THE 'GUTENBERG' BIBLE.

OF the many studies and essays, good and bad, which the Gutenberg celebration this year has called forth in Germany, the most attractive to one who is interested in the development of printing as a craft is that which was issued by the Royal Library at Berlin some months since. Its writer, Dr. Paul Schwenke, has succeeded in gaining fresh light from a source which most of us believed to have been exhausted by Dr. Dziatzko in his treatise on the same subject ten years ago. This new work on the 42-line or 'Mazarine' Bible supplements in several respects the results arrived at by Dr. Schwenke's forerunners, but is chiefly remarkable for approaching the problems from a somewhat different standpoint. He undertook a very painstaking and minute investigation into the relations of the individual letters to one another, both in the case of different letters or 'sorts' placed side by side in the same line, and of the same letter as it appears in different parts of the work. He has thus satisfied himself, and brings forward arguments to convince others, that the technique of the printer of this Bible is such that, with the exception of a Donatus or two, the Paris 'Cantica ad matutinas,' which is a fragment of a liturgical Psalter, and the 30-line indulgence of 1454-55, the production of no other book now extant can be safely attributed to him. The criticism which one feels inclined to make on these conclusions is that the case as against Schöffer seems by no means convincing. The natural development is towards greater freedom in the use of material, and Schöffer's characteristics are singularly like those of Dr. Schwenke's printer. He is shown to be a man with a strong sense of method, so much so that even

in the distribution of the different sorts of paper to his pressmen some kind of rotation was observed; the work was carefully planned as a whole, and after its first experimental stage was past, moved on without a hitch, though the number of compositors and presses simultaneously at work was a large one. Great care was thus taken to avoid undue waste or delay due to want of organisation: at the same time no sign of scanty resources is apparent, or of parsimony, in sparing any change considered advisable for the success of the undertaking, or making shift with scrappy material (as was done with the paper used in the 36-line Bible), or any other than the best. Dr. Schwenke is able to give a detailed account of the remarkable way in which the type was constantly worked upon while the book was passing through the press; and even estimates, by an ingenious chain of part reasoning, part conjecture, with some degree of plausibility the number of copies that may have been produced both on paper and on vellum.

It is well known that during the progress of the work, some time after the final adoption of the 42-line page in place of the original one of 40 lines, it was decided that the number of copies to be printed should be increased, and accordingly it became necessary to set up afresh such part of the text as had been already printed off. Hence the existence of a double 'edition' of certain quires, which is valuable to the investigator in many ways, not only by showing him in how many places at once the compositors took the copy in hand, but more especially because the additional number required was not struck off as soon as the increase of the edition was decided, but was left to the end of the work. Thus the two 'editions' show respectively the earliest and latest period of type and technique, and are so much the more serviceable for purposes of comparison. The chief object which the designer of the fount had in view was to equalise as much as possible the intervals between the perpendicular strokes, which in a church type are more prominent than

the rest. He thus sacrificed to the appearance of his page as a whole much of the beauty of the single letters. For it was impossible to attain the effect he aimed at, in the case of letters such as c, e, r, which have projections on the front side of their up and down strokes, without suppressing the angular bosses on the hind side of the letters following these, on which much of their success as letters depends. Accordingly a complete alphabet of secondary forms was made, in which the left or hind side was left perfectly flat, and was brought to the very edge of the shank, so that it might fit closely on to the preceding letter. This was probably managed in many cases by trimming an existing letter, and then striking a fresh matrix from it; but in some cases a new punch had to be cut. The reckless way in which the first printers multiplied their 'sorts,' and the frequency with which a whole fount is disused after one or two impressions, without ever being recast, make it certain that this process involved by no means the same labour that the steel punches of to-day require, and that both punches and matrices were of some comparatively soft and perishable material; very probably, as Dr. Schwenke thinks, at any rate with founts of large body, the punches were of wood, and the matrices of lead, into which the punches were struck while it was half-melted. The rule adopted with regard to these secondary forms was that they were to be used after certain letters, in all seven capital and nine lower-case sorts; and the practice was invariable. With regard to a tenth letter, the f, which projects in a similar way, the matter is rather different. The top of this letter stands at such a height as makes it possible for shorter letters to be adapted in such a way that they will fit under it. Hence the letter following the f is the main form, except where it is also a tall one, such as b; in these cases the secondary form was used, or the point of the f was slightly filed and fitted on the main form of the b. The combinations occurring most frequently, ff, ff, ft, were cast as a single letter. An

exception to the use of the main form after *f* is found in certain definitely restricted parts of the work, where after the secondary *f* the secondary form of the short letter following is found, possibly from some notion of assimilation. But with this slight exception the rule is for the most part strictly held to, and Dr. Schwenke thinks it the best test that can possibly be applied as a means of identifying or rejecting other books attributed to the same press. Thus the neglect of the rule in the Bible of 36 lines, and in such books of Schöffer as are printed in types which have similar characteristics, is to him strong evidence that the printers of those books did not know the rules here adopted for the use of secondary forms, or, knowing them, did not trouble to apply them; consequently Schöffer cannot be identified with the printer of the 42-line Bible, and Dr. Dziatzko's view that the two Bibles are due to a single hand is likewise shown to be mistaken.

Another detail which leads to the same conclusion is to be found in the spacing out of the lines. After allowing for variations due to the different degrees of skill in this respect of the several compositors, who had nothing to guide them but the eye, no one can doubt that their instructions were to make the lines as even as possible. It was, however, laid down at the same time that the full point, which stands on the line, the hyphen, and that form of *s* final which is like the figure 5 and stands above the line, should be reckoned, when they came at the end, to be outside the column. These, therefore, invariably project into the margin. For the higher or half point no rule was at first laid down, but it was finally decided to include it in the column; thus it is found at first indifferently in the line or outside it, but in the later parts of the book it is never placed in the margin. These striking rules and usages are not reproduced in the 36-line Bible or in the books of Schöffer.

The various changes undergone by the type during the course of printing have been worked out with great care by

Dr. Schwenke; the story of them forms a noteworthy instance of the unvarying diligence and indifference to trouble shown by the printer in carrying out his plans, as they were formed at first, and then from time to time modified. The fact that the column of 42 lines occupies almost exactly the same space as that of 40 lines has long been known, but with hardly any exception the difference has always been attributed to the use of leading on the 40-line page. This, as Dr. Schwenke clearly proves, is not so; the change is due to successive alterations in the body of the type. The page of 41 lines shows an intermediate stage. For this the letters were reduced in height by some $\frac{3}{10}$ of a millimetre, so that the 41 lines measure nearly 5 mm. less than a 40-line column. This was done by means of the file for each letter separately; and its effect on them is to be seen best in the case of those letters which run up to the top of the 'face.' The upper edge of the capitals is flattened and rounded, and the marks of abbreviation are visibly thinner. When, after a single trial of 41 lines, the definitive arrangement of a page of 42 lines was adopted, a further very slight lessening in height took place, the final result being that the 42 lines are about $\frac{7}{10}$ of a millimetre shorter than the 40 lines of the type before alteration. Though so slight ($\frac{1}{10}$ mm. only) this second reduction has left very clear traces, as it broke into the crown of the semicircular stroke over the i which is used for a dot. The old letters, thus mutilated, were gradually replaced by new letters cast on the shorter body from fresh punches. The form of the separate letters, the appearance of the page as a whole, and its readableness were so greatly injured by the change, that it is difficult to find any gain that can have been so great as to induce the printer to undergo so much labour and expense for a worse result. It seems hardly possible that it was merely on account of the saving in space, which, Dr. Schwenke reckons, would amount to 32 leaves in the whole work, as one would think that so small a gain would not cover the cost of the changes;

but it must be remembered that in any case new letters would have had to be made to replace the old when worn out, and it may be that the comparatively small quantity of type existing made the task of filing down each sort separately not so great a task as appears likely at first sight.

The calculations of Dr. Schwenke as to the probable number of copies which formed the edition are based on the proportionate use made of two of the four kinds of paper used for the book. He found that in a normal copy this is as 4 to 13, there being 16 sheets of the one and 52 of the other. Thus, of the former paper a ream of 480 sheets would be enough for 30 copies. Four times this quantity would give 120 copies. But the appearance of a single sheet of this paper in three successive quires suggests that the amount was divisible by three, so that it may have been six reams. This makes 180 copies, or, allowing for waste, say 170 copies on paper, of which some 30 or more still exist. The 11 extant on vellum may represent an original number of 30, or an edition of 200 copies in all. From an inscription in the copy on vellum formerly in the Ashburnham collection, and now in New York, we learn that at an early period the two volumes with their illuminations were valued at 100 florins each. A paper copy may have been worth half this sum or less.

The facsimiles with which Dr. Schwenke's work is illustrated have been carefully chosen to illustrate his arguments. Those which show the same text in the 40 and 42-line 'editions' side by side are especially valuable. In one or two of his reproductions some 'spaces' which have worked up are shown, and another gives the impression made by a letter which has fallen sideways on the margin of the forme. This is hardly satisfactory, as the indentation of the type necessarily disappears in a process-block, and all that is left is the mark made by the ink which penetrated the frame of paper attached to the tympan for the purpose of keeping the margins clean.

We may, however, take Dr. Schwenke's word for it that the shape of this letter supports the conclusion drawn from the spaces just referred to, which never show anything higher than the top of the short letters. This seems to prove that part of the type was made with the upper shoulder cut rather low, for the purpose of fitting into the f; and Dr. Schwenke says that the letter lying on the margin, which he takes to be a g, shows the same peculiarity. Many other valuable and curious pieces of information in his book must be perforce passed over here, or but briefly mentioned. He finds that at first each doubled sheet of paper was fastened to the tympan by no fewer than ten pins, two at the top and two at the bottom of each column, and the others in the outer margin. The space between the columns, and some part at least of the margin, was built up with masses of quadrats, some of which have left an impression on the paper. Dr. Schwenke's notes on the first binders of various copies are also of interest. He has discovered that the binder, Hainz or Heinrich Coster (misread in the South Kensington catalogue as 'Huntermaster'), worked at Lübeck, while Hans Fogel, who bound at least two existing copies, was a bookbinder at Erfurt, and at some time after 1478 was succeeded there by one Paul Lehener. The ingenious table (following that of Dr. Dziatzko) on pp. 52, 53, indicates at a glance the arrangement of the sorts of paper in the various quires, the division of the work among the six presses, as well as the points at which certain changes in plan or new forms of letters first appear. The exhaustive list of known copies is of great value, and the writer devotes some pages at the end to a short account of the Bible of 36 lines and the Catholicon group of 1460, in order to prove that they cannot possibly be the work of the printer of the 42-line Bible.

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