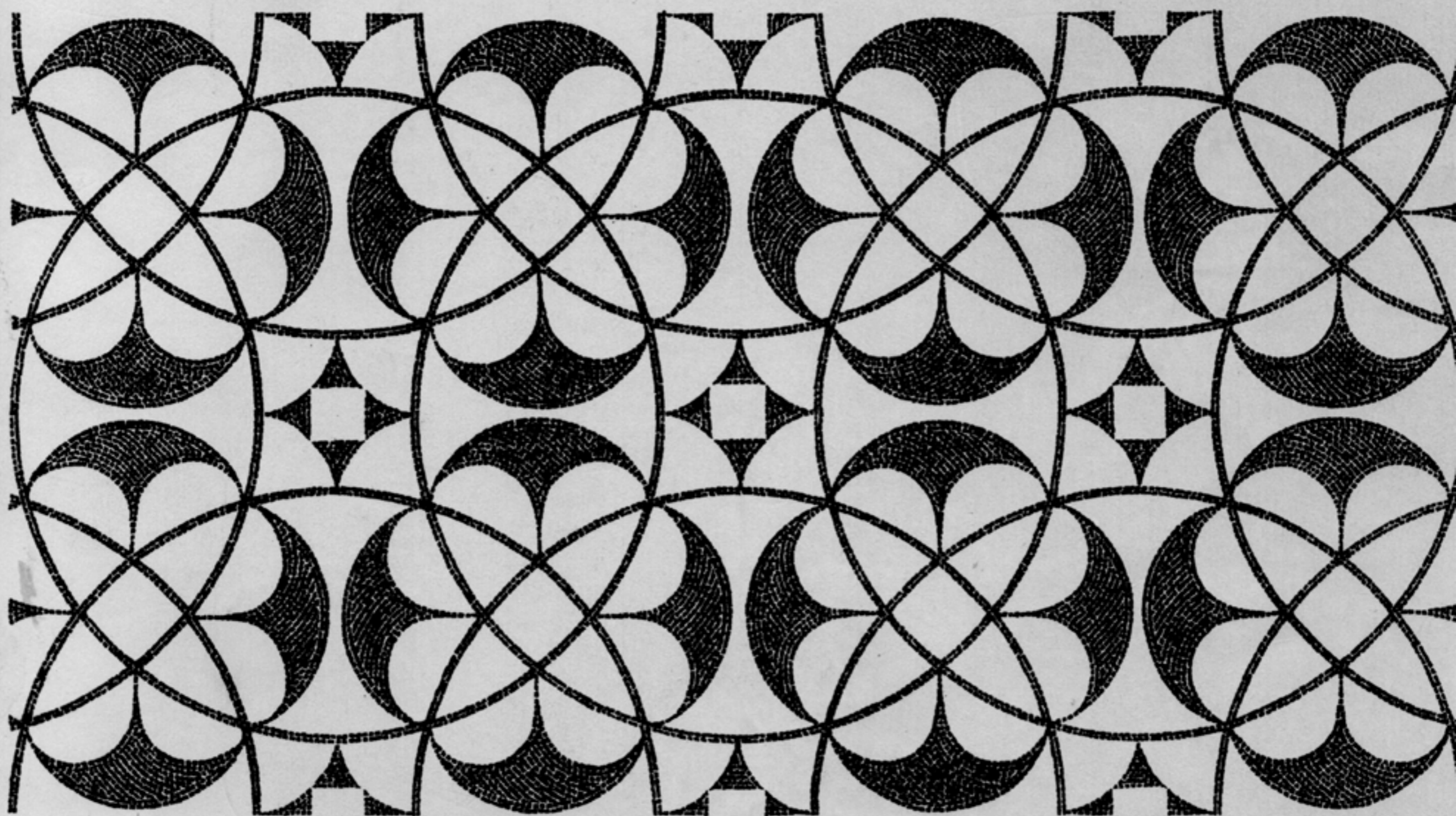


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T.1 ARTICLES.





## ARTICLE

PH. CRUMMY, ERRORS IN A MOSAIC FOUND AT COLCHESTER, ESSEX, ENGLAND AND A METHOD OF DRAWING MOSAIC PAVEMENTS (Colchester Archaeological Trust).





In 1977, a fine mosaic pavement (fig. 1) was discovered during the archaeological excavations at the Old Cattle Market site at Colchester, Colonia (? Claudia) Victricensis. The pavement, probably of Antonine date, lay in one of the principal rooms of a large courtyard house built immediately outside the town wall of the Roman colony. A full description and discussion of the pavement by Dr. D.J. Smith is planned to accompany the site report when this is published but meanwhile it seems of value to provide notes about various related matters which might have a more widespread application to mosaics in general.

The following paper falls into two parts. The first deals with the mistakes occurring in the foliate scroll which borders the pavement and the implications these may have. Also described in this part are the dimensions in Roman feet of the major components in the design of the pavement and estimates of the accuracy with which they have been laid out. The second section sets out an account of the method by which a scaled reduced drawing of the mosaic at the Old Cattle Market site was produced.

I. - THE MOSAIC FROM THE OLD CATTLE MARKET SITE, COLCHESTER : THE DESIGN OF THE CONTENTS OF THE SCROLL AND THE ACCURACY BY WHICH THE PAVEMENT WAS SET OUT.

The positions of the ivy leaves and lotus flowers in the roundels of the foliate scroll were carefully worked out in a logical fashion by the mosaicist. Although mistakes were made in the positioning of the flowers and leaves, sufficient is correct to make clear the principles of the design.

There are two types of ivy leaves and two types of lotus flowers making, apart from the birds positioned one in the centre of each side, four motifs in the scroll. On each side of the mosaic there are two groups of four roundels, one to each side of the central bird, making a total of eight groups of four. It was also planned that leaves should alternate with flowers and that each of the four motifs should occur (a) in every group of four, (b) in the corner roundels of the mosaic and (c) on the side of each pair of opposing birds. In this way a balanced distribution of flowers and leaves was achieved. The following is one of several possible methods of working out the original distribution of motifs. It is unlikely that this bears much resemblance to how the pattern was originally conceived.

Let  be A,  be B,  be X and  be Y. The possible permutations of alternating leaves and flowers with each motif occurring only once are

AXBY	BXAY	XAYB	YAXB
AYBX	BYAX	XBYA	YBXA

The arrangement which occurs on the mosaic is shown in figure 2. (The permutations are circled which do not contain A, B, X and Y, and in which A and B do not alternate with X and Y).

Thus, reading in a clockwise direction, the following in the mosaic are not permissible : AYAX, XAYA, AYXB and XBYX ; and the following are permissible : YAXB, YBXA, AYBX and XBYA.

These latter occur in the group of eight possible permutations listed above, leaving the following which should occur in the mosaic but do not : AXBY, BXAY, BYAX and XAYB.

BYAX must belong in position 4 (fig. 3) since of the four missing this is the only permutation to end with X, the latter being fixed by the adjacent XBYA. BXAY must belong in position 7 since this permutation begins with B, the only letter not to occur in a corner. XAYB must fill position 6



since this permutation ends with B. AXBY must belong in position 8 since this ends with Y and fills the last remaining space.

By comparing the intended with the actual distribution of motifs (fig. 4) two areas of mistakes can now be detected. At the top of position 4, the wrong type of leaf has been laid. This is a minor mistake, the short curved lines on the more elaborate form of the leaf having been omitted. Presumably this can be put down to carelessness on the part of the mosaicist concerned. However, the other mistakes are more serious and in effect result in almost an entire row being wrongly laid. Furthermore, two other errors associated with this row can be found: The leaf in the bottom left-hand corner was not laid to point towards the centre as it should, but treated like the others in the row. Also a short stretch of the adjacent scroll here runs anti-clockwise, note clockwise as it should. The implication of these mistakes is that the mosaicist laying this part of the pavement did not understand the design and therefore was not involved in its conception. Perhaps laying the pavement there were at least two mosaicists whose quality of workmanship is otherwise indistinguishable? Alternatively perhaps the mosaicist was using a design from a standard pattern-book which he somehow misunderstood and copied wrongly?

The scroll in the bottom right-hand corner is thicker and clumsier than elsewhere; the stalk is two cubes thick unlike the rest of the scroll. Perhaps here can be detected another hand involved in the laying of the pavement, this time less skilled?

The drawing here of the mosaic (fig. 1) is, as described below, an accurate reconstruction of the original since it is a photographically reduced tracing of it, drawn cube by cube. From this the following observations can be made. The pavement was designed so that its major components were multiples of  $2\frac{1}{2}$  Roman feet (1) (see top to bottom, fig. 5). In practice it was not set out with great precision; the greatest inaccuracy occurs in the central panel which from top to bottom is 3 cm longer than it is wide. The linear lines in the design are almost perfectly straight and the right angles accurate to within one degree. The arcs of the lunettes and the adjacent guilloche are close to true circles but their execution in the pavement tends to wander off position more than the cubes laid in straight lines.

Thus, in general, we can conclude that the pavement embodied a carefully designed pattern laid out with care and precision although by no means perfectly.

## II. - AN APPROACH TO MAKING AN ACCURATE PAINTED REDUCTION OF MOSAIC PAVEMENTS.

The following technique was first employed on small fragments of pavements found during the archaeological excavations in Colchester during the 1970's and was first applied to an almost complete mosaic in 1978. This has about a quarter of a million cubes and is the pavement from the Old Cattle Market (fig. 1). Although the method employed is obvious enough and hardly new, it is felt that other excavators who have mosaics to record might like to share our experiences and thereby assess the merits or otherwise of the approach for themselves.

Using rapidograph pens fitted with 0,6 mm nibs, the mosaic was traced cube for cube onto clear acetate film of 0,005 inch gauge lightly nailed to the pavement. The tracing was done on strips of film, one metre wide, which spanned the complete width of the pavement. Five strips were used in all, each tracing over-lapping its neighbour by two or three rows of cubes. One strip was completed at a time and a cube every metre or so along the rows common to adjacent strips was shaded black to assist assembly of the final drawing. The colours in the mosaic were numerically coded and these were recorded on the film, as the tracing proceeded. They were matched against the Munsell Soil Color Chart, and their equivalent codes noted. Each strip was then gently cleaned of as much dirt and grit as possible and the ink lines retouched where necessary. The strips were then cut up to form twenty-eight squares approximately one metre across each of which was coded to help reassembly later. The squares were then photographically reduced by exactly one fifth and fitted together to form the complete mosaic drawing. The reductions were done by a local



firm of printers. The matching together of the reduced squares was almost perfect and presented no serious difficulty. The strips had to be cut up since otherwise they would have been too long for reduction.

To the assembled reductions were added a metric scale and outlines of the design where it was missing in the mosaic. All extraneous lines and other marks were either whited out or cut off. The drawing was then again reduced professionally, this time by one tenth, and printed on good quality paper ready for painting. The finished size measures 87 x 93 cms. After the cubes were all painted, the large unpainted white areas were made less obtrusive by covering them with light grey 'Letratone'.

Apart from the weather, problems which often slowed down the tracing considerably were condensation building up under the film, iron-pan, and crushed cubes, since all these factors obscured colour and cubes. The painting of the final reduction was also held up by having to rectify mistakes made on site in the colour coding of individual cubes.

The colour matching has to be a compromise since within any single colour there can be a range of subtle differences of hue depending on the nature and humidity of the materials concerned.

The method is extremely expensive in labour terms. In the case of the Middleborough mosaic, materials and reductions were about £125 whereas labour costs were the equivalent of several months' pay for one person. On the other hand, the result is in the main very accurate and faithful to the original. The method is certainly convenient for dealing with small fragments of mosaic, although with large areas, especially if the cubes are small, this would be a major undertaking.

If a pavement is to be lifted, this method does provide a one-to-one tracing of the original for use if need be during the reconstruction and mounting work. The cost of lifting and mounting the Middleborough pavement by the Colchester and Essex Museum is estimated at several thousand pounds; compared with this, the cost of drawing and painting is not excessive.

If this method is to be used, points to bear in mind are as follows :

- A. - The thickness of the lines of the tracing must be related to their final reduced size and be such that on reduction the lines will not vanish. As a rough guide, if the tracing is to be reduced  $x$  times, make the line thickness of the tracing no less than  $x/10$  mm.
- B. - To ensure fast tracing, it is necessary only to trace round two adjacent sides of each cube, not four; also where obvious in the pattern, colour coding of the cubes can be strictly minimised.
- C. - The size of the final reduction should be related to the cube sizes of the pavement. In the case of the Middleborough pavement, exceptionally small cubes were reduced to 1/2 mm square although a comfortable size of cube which is neither too small nor too big to paint easily and quickly is about 2 mm square.
- D. - It is helpful if the final reduction can be printed on paper lightly tinted grey.
- E. - The final drawing should be mounted on cardboard and this should be done before painting.
- F. - The work can be undertaken by inexperienced workers under close supervision providing the final painting is done by somebody who is neat, has a steady hand and can match colours. Of course artistic ability is highly desirable.

## ACKNOWLEDGEMENTS

The painting of the Middleborough mosaic was done by R.H. Moyes who, during the tracing stage, was assisted by A. Drysdale, L. Hendry, V. Grainger and N. Crummy. To all concerned, especially Bob Moyes on whose skill the success of the project depended, I extend my warmest thanks. The excavation at the Old Cattle Market site was directed for the Colchester Archaeological Trust by Howard Brooks and the writer and was carried out with the generous assistance of the developer, the Royal London Mutual Insurance Co. Ltd. I am indebted to Professor S.S. Frere and Dr. D.J. Smith who kindly read this paper through in draft form.

## ILLUSTRATIONS AND CAPTIONS

- Fig. 1 - The pavement from the Old Cattle Market site, Colchester. Illustration by R.H. Moyes.
- Fig. 2 - (No caption)
- Fig. 3 - (No caption):
- Fig. 4 - (No caption)
- Fig. 5 - Measurements in Roman feet.
- Fig. 6 - Painting : detail of central panel, scale double actual size of painting.
- Fig. 7 - Painting : detail of foliate scroll, scale one and a half times the actual size of the painting.

## NOTES

- (1) - One Roman foot taken to be 11.6 English inches. There is no clear evidence that I could find of Moore's 'mosaic units' (R.E.M. Moore, Mosaic Units : Archaeometry 11, 1969, pp. 145 - 58).





Fig. 1

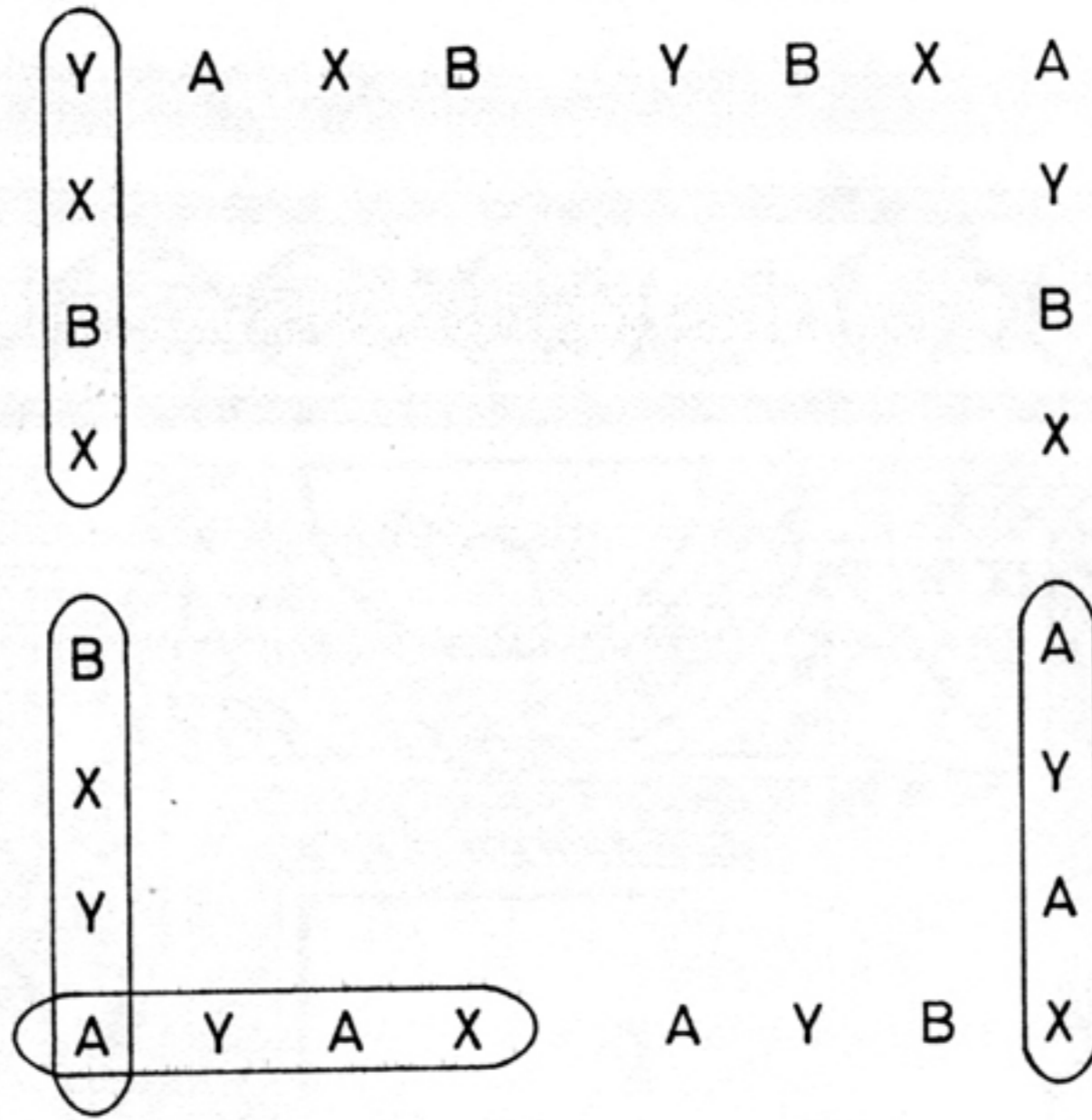


Fig. 2

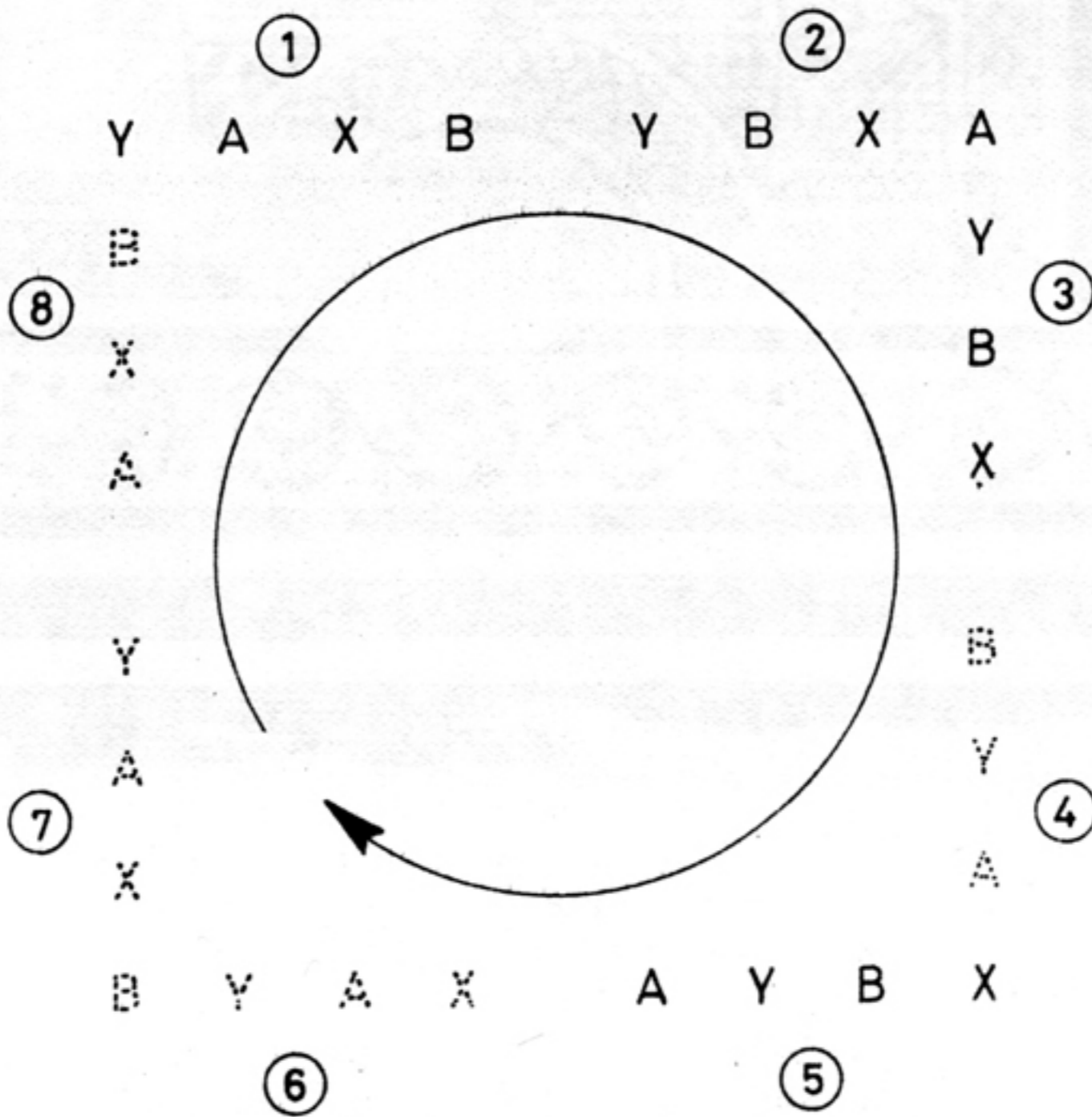


Fig. 3



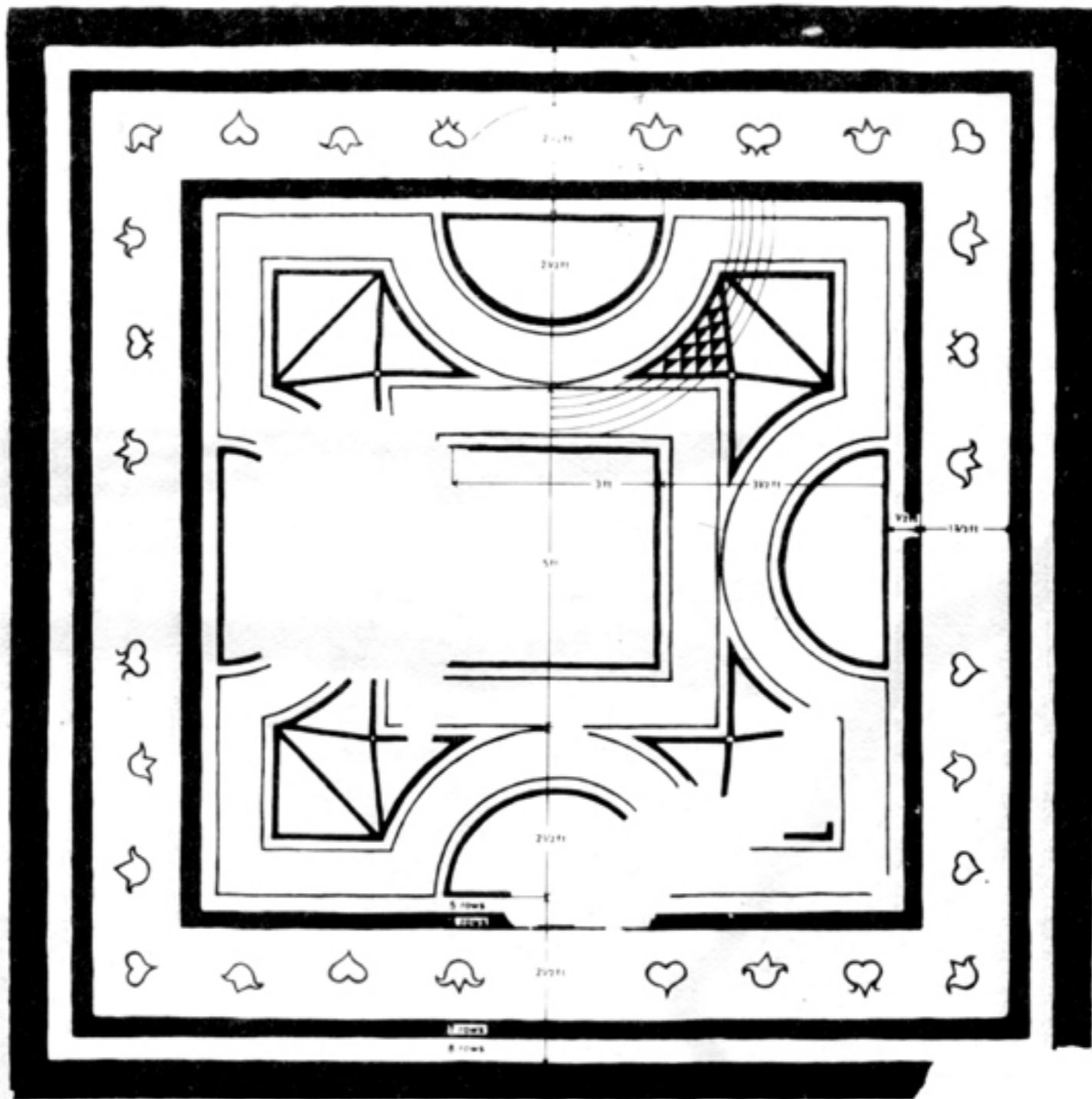


Fig. 4

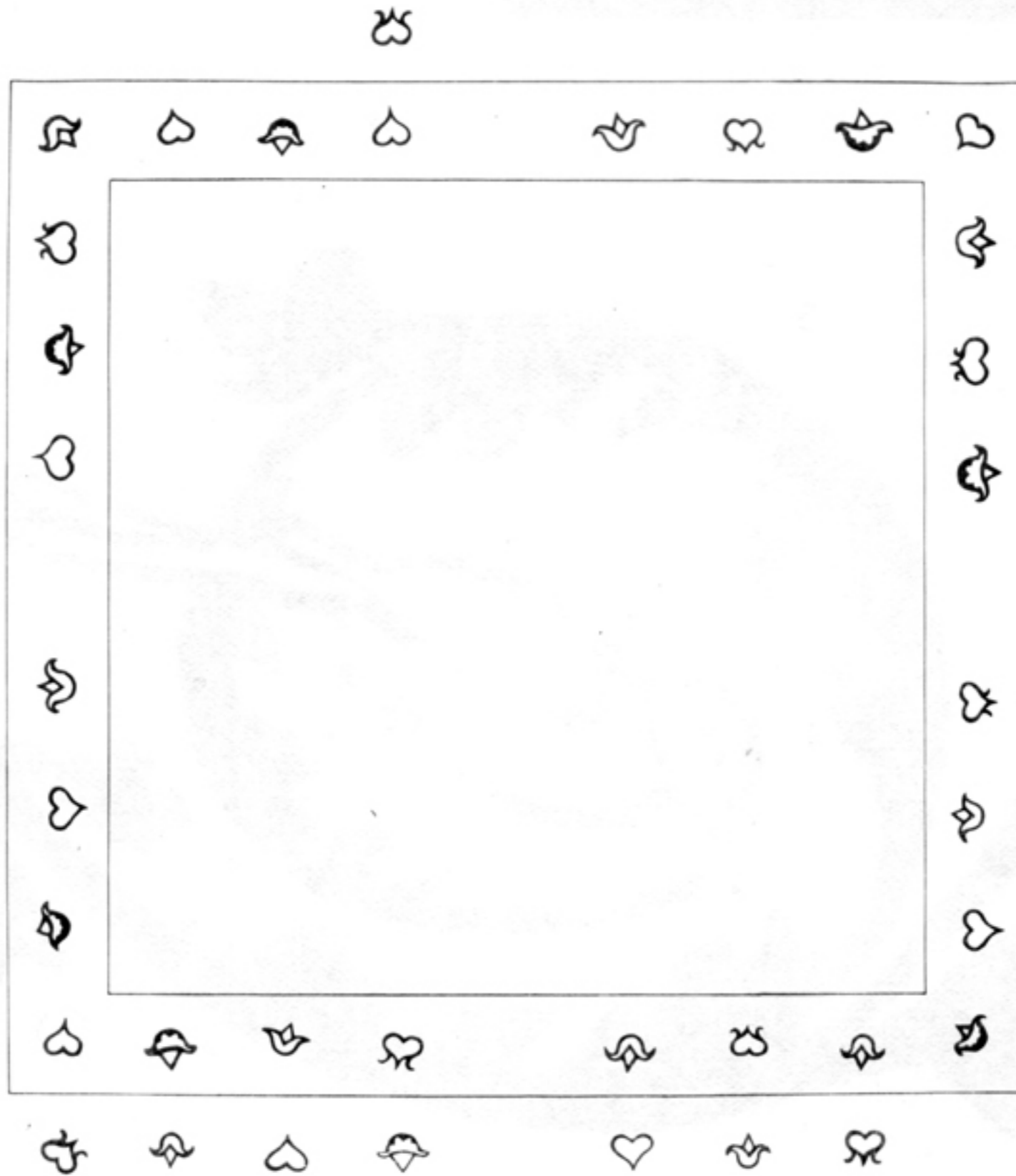


Fig. 5



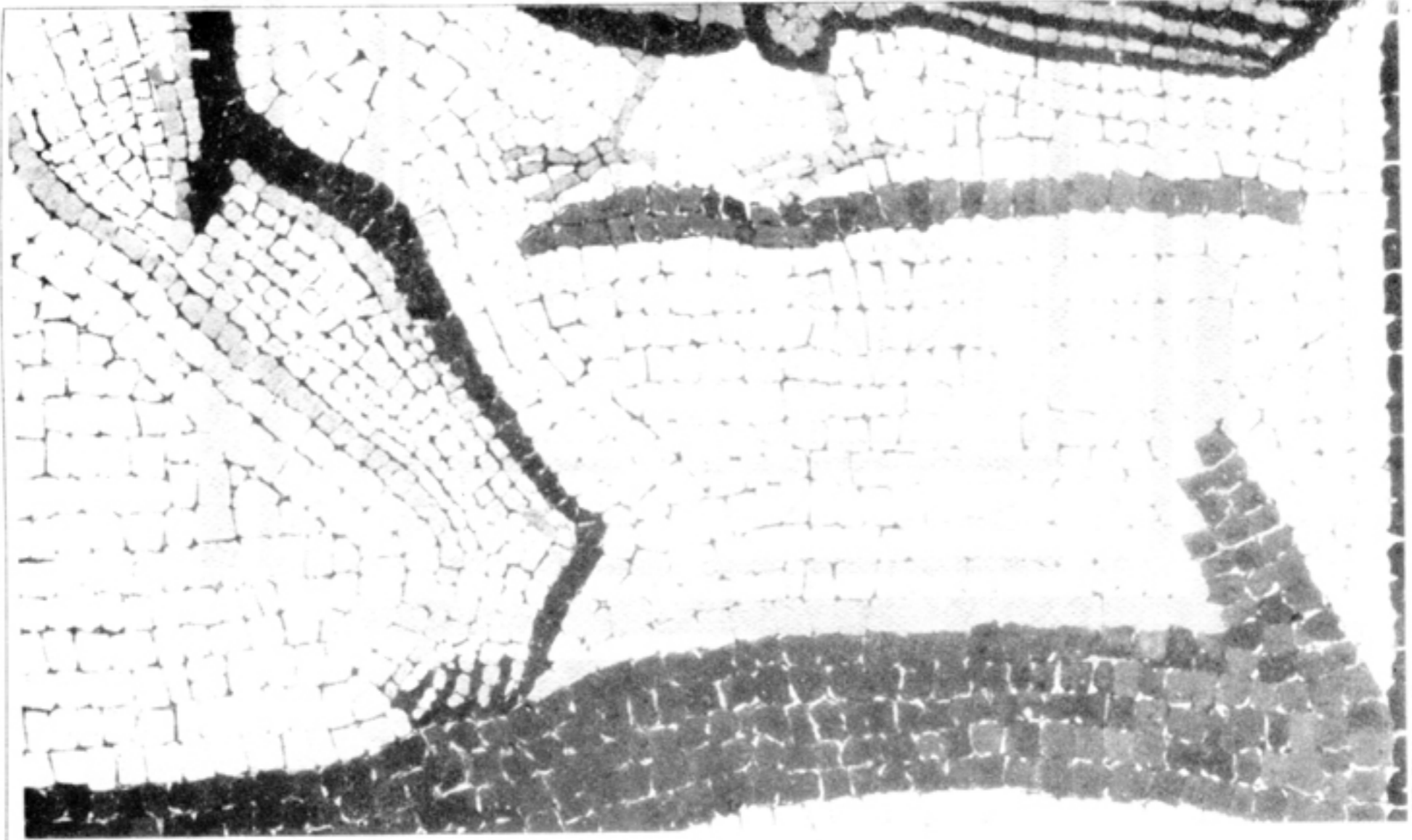


Fig. 6



Fig. 7