey jade-crystal vase. A thick flushing of rose-tinted glass is carved into a chimera-like flower, half influorescent, half smiling, half weary, half orchid, half pansy. A beetle drags its slow length over the rust of the lichens. Side by side with flesh-tints and carnations we see bold touches of coral pink. A pale gleam steals through the dull maze of iridium. Vegetable shadows grin at us. Phantoms of bloom are dimly seen. A fossil shell engraved beneath the fragile work contains the glass-worker's signature.'—(Quoted by H. Frantz, *Magazine of Art*, vol. xx. p. 269.)

Of quite another nature is the *pâte de verre*, a substance somewhat of the nature of a glass frit, which has

been made use of by the French sculptor, M. Henri Cros, in the modelling of polychrome reliefs and friezes. I say 'modelling,' for this strange material can apparently be worked like wax or plaster at one stage of its preparation. When cold it is of so tough a nature that a nail may be driven into it. At the entrance of the new hall of Sculpture at the Luxembourg may be seen a relief of this *pâte de verre* forming the back of a fountain. As a material it lies perhaps a little remote from the class of objects with which we have been occupied in this book. I mention it here as an example of the success which in France of late years has attended the attempt to take advantage of the new appliances and materials that, thanks to recent scientific discoveries, lie at the command of the artist and craftsman. Here, as in the case of the potter's art, not only have old-world processes—those of the Far East above all—been revived, but a constant endeavour is being made to strike out in new directions.

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Printed by T. and A. CONSTABLE, Printers to His Majesty
at the Edinburgh University Press