Technical Drawing Se...

FREE-HAND LETTERING

DANIELS

TECHNICAL DRAWING SERIES

A TEXT-BOOK OF FREE-HAND LETTERING

BY

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PREFACE

THE changes in this edition of "Free-hand Lettering" are so numerous and radical that the result is a new book, rather than a revision of the old one. The text has been entirely rewritten, and new plates and figures have been drawn. The proportions of letters have been greatly improved, and a distinctly higher standard has been set for the student. At the same time, he is given careful directions to enable him to approach the standard. These directions have been made as explicit and clear as possible, for the author is well aware that the time which can be given to this work in the technical schools is very limited.

Throughout the book there is a constant attempt to present principles which will appeal to the student's reason, rather than to give rules which will only tax his memory; that is, an effort is made to show that the details, which at first sight may seem numberless and involved, have a logical basis. When this basis is once understood, no effort of memory is necessary for the proper handling of details. On the other hand, teachers should remember, especially in the first stages of the work, that it is not sufficient for students to understand reasons. In order that they may attain the object of their work in this subject, they must acquire skill in execution; wherefore the definite directions for performing exercises.

There is repeated insistence in the text that lettering belongs in the realm of *design*. If the work is approached with this idea, it will be done with pleasure, and with a sense that it is a means of expressing individuality.

The definite examples and exercises for practice constitute a complete minimum course, which can easily be extended by those who can give additional time to the subject. These

definite examples, exercises, and directions for work save the time of both instructor and student, and constitute an important feature of all the books in the Technical Drawing Series.

Plate XIII was made directly from a drawing of the Massachusetts Metropolitan Water Works, and Plate XV from the tracing of a drawing from the same source. Plate IX was drawn by the author from the "Ephemeris Epigraphica," Vol. I, and all other plates and the figures in the text were devised and drawn by the author.

BOSTON, August, 1907.

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FREE-HAND LETTERING

CHAPTER I

INTRODUCTION AND PRELIMINARY EXERCISES

1. General Requirements. A draftsman should be able to letter his drawings not only neatly but rapidly. To secure speed and well-balanced proportion, he must be able to do good lining *free-hand*, and to estimate accurately both distance and direction. The following exercises are designed to secure such results.

Many combinations of lines deceive the eye, not only as to the extent and form of the areas they include, but also as to the relative directions of the lines. The degree of deception varies under different conditions; and as these conditions in the various forms, proportions, and combinations of letters are unlimited, it is impossible to give rules to cover all cases of proportion, spacing, etc., in individual letters, and in words and combinations of words. Hence the importance that the *general principles* governing good taste and proportion be learned, in order that the draftsman may have a basis for solving the differing problems as they arise.

The execution of good lettering requires considerable manual skill, therefore practice as well as careful observation is necessary.

The remarks upon each exercise should be read carefully before practice is begun, and suggestions should be followed. It is carefulness rather than amount of practice that is of value. The elementary things are few, but they must be thoroughly learned first.

2. Paper. For the preliminary exercises and for any work that is not to be inked, use a paper with a moderately soft surface, such as Whatman's cold-pressed, architects' detail paper, or German drawing paper.

For work that is to be finished in ink, a hard, smooth surface must be used, such as Bristol board, Keuffel & Esser's Normal paper, or Weston's linen record paper. Most of the drawings for this book were made on the Weston paper. The exercises are intended to be executed upon sheets 7 by 10 inches. These sheets should be tacked, with the long edges horizontal, to a small drawing board.

3. The Pencil suitable for this work will depend somewhat on the paper. Grade 2 H will be found well adapted for papers of medium rough surface. Paper with a hard surface, which has also considerable "tooth," or roughness, will require a 3 or 4 H grade pencil. Whatever the degree of hardness, the pencil must be of the best quality, made especially for drawing. Probably the best pencils now on the market are Hardmuth's.

The care of the point is of prime importance. With a sharp knife cut away the wood, beginning the cut an inch back from the end, leaving bare at least one-fourth inch of the "lead." The point cannot be properly finished with the knife, but must be ground upon a piece of fine sandpaper fastened to a flat strip; or, better still, upon a file such as is sold for that purpose. Rub the pencil upon the file, holding the latter in the left hand. The point must be long, smooth, and conical, but not quite so sharp as it can be made.

When drawing, hold the pencil about $2\frac{1}{2}$ inches from the end, and be careful that the forefinger is but slightly bent. Exercise constant care not to pinch the pencil, otherwise the muscles will soon tire, and good lines cannot be made. At frequent intervals roll the pencil slightly in the fingers to prevent the point from being worn flat. *Sharpen frequently.*

4. Pens. A variety of pens will be needed. Those most generally useful are Gillott's Nos. 170, 303, and 404; Spencerian "Epistolaire" No. 12; and Leonardt & Co.'s ball-pointed Nos. 506 F and 506 EF. The skilled draftsman will find a lithographic or mapping pen useful, but these pens are too fine and flexible for most students to use, as they require a very light touch.

No pen is at its best when new, and pens that are once "broken in" should be given as great care as any other drawing instrument. When used only with India ink, which does not corrode them, pens will remain in good condition for a long time, in some cases for years.

5. A Triangle and a Scale will be useful, the former for testing the direction of lines, and the latter for laying off distances between limiting lines and for testing distances that have been estimated.

6. Limiting Lines are ruled lines to limit the height of letters. A T square is most convenient for drawing them. They must be light, fine, and accurately parallel.

When it is necessary to erase part of a limiting line, it must be drawn in again before work is resumed, for these lines cannot be dispensed with, even by skilled letterers.

PLATE I, EXERCISE 1

7. General Directions. Draw limiting lines according to dimensions given. Each line of each exercise is to extend across the sheet, except that a space of about one inch is to be left at each end; thus each exercise will fill a sheet. The blank line at the end of each exercise is for additional practice upon such portions of the exercise as shall have proved most difficult.

8. Line 1, Estimation of Distance and Direction. Make a dot upon the upper line where the work will begin, then another vertically below it upon the lower line. Draw from the upper to the lower point a fine, light line with one stroke of the pencil. Go over the line as many times as need be to make it straight and firm, but always with a stroke the full length of the line. Now place another pair of points at an estimated distance of one-fourth inch from the first pair, and draw the second line. After having drawn several lines, test to see if they are vertical and one-fourth inch apart. If not, do not erase them, but seek to correct the errors in the following lines. In the latter half of the exercise, seek to dispense with the points upon the limiting lines.

9. Line 2, Comparison of Lines and Spaces. Draw in pairs. A dash on the upper line forms a pair with the one below it. Draw the upper line of a pair first, and finish each pair before drawing the next. Be careful that the pairs are at the correct distances apart.

10. Line 3, Comparison of Widths. Make the angle between vertical and horizontal lines sharp and decided. Some difficulty may be experienced in estimating the distance from L to T, as we must here pass from the lower to the upper line. When the L is finished place a point vertically above its right-hand limit, and from this estimate the distance to the beginning of the T. Notice that when these letters are of the same width the T looks the narrower; notice also that while there is the same horizontal distance between the letters, they do not appear evenly spaced.

11. Line 4, Comparison of a Vertical with a Horizontal Distance. Place a point for the lower end of the first line. Point vertically above this, and to the right upon the upper line point a distance equal to the distance between the limiting lines. Join the last point with the first at a single stroke.

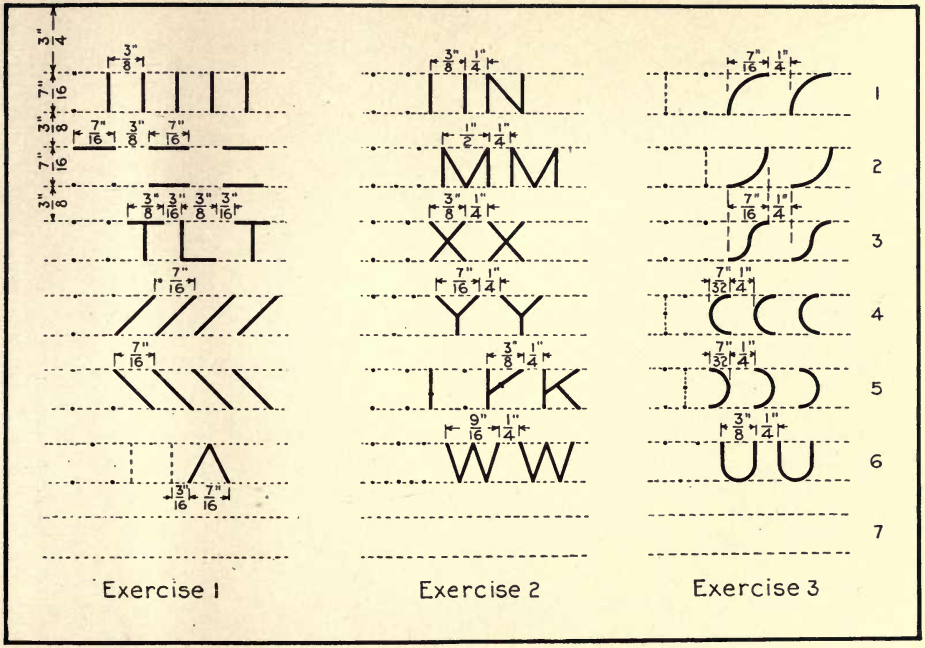


Plate I

12. Line 5, Backward-sloping Lines. Point as suggested in the Plate, and draw from the top downward, resting the hand upon the paper between the work and the right-hand edge of the sheet.

13. Line 6, Slopes to Right and Left. Point carefully as follows: on the lower line estimate the extreme width of figure, and bisect it. Point upon the upper line vertically above the bisecting point; or a square may first be very lightly outlined, and its upper side bisected. The latter half of the line may consist of V's. Note that with equal height and width of figure the width *appears* less.

PLATE I, EXERCISE 2

14. Line 1, Effect of Diagonal Lines. Draw the vertical lines first. Note that when the diagonal line is added, the figure seems to have been slightly widened. Omit pointing in latter half of line, but always draw vertical lines first.

15. Line 2, Effect of Many Angles. The figure is made considerably wider than those previously given; otherwise the presence of three acute angles would cause the figure to look pinched and out of proportion. Draw vertical lines first, and draw all lines downward.

16. Line 3, Two Diagonals. This combination of lines requires some care to secure a symmetrical figure, leaning neither forward nor backward.

17. Line 4, Two Slopes and a Vertical. Be careful that the figures in this line are like one another. Note that this combination of lines causes the figure to appear a little narrower than the figure of line 3; hence the greater width assigned to the figure of line 4.

18. Line 5, Unsymmetrical Figure. The effect of this combination is to cause the figure to look a little wider than it is high. Draw the lines in the order indicated, and always downward.

19. Line 6, Effect of Small Angles. This combination of lines gives more acute angles than does the combination in line 2, with the result that the figure must be considerably widened to escape a decidedly pinched appearance.

PLATE I, EXERCISE 3

20. General Directions. Detailed directions for this exercise should not be needed if the following hints are heeded : —

Note that each figure is a quadrant, or a combination of quadrants, and that it occupies either a square, or a rectangle whose length is twice its width. So far as possible, draw each figure with a single continuous stroke, rather than with a series of short dashes. Use a drawing instrument occasionally to test the curves. In line 6 draw the vertical lines first, then add the curve.

CHAPTER II

GENERAL CONSIDERATIONS APPLICABLE TO ALL STYLES OF LETTERS

21. Principles governing Form. It is important that the principles governing the forms of letters, whether of the Gothic, Roman, or other style, be understood before any attempt is made at drawing even the simplest letters. While no alphabet is made upon anything like a mathematical basis, yet there are a few principles which by common consent apply in the construction of letters of whatever style.

First, letters should have an appearance of both stability and grace. In letters with a narrow base, as F and P, it is impossible to avoid a top-heavy effect, but in general the correct form with respect to stability and grace is secured : —

1. By making the lower part of the letter wider than the upper, as in B, E, K, R, S, X, and Z.

2. By placing some horizontal members above the center, as in B, E, F, H, and R.

Some letters, as B and E, exhibit both the above principles.

In a few cases, notably in A, the horizontal line is placed below the center for reasons which can best be explained later (Art. 49).

Second, since letters are used in combinations to form words, it is not sufficient to secure a graceful form for the individual letters, considering each by itself, but they must be so proportioned that when compared with one another the effect of the combination will be pleasing

to the eye. It is quite apparent that the I cannot be as wide as the H, nor would any one draw the J as wide as the W, and the reasons for these differences would not be far to seek; but why the O need be wider than the E is not so plain.

22. Optical Illusions. Referring to Fig. 1, it is seen that the converging lines form a figure whose width at the base is *apparently* considerably less than the width of the square, although these widths are really equal. This apparent difference in extreme width is due to the fact that in the first case the width is constantly changing, while in the other case it is everywhere the same. In the first case the eye does not discriminate between the width at the base and the width taken all along from base to top, but attempts to accept their *average* for the extreme width, and partly succeeds; while in the case of the square the width at the base is the same as at any other point, and there is no deception concerning this dimension. No amount of study of the figure will cause this apparent difference in widths to disappear; hence the deception is not due to an untrained eye, but to psychological reasons. When similar combinations of lines occur in lettering or other design, allowances must be made to overcome such unbalanced appearances; for instance, in Plate II the A is made wider than the H. Referring again to Fig. 1, it will be noted that the O, although of the same width and height as the E, looks both narrower and shorter, because the eye (or rather the mind) tends to accept the *average* width and height for the extreme. Hence the necessity of making the O wider and higher than the E of the same alphabet. These considerations lead us to the general rule that *when the width or height of a letter is constantly changing, these dimensions must be creased.*

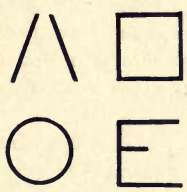


Fig. 1

Some exceptions to this rule must be made, as in the case of the B. If the width as compared with the height be so great that portions of the top and bottom lines are straight and horizontal, as is generally the case, no increase in height is necessary. The width needs no increase, partly because of the straight line which limits it at the left, but principally because of the middle horizontal line, which breaks the outline into two loops, each wider than it is high.

23. Effect of Acute Angles. There is little deception of appearance in the width of the M, yet this letter is drawn considerably wider than, for instance, the H. The reason is that the angle between adjacent lines must not be very acute; otherwise the letter will have a squeezed, uncomfortable, and unpleasing appearance. Hence the M is spread out to give sufficiently wide angles between its lines. For the same reason, and also because its extreme lines are converging, the W is drawn much wider than E or H.

24. Relative Heights of Lower-case Letters. The lower-case, or "small" letters, may be divided into three groups: first, those like **b** and **d** which have the same height and limiting lines as the capitals with which they would be combined in words; second, those like **a** and **c** which have their bases drawn on the same lower limiting line with the capitals, but which are much shorter than the latter; third, those like **g** and **j** which extend below the lower limiting line of the capitals.

The **t** might form a fourth class, as its height is less than that of the first group, and greater than that of the second.

In proportioning the lower-case alphabet the first question to be settled is the actual height of the letters in the second group as compared with the height of the capitals with

which they are to be used. Different designers use different ratios. In this book the short letters are made two-thirds as high as the others, as this is believed to be the ratio which most nearly suits all cases.

25. Limiting Lines. The height of capitals having been fixed by their limiting lines 1 and 2, Fig. 2, the height of the first group of the lower-case letters will be fixed by the same lines. Line 3 drawn above 2 at two-thirds the distance from 2 to 1 will limit the height of the letters of the second group, while those of the third group will be limited at the top by line 3, and at the bottom by line 4, which is drawn as far below 2 as 3 is below 1.

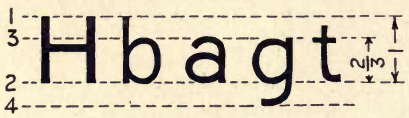


Fig. 2

CHAPTER III

UPRIGHT AND INCLINED GOTHIC LETTERS

26. A Simple but Useful Style. The Gothic alphabet is the simplest style, and when well drawn is suitable for almost any purpose. Its simplicity renders it especially useful as the first alphabet to be studied, for with the fewest possible strokes in each letter to deal with, it is easier to give due attention to proportion, without which no letters are well drawn, however well they may be executed in other respects. Moreover, the Gothic letters may be regarded as a basis for all the other styles considered in this book.

27. No Standard Proportions. By reference to Plate II it will be seen that the height of letters is assumed to be divided into six equal parts, or units, and that each letter and figure is assigned a certain number of these units for its width. It should be plainly understood that the proportions thus indicated are not standard. Lettering is a matter of design, and each designer is at liberty to follow his own ideas, just as an architect follows the dictates of his taste in proportioning. But in both cases there are certain fundamental principles which will govern the general matter of design. No one can state that the M should be exactly $6\frac{1}{2}$ units wide for 6 units in height, or that the H should be 5 units wide. Both of these letters are often drawn with quite different proportions. But the principle of design recognized as governing the relation of H and M is that, whatever width be given to the H, a *greater* width must be given to the M of the same alphabet.

Furthermore, since letters are combined to form words, the proportion of each letter must be considered with reference to its effect upon its neighbor. As the architect varies the proportions of doors, windows, and ornamental features so that each will contribute to the harmony of the whole, so the designer proportions each letter in a word with due regard to the forms of the neighboring letters. Thus, in such a word as CARTWRIGHT the tail of the first R will extend a little farther to the right than will that of the second R, in order to close up what would be a wide space at the left of the stem of the T.

28. Printers' Types not to be taken as Models. From the foregoing it will be seen that printed letters should not be taken as models, and that types cannot be used to good advantage to print titles or other lettering on drawings, for the fixed forms and limited means for adjusting the spaces between letters render it impossible to make the result a *design*.

29. Proportions to be followed in Practice. The proportions given on the Plates should be regarded as good *average* proportions, and the draftsman should adhere rigidly to these proportions in the practice work, although he may use somewhat different proportions after his taste has become adjusted to the principles of design.

30. Laying out the Sheet. The sheet should be 7 by 10 inches in size, with no border line; or, if a border line is desired, it should inclose a space 7 by 10 inches, the margin extending beyond. In either case the distances given on the Plates for laying out the sheet are to be measured from the sides of the 7-inch by 10-inch rectangle. Draw the limiting lines in accordance with the dimensions given at the left of the Plate. These lines should be firm but fine lines, drawn with a pencil of about 4 H grade. They will be continuous,


GOTHIC—FOR PRACTICE
EE FF HH II LL TT AA
KK MM NN VV WW XX
YY ZZ BB DD JJ PP
RR UU OO CC GG QQ SS
k l v w x z b d f h j m n p q r t t
u y a c e g g o s
1 4 7 2 3 5 6 8 9 0

Plate II

or "full," lines, and not dotted as shown in the plate. The figures by which the limiting lines are placed should not be copied on the practice sheet, as they, and indeed the limiting lines also, are but means to an end, the real problem being the drawing of the letters in their correct proportions.

31. The Scale for measuring Widths. The space between the lines limiting the height of the capitals, and also that between the lines limiting the height of i, v, x, etc., in the lower-case letters, should be divided into six equal parts, not by actual measurements, but free-hand. First bisect the space, then divide each of the half-heights thus formed into three equal parts. Next bring the edge of a card near the points of division and copy them upon it, as shown in Fig. 3, extending the number of divisions to eight.

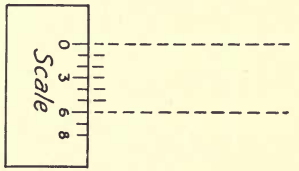


Fig. 3

This scale will be used in measuring the widths of letters.

32. The Proper Use of the Scale. The scale will prove to be either a help or a hindrance, according to its proper or improper use. Always remember that the formation of letters is a problem in free-hand design, and not one in mechanical drawing. The scale will then be used as little as possible, and when used it will be *after* a letter has been drawn, in order to test the accuracy of its proportion, rather than to lay out the proportionate width *before* drawing the letter.

When the designer knows that his proportions are right by looking at the letters

and *feeling a sense of harmony*, then the scale may, and indeed should, be dispensed with. Until that time is reached, it will be useful in correcting errors of judgment, and so help the designer to a sense of proportion.

33. The Scheme of Plate II. The letters are arranged in the progressive order of the difficulty of drawing them. First, those composed of straight vertical and horizontal lines; second, those containing inclined straight lines; and finally, those consisting partly or wholly of curved lines.

Two of each of the capitals are to be drawn. Estimate the width of the first letter of each pair in accordance with the number of units shown. After the sketching of the letter is completed, measure its width with the scale. Note carefully the defects. Do not correct them in the first letter of the pair, but seek to do so as you draw the second, still refraining from using the scale until the outlining is finished. If necessary, make erasures and corrections in the second letter of each pair; but this should not be necessary if the defects in the first are carefully noted.

34. Thickness of Stems. The thickness of the lines composing the capital letters and figures is one-ninth of the total height, or two-thirds of a unit, as shown by the I. For the lower-case letters this thickness is three-fourths of a unit.

35. Special Details of Form. In many cases the first letters of pairs are shown with dotted lines calling attention to details of form. For instance, the X and S are shown to be narrower at the top than at the base (as would be expected from Art. 21), but the dotted lines show that the narrowing is all at the right-hand side, while in the Z it is all at the left-hand side.

When two lines join at an acute angle, as in the A, M, N, V, W, and Z, the junction is made so that the lines combine at the limiting line in a width equal to the standard thickness of stem. Thus the V is not pointed at the base, but is as wide at that point as is the F, T, or Y. It is perfectly easy to bring about this result except in the case of the W. Although this letter has no more lines and angles than the M, the requirement that the third line shall be parallel to the first, and the fourth to the second, introduces a condition which makes the letter a difficult one to outline in a *predetermined total width*, unless some special measures be taken to locate the position of the angles. Fig. 4 shows how this may be done. Having fixed the total width, as shown by dotted lines, place points at 1 and 2, fixing the required thickness of the extreme branches of the letter on the upper limiting line. Then place points at 3, bisecting the space between 1 and 2. Bisect again the spaces between 1 and 3 and 2 and 3, giving points 4 and 5. From these drop verticals to the lower limiting line, giving points 6 and 7. On each side of these lay off the required width for the junctions, and outline the letter by joining points as suggested in the figure.

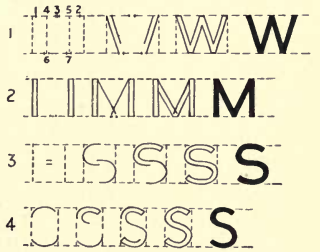


Fig. 4

Although the M does not present special difficulties, the method of pointing in advance of outlining may be employed to advantage, as suggested in line 2, Fig. 4.

By following the methods given in Fig. 4, no trouble will be experienced in forming the S.

If the S is wide compared with its height, proceed as shown in line 3, first fixing the thickness of the stroke by two short dashes placed slightly above the center between the limit-

ing lines, then adding other parts of the outline as shown in the progressive stages. If the S is narrow, the progressive stages may occur as shown in line 4.

36. Weight of Pencil Lines to be used in Outlining. Before attempting to outline letters of any style, note the effect of a heavy outline on a letter that is afterward blacked in solid, either with pencil or ink. Fig. 5 shows light outlining in the first line, and heavy in the second. The proportions in the two cases, however, do not seem essentially different, because when letters are in outline only, the areas by which the eye judges proportions are those included by the *inner edges* of the outline. Lines 3 and 4 are reproductions of lines 1 and 2 respectively, except that they are now blacked in. These last two lines, when compared with each other, show a distinct difference in ratio of thickness of lines to heights and widths of the letters. The reason for this is that proportion in this case is based upon the black areas, and these correspond to those included by the *outer edges* of the original outlining.

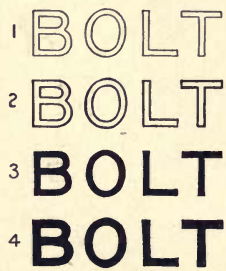
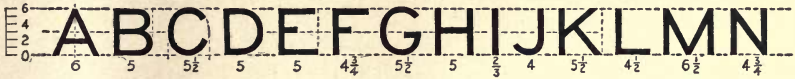


Fig. 5

Until the student appreciates this fact, he is disappointed to find that letters which look well-proportioned when in pencil outline look heavy and clumsy after being blacked in.

For outlining letters that are to be finished solid, two courses suggest themselves from the above considerations. The first is to use a moderately heavy outline, but to make the members of the letters appear rather slender, knowing that when the filling-in has been completed the members will appear much heavier. The second method is to make the outline so fine that

GOTHIC—FOR REFERENCE



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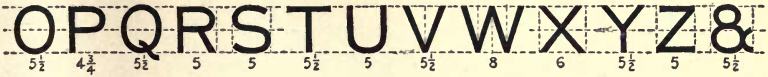

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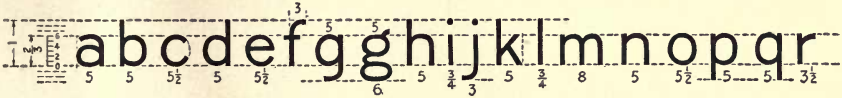

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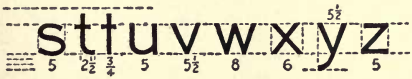

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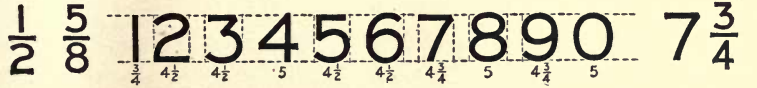


5

Plate III

proportions will be essentially the same whether judged by the inside or outside edges. Until the student has acquired a good idea of proportion it will be much safer for him to follow the second method, which leads also to neatness and carefulness of execution.

37. Gothic Letters and Figures for Reference. For the purpose of easy reference, Plate IV is added, showing the letters and figures in order.

INCLINED GOTHIC, PLATE IV

38. Uses of Inclined Gothic. While for titles, or other purposes, where several lines of words are used, the upright form is more suitable, the inclined form is much used in "one-line titles" or "sub-titles," and in prominent notes, as shown in the last two lines of Plate IV. The upright form is always suitable for these purposes, but if it is used for the title of a drawing, a pleasing variety is obtained by using the inclined form for at least a portion of the lettering in the body of the drawing.

Many draftsmen find it easier to do good work with the inclined form than with the upright. This is probably the result of education rather than of any inherent difficulty in the upright form.

39. Amount of Inclination. The exact amount of inclination is not of great importance, but it is necessary that *uniformity* of inclination must be maintained.

The inclination or slant used in this book is shown at (*a*), Plate IV.

It is obtained by laying off three units on a horizontal line and eight of the same units on a vertical dropped from the left-hand end of the first line, and joining the extreme points.

The slant line thus drawn makes an angle of about $69\frac{1}{2}°$ with the horizontal. Parallel to this are to be drawn all lines of the inclined letters which correspond to vertical lines of the upright form.

40. Transition from Upright to Inclined Gothic. Although the vertical lines of the upright form suffer a change of direction in the transition to the inclined form, the horizontal lines still remain horizontal. The letters of this form, then, are not simply those of the upright form rotated through a few degrees, but are essentially a new form, though still the same "style" as the upright.

Letters formed of straight lines will be found easy to draw, but the curves need a little preliminary study. With drawing instruments construct an approximate ellipse, as shown at (*b*), Plate IV. Divide its vertical axis into several parts, and through the points of division draw indefinite horizontal lines to the right. Intersecting the latter, draw a slant line as shown at (*c*). Lay off a', b', etc., equal respectively to *a*, *b*, etc., of (*b*), and through the points thus determined draw the curve.

Although the long axis of (*b*) is an axis of symmetry, the slant line through (*c*) is not. It is seen that the curve, when referred to the slant line, is rather flat in the upper left- and lower right-hand portions, while in the lower left- and upper right-hand portions it is full and well rounded. The highest and lowest points are where the slant line intersects the upper and lower limiting lines respectively.

This curve should be practiced with a soft pencil or chalk before attempting to draw letters containing curves.

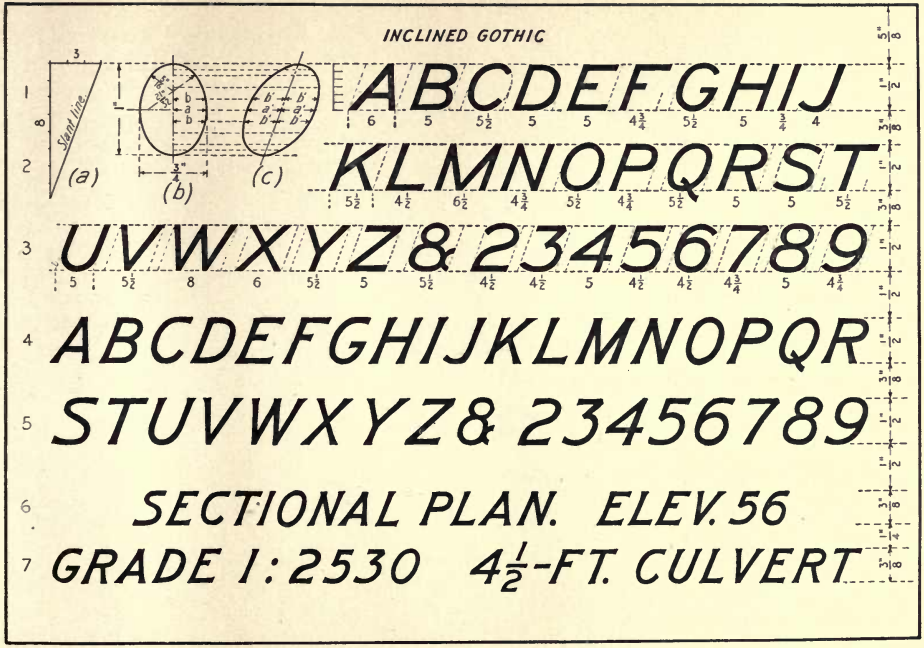

INCLINED GOTHIC
Stand line
(a)
(b)
(c)
ABCDEFGHIJ
KLMNOPQRST
UVWXYZ&23456789
ABCDEFGHIJKLMNOPQR
STUVWXYZ& 23456789
SECTIONAL PLAN. ELEV. 56
GRADE 1:2530 4½-FT. CULVERT

Plate IV

41. Curves of Letters are Portions of the O. The closed curve shown at (*c*) is the proper form for the inclined O, and all curves which form portions of other letters, except the S, are in form portions of the O. Thus the curved part of the U is the lower half of the O, and the curve of the P is the right-hand half of a small O. The figure 8 (Plate IV) is two small O's, which are broad compared with their height, but which exhibit the essential characteristics, — being well rounded in the upper right- and lower left-hand portions, and comparatively flat in the upper left- and lower right-hand portions.

If the curves of the S were made to follow the corresponding portions of the O, it would be found that the curves of the latter, especially the flatter ones, would not be at all suitable for forming an S of graceful form.

42. Thickness of Stems. A comparison of Plates III and IV shows that for the same height of letters, the same width, measured horizontally, may be used for the same letters. But, taking the I as an example, it is seen that since the letter is no longer perpendicular to the limiting lines, its actual length is somewhat greater than that of the I of the upright form. For this reason the thickness of the lines is increased from two-thirds to three-fourths unit.

This appearance of slightly greater height leads to a rule often given, that when upright and inclined letters are used in the same line (as very seldom happens upon drawings), the upper limiting line for the inclined form should be slightly below that for the upright form.

43. Modified Inclined Gothic. It is common, especially in lettering smaller than that used for the title of a drawing, to use letters and figures differing slightly from those shown in the first three lines of Plate IV. These differences are shown in the second alphabet and in the two lines at the bottom of the plate, and may be summarized as: —

1. Letters narrower than those of the first alphabet.

2. Letters having a slight increase in width of the ends of many strokes that terminate at the limiting lines. This increase should be but slight; otherwise the letters cease to belong properly to the Gothic style, and do not come under any other standard style.

3. Certain letters and figures in which one or both free ends terminate horizontally, instead of being portions of the O. This difference may be observed in the upper end of C, G, 2, and 6, the lower end of 3, 5, and 9, and both ends of S.

The first variation is often dictated by a small distance, horizontally, available for the lettering, and the necessity of making it prominent. As stated in Art. 27, the width of letters as compared with the height is not standard, but is largely a matter of taste.

The second variation, when skillfully executed, gives a pleasing elasticity to the outline, but it must not be resorted to because of inability to draw the straight, clear-cut outlines of the first alphabet.

The third variation is least justifiable, and is objected to by some designers.

44. Exercises. Plates II and IV should now be drawn in accordance with the dimensions in their margins.

CHAPTER IV

SPACING

45. The Problem. Thus far consideration has been given almost wholly to the design of individual letters without regard to their combination to form words. However well designed and drawn letters may be, if they are not placed at proper distances from one another when combined into words, the result is inharmonious.

With twenty-six different letters as elements, and an almost endless variety of combinations of these letters, the problem of spacing is not a simple one. Rules have been worked out for its solution, but it is better to regard the problem as one to be solved by the exercise of good taste.

46. Some Guiding Principles in Spacing. It is not difficult to arrive at some general principles which will be helpful in the solution of all problems in spacing. The thing to be secured is to distribute the letters in such a way that there will be an appearance of evenness in the words formed, just as a picket fence is easily seen as one coherent thing, rather than something which cannot be comprehended until we have examined the individual pickets. But letters, unlike pickets, are not all alike. If they were, we should simply place them at uniform distances apart.

In Fig. 6, line 1, the letters are at equal distances measured between the nearest adjacent points. It is seen at once that the letters appear to be in two groups, HIGHL and AND. In line 2 an attempt is made to remedy this by bringing the L and A toward each other until

they almost touch. But the difficulty is not overcome, and would not be if these letters were brought in contact.

It is plain that the trouble lies in the great distance which separates the tops of the L and A. The unbroken white *area* between these letters is great as compared with that between any other two adjacent letters, this area being space bounded on two sides by the outlines of the letters, and on the other two by the limiting lines.

Fig. 6

This leads to the first and most important principle in spacing; namely, that *the areas between letters must be approximately equal.* Referring again to Fig. 6, we note that the L and A in line 2 are as near together as they can well be, so the area between them cannot be reduced. It becomes necessary, then, to increase the spaces between the other letters in order to secure an approximate equivalence of white areas between letters. There should not be the same amount of increase at all points, however, as may be seen by further study of line 1. Between A and N considerable area already exists because of the form of the A, and the space between these letters needs no increase. The only other letter in the word which, by its form, gives a considerable area between itself and its neighbors is the G. But the apparent spaces between the I and G and the G and H are not so great as the space between the A and N; hence, these first-named spaces must be increased. The appearance of greatest crowding, however, is between those letters whose adjacent sides are straight and parallel; namely, H and I, H and L, N and D. Here the

apparent intermediate areas are due only to the actual linear distances between the letters, with no help from the forms of the letters. The areas between these letters, then, must be considerably increased in order to make them even approximately equal to the area between A and N, to say nothing of that between L and A.

Before we pass to line 3, where these changes are made, another point must be noted. Remember meanwhile that in line 1 the linear distances between the nearest adjacent points of the letters were made equal. This might lead to the supposition that the spaces between I and G and between G and H should be increased in like degree, since the I on one side of G and the first stroke of the H on the other side are straight vertical lines. This would be true were it not for the opening in the curve on the right side of the G, the effect of which is that the white area lying *within* the outline of the letter supplements that which is properly between it and the H. Therefore the space between G and H does not need to be increased so much as does that between I and G.

In line 3 are shown the spacings suggested by the arguments above. These may be summarized as follows:—

Spaces between L and A and between A and N remain unchanged so as not to increase the already large areas.

Spaces between H and I, H and L, N and D, are considerably increased, and by equal amounts.

Spaces between I and G and between G and H are somewhat increased, the latter less than the former because of the break in the curved outline of the G.

The result in line 3 is not ideal, since the area between L and A is still obviously greater than that between other letters. But if the letters were separated so that all the

intermediate areas were apparently equal, the whole would have a disagreeably loose, disjointed appearance, and it would be seen that a compromise is necessary in such a case as the present one. It will now be apparent why, in the first general principle given above, it was said that the areas between letters must be *approximately* equal; and in an extreme case like the present one, involving an L followed by an A, the approximation must be somewhat rough.

Line 4 of Fig. 6 shows a still wider spacing between letters except L and A. This spacing is as wide as one would generally be justified in using. The appearance of the word as a whole is improved.

47. All the Words in a Line must be Considered. If a line of a title contains two or more words, all these must be considered when deciding upon the spacing. Thus, suppose a line to consist of the words MOTIVE POWER. The letters here are of such forms that narrow or wide spacing will suit either word equally well. But in the words GROUND PLAN, while either narrow or wide spacing might be used for the first word, the letters in the second one are of such form as to dictate wide spacing; therefore wide spacing should be used for both words.

48. Summary of Hints on Spacing of Letters: —

1. Areas between letters should be approximately equal.

2. The smallest spaces (measured parallel to limiting lines) will occur in connection with letters of such form that intermediate areas will necessarily be large. Thus we expect F, L, and P to be followed closely by the succeeding letters; J to have the preceding letter drawn near it, and A, T, V, W, and Y to have both the preceding and succeeding letters near them.

In some combinations, as AV, WA, the adjacent branches of neighboring letters may sometimes actually overlap.

3. Letters with curved outlines, such as C, G, and O, will require moderate spacing, since their forms will insure fairly large intermediate areas.

4. Vertical sides of letters, as in H, M, N, and the left side of B, D, E, etc., call for wide spacing.

5. If the side of a letter is a broken curve, as in C, G, and S, the area lying within the outline has a modifying influence upon the area outside the letter on the side where the break occurs, and the latter area need not be quite so large as would otherwise be required.

6. Finally, each combination must be considered as a problem in itself, and the ideal of a smooth, uniform, and easily legible word or line of words must be kept in mind.

49. Equivalent Areas and Forms of Letters. It may be stated here that the idea involved in maintaining approximately equal white areas between letters is carried into the design of letters themselves. This is most plainly seen in the A, where the horizontal bar is placed considerably below the middle of the height of the letter. If this bar were placed midway between the limiting lines, the triangular area above it and the quadrilateral area below it (the lower limiting line forming one side) would be so very different in magnitude that the letter would be badly proportioned.

An apparent contradiction of this principle is seen in B, H, etc., where the middle horizontal line is *above* the center between the limiting lines, thus unbalancing the equivalence of areas. In the B the upper portion is contracted horizontally, thus introducing a further difference between the two included areas. But in these cases there is the element of stability to

consider (Art. 21), the lower area being regarded as a base upon which the upper area, or superstructure, securely rests.

50. Spaces between Words. The average space between words should be about three times the average space between letters. Spaces will vary, however, for the same reasons that spaces between letters vary, and each case must be considered as a problem in itself. A word looks slightly more prominent if the spaces between it and its neighbors are wide. But the chief aims are to give sufficient space, so that the eye readily discerns the individual words, and also to preserve an appearance of uniformity.

51. Spacing in Connection with Punctuation. If a mark of punctuation is to be used between words, extra space must be allowed for it. The mark belongs to the word which precedes it, and is placed nearer to that word than to the one which follows. In the case of the comma and semicolon the space between the mark and the following word should be as great as would be the space between the words if no mark of punctuation were used. The colon and period require wider spacing.

52. Examples. As examples for practice in spacing, the following words are suggested, the letters to be all capitals about one-fourth inch high: hilt, late, waver, room.

CHAPTER V

WORD SKETCHING AND TITLE BUILDING

53. The Value of Preliminary Sketching. In combining letters to form words it is desirable that, as far as possible, the word or line of words be evolved as a whole. The result is then more spontaneous, free, and homogeneous, and rapidity of execution is secured.

54. The Title taken as an Example. Lest it should appear that the only aim and end of lettering is the design and execution of titles, it is proper to state that in many cases other lettering on drawings is of so formal a nature as to require the care and methods here indicated under the general head of titles. But it is convenient to use the title by way of illustration and example, since the considerations and methods pertaining to it will suffice to cover the necessities of other lettering.

55. Nature of the Title. The amount of information contained in a title will depend on the nature and relative importance of the drawing to which it is attached. But in general the title is a group of words which answers the following questions concerning the thing shown by the drawing: *what, where, by whom, how large, when?* Thus the title of a map, answering these questions in the order given, might be: A MAP OF THE PUBLIC GARDEN, BOSTON, MASS. *Horace T. Banks, Surveyor. Scale* 1 *inch* = 200 *feet. September*, 1905.

Many plans are made under the auspices of a city engineer, a commission, or a board of public works. In such a case an official seal often appears at the head of the title showing where and by whom the work is done.

56. Arrangement of Words in Titles. In every title there are some words of more importance than others, and these are the words which indicate *what* is shown by the drawing. Assume the following words for a brief title : PLAN SHOWING LOCATION OF BORINGS AND SOUNDINGS. SCALE 1 IN. = 40 FT. 1907. The words of obvious importance are *Borings* and *Soundings*. Since the drawing does not show the borings and soundings themselves, but their *location*, the words to be given emphasis are *Location of Borings and Soundings*. The other words are of minor importance. The scale and date generally appear as parts of titles, and, although very necessary parts, they are made inconspicuous.

The words composing a title are arranged in lines in accordance with (1) the importance of the ideas expressed; (2) a well-proportioned outline for the title as a whole. The words given above if arranged in accordance with (1) would appear thus : —

PLAN SHOWING
LOCATION OF BORINGS AND SOUNDINGS
SCALE 1 IN. = 40 FT. 1907

57. Means of giving Prominence. A word or line of words may be given prominence by (1) the use of large or heavy-faced letters; (2) making wide spaces between letters; (3) making wide spaces between the word or line in question and the adjacent lines, if there are any. All these methods may be used at once. The usual way of securing prominence for the impor-

tant words of a title is by the use of larger letters than are used for the less prominent words. In accordance with this idea the words given in Art. 56 would appear: —

PLAN SHOWING

LOCATION OF BORINGS AND SOUNDINGS

SCALE 1 IN. = 40 FT. 1907

58. The Outline of the Title as a Whole. The shape and proportions of the figure which may be drawn circumscribing a well-proportioned title will vary greatly. Sometimes the available space on the drawing will determine the general form. If the title must contain many ideas, necessitating many lines of words, it may be longer from top to bottom than from side to side. In most cases, however, the conditions will permit an arrangement of words such that a figure closely circumscribing the title is an ellipse with its long axis horizontal. The best proportion is that in which the circumscribing ellipse has its short axis three-fifths the length of the long one.

The title as arranged in Art. 57 might be circumscribed by an ellipse, but it would be one with the minor axis very much shorter than the major axis. Thus, while the arrangement is a symmetrical one, it is not in good proportion. A better proportion may be secured without sacrificing the prominence of the important words by breaking the long line into two shorter

ones, keeping the letters of the same size for the two lines, and by placing the scale and date on separate lines. By this means the major axis of the circumscribing ellipse is shortened and the short axis is lengthened. Thus the final arrangement will be: —

PLAN SHOWING

LOCATION OF BORINGS

AND SOUNDINGS

SCALE 1 IN. = 40 FT.

1907

The wording of a title and the order of words should, as far as possible, be such that the important ideas may be brought out in comparatively large letters, and so that the whole may be arranged within a well-proportioned circumscribing figure; or, as is commonly said, so that the words will "compose" well. Notice that in the above example the "composition" would not have been so easy if the order of the important words had been *Location of Soundings and Borings*, for then the principal line, which is already long enough, would have two more letters than the present long line contains.

Sometimes the only words which can suitably be used as the important words are so few and short that it is not easy to make them extend to the outline of the circumscribing figure without drawing the letters too large to look well with the letters in adjacent lines. Plate XVI shows a case in point, where the words "Waste Weir" are shown in "extended"

letters; that is, letters with the width greater than the height. The use of extended letters is generally the solution of this kind of difficulty, as it gives great length of line without making the letters look too large.

Another case in point is shown on Plate XV. This case is from actual practice, where there were several drawings in a set, and it was desirable to keep the general wording of the titles uniform, and where the words "Sudbury Dam" were the only suitable ones to describe that particular drawing.

It must not be supposed that every line of a title should extend, even approximately, to the figure which circumscribes the title as a whole. Thus, if a title were to be composed of the following words: *Proposal for constructing the Superstructure of Gate Chamber No. 3, Cambridge, Mass.*, the unimportant words *for* and *of* might be placed each in a line by itself, in which case very small letters would be used as compared with those used for the more important words.

59. Methods of Grouping Parts of Titles. It will be noted that if a vertical line is drawn bisecting any line of words in the title shown in Art. 58 it will bisect all the other lines. Such a vertical line is obviously the short axis of the circumscribing ellipse, and is an axis of symmetry of the title. One of the problems in title building is the placing of the lines so that all will be bisected by a common line.

Three conditions may be recognized under which titles are made, each requiring or permitting a different method of procedure.

First. When the drawing is on tracing cloth or other transparent material, the lines of the title may very easily be arranged in proper relation to each other as follows: first, sketch

them on a separate piece of paper, taking care only to have the letters of proper size, properly spaced, and the lines of suitable length. Then, having marked the center of each line, place the paper under the tracing cloth with the longest line in the desired position, and trace the outlines of the letters of that line. Draw a vertical center line in pencil through the traced line of letters. Shift the tracing over the paper so that another line of the lettering is brought with its center coincident with the center line on the tracing, at the same time securing the desired space between the line already traced and the one about to be traced. Treat all the remaining lines in the same way.

SECOND. When an elaborate title is to be made for a drawing on opaque paper, the lines may be sketched on tracing paper and transferred to the drawing in their proper relative positions. The transferring may be done by blackening the back of the paper upon which the lettering is sketched, using a soft pencil held flatwise. Then go over the outlines with a sharp, hard point, after having placed the paper in its proper position upon the drawing; thus the outlines will be transferred in light lines. If there is much of this transferring to be done, it is better to blacken the whole of one side of a piece of thin paper, using a soft pencil, and slip this sheet, blackened side down, between the drawing and the sheet containing the sketch to be transferred. The firm pressure of a smooth, sharp point will then transfer the outlines to the drawing. The carbon paper used for duplicating typewritten work should not be employed for this purpose. The outlines transferred as described are not so sharp and true as the original, and usually require some correction with a pencil before they are inked.

This method allows the title to be studied to advantage, as the lines may be drawn on separate slips of paper and compared one with another as to size and style of letters and spacing

between lines. The effect of several combinations may easily be tried before putting anything upon the final drawing, which will be kept free from the disagreeable effects of erasures.

THIRD. In the majority of cases the titles are not elaborate, and require no extended study of size and style and spacing. It is desirable in such cases to outline the letters as quickly and directly as possible upon the drawing. A little experience, aided by good taste, will enable one to determine quickly the sizes and arrangement of parts, and the problem becomes largely the drawing of the lines so that all will be symmetrical about a common vertical center line.

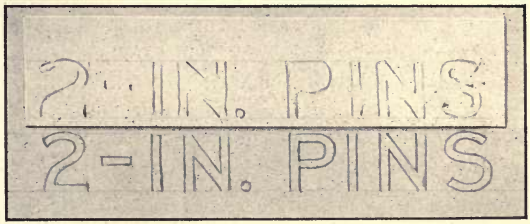


Fig. 7

The following method may be used: near the lower edge of a strip of paper, and parallel to it, draw a set of limiting lines for the longest line of the title (see Fig. 7). Between these sketch the letters of this longest line. The sketching may be very rough, but the widths and spacing of the letters should be indicated with care, with occasional use of the scale of units if necessary to get the widths approximately right. Find the center of the line by measurement, and draw a vertical line to mark it. Now place this strip of paper upon the drawing just above the limiting lines to be used for this long line of the title, with the center in line with the desired position for the center line of the finished title. With a 2-H or 3-H pencil sketch in the complete outlines of the letters in their final positions, using as a guide the rough sketch above on the strip. It is not to be expected that every letter will come

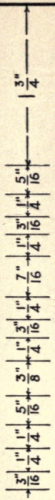
directly below the rough sketch of its counterpart, for generally adjustment will be needed — to the right in some cases, to the left in others — so that the line as a whole will be equal in length to the first sketch.

In making this final outline, avoid giving it too high a finish at first. Go over it in a rather sketchy way, but always with careful regard to *proportion and spacing of the letters*. It may be necessary still further to adjust parts of the line after it has been fully outlined, and then the wisdom of avoiding too careful a finish will be apparent. The pressure of the pencil should always be light, so that, if erasures become necessary, no grooves will be left in the paper as the result of heavy pressure. When the line looks satisfactory as a whole, go over it again with a slightly harder pencil and smooth out rough places in the outlining, which should be clear and sharp, especially if the work is to be inked. Some portions of the outlining may have been so rough as to require nearly complete erasing before the final smoothing is done. For this, use a very soft rubber such as the Hardmuth eraser, or a piece of "art gum."

It is often unnecessary that the line first drawn shall have its middle point exactly beneath the middle of the rough sketch, in which case no time need be spent in adjustments except those required for proper widths of letters and spaces; therefore there is greatest economy of time in selecting the longest line as the first one to be drawn. Through its middle point draw a vertical line, which will be the vertical axis of symmetry for the title. The remaining lines are drawn by the method used for the first line, care being taken that the middle of each shall be at the vertical axis of symmetry.

When a little skill has been attained the long line may be drawn directly in place without the aid of the rough sketch, and the other lines may be grouped about it as above described.

Fig. 7 shows the process, and about the proper degree of finish for drawing titles by this



DETAILS
OF
BACK GEARING
FOR
ENGINE LATHE

SCALE 3 IN. = 1 FT.

1907

Plate V

third method. The upper line is the first rough sketch; the first half of the second line is the preliminary stage of the final outline; and the last half is the last stage, ready for inking.

By the use of this third method an accurate idea of the form of a title may be gained before any of the final penciling is done. As soon as the rough preliminary penciling is finished, giving the length of the several lines, these may be blocked out as shown in Fig. 8. An advantage in this blocking out is that it affords an excellent basis for choosing suitable widths of spaces between the lines. Figs. 8 and 9 show plainly the relation between blocking out and finished work.

See also Art. 82.

60. Plate V may now be drawn, using the third method given above.

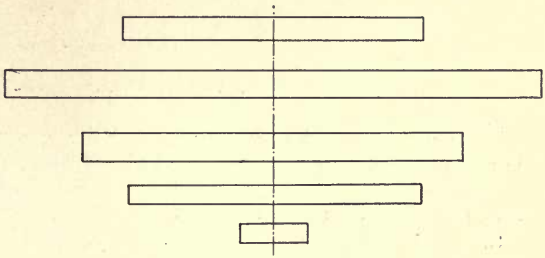


Fig. 8

PLAN SHOWING
LOCATION OF BORINGS
AND SOUNDINGS
SCALE 1 IN. = 40 FT.
1907

Fig. 9

CHAPTER VI

ROMAN LETTERS AND FIGURES

61. Comparison of Modern Roman with Gothic Letters. A comparison of Plates II and VI shows that the Roman letters and figures differ from the Gothic in several particulars, the most prominent difference being that the Roman style involves combinations of light and heavy lines, whereas the Gothic style has all its lines of uniform thickness.

In the Roman letters all of the straight vertical strokes, and most of the straight inclined ones ending in the limiting lines, are terminated by short horizontal lines, as at the base of the F, or by extending horizontal members across the stem, as at the top of the F. These short finishing lines are called "**ceriphs**" or "**spurs.**"

The free ends of horizontal members (as in E, F, and L) terminate in short vertical lines, as do also the free ends of most curves, as in C, G, and S. These short vertical lines are called "**kerns.**"

62. Width of Letters. The spurs have no practical effect in modifying the apparent width of letters, and the figures which express units of width do not include the spurs. These spurs must be considered, however, in spacing, as the spurs of two adjacent letters must not touch each other. Hence this style of letter must always be spaced rather wide.

Most of the letters are of the same width as the corresponding letters in the Gothic alphabet. There are two groups of exceptions, the D, O, L, and Q being wider, and the A, M, N,


ROMAN
A A B B C C D D E E F F G G
H H I I J J K K L L M M N N O
O P P Q Q R R S S T T U U V
V W W W X X Y Y Z Z & &
a b c d e f g h i j k l m n o p q r s t u
Cape vwxyz Fear
1/2 1 2 2 3 3 4 5 6 6 7 7 8 9 0 3/4

Plate VI

U, and V narrower than in the Gothic alphabet. Both groups of exceptions result from the changes in the areas included within the strokes of the letters. Taking the O as a type of the first group, it is seen that since the thick lines at the sides are narrowed to "hair" lines at the bottom, the included white area is much longer compared with its width than is the case with the Gothic **O**. The presence of this long, narrow interior space tends to make the letter as a whole look narrower than it really is; consequently it is widened to counteract this deceptive appearance of narrowness. This is simply another illustration of the principle illustrated in Fig. 1.

Taking the Roman V as a type of the second group, it will be seen that if this letter be drawn with the same outside width as that of the Gothic **V**, the width of the area included between the branches of the Roman V is greater than that of the corresponding area of the Gothic **V**, because the second branch of the Roman V is a light line instead of a heavy line as in the Gothic **V**. The result is that the Roman letter looks too wide, and must be drawn a little narrower than the Gothic letter to preserve a proper proportion. Similar changes in width may be observed among the lower-case letters.

63. Width of Stroke. Since the fine lines are made very fine in the Modern Roman letters, an appearance of solidity is maintained by making the heavy strokes thick, one unit being used for the straight ones. Curved members, since they vary in width, are made wider in the widest portion than the straight heavy members, but only enough wider to make them appear the same width, — still another application of the principle illustrated in Fig. 1.

64. The Fillet. The spurs and kerns making sharp angles with the members of a letter would give a stiff and unpleasing effect. To avoid this, "fillets," with curved outlines, are

introduced at the angles. At the spurs the fillets are very small, and the curve does not extend to the end of the spur. At the kerns the fillets are much larger, and are drawn tangent to the end of the kern, but not tangent to the horizontal members unless the letters are unusually wide.

Not all the angles in the letters are filleted, however. At the bottom of the stem of the L, for instance, there is a fillet at the left of the stem, but none at the right. The rule to be followed is this: —

No angle which exists in the corresponding Gothic letter or figure is finished with a fillet except the single angle of the Gothic G, *and the angle at the left side of the figure* 4.

This rule applies to the *Modern* Roman only.

65. Order of Light and Heavy Lines. The proper placing of light and heavy lines will be made easy by noting the following simple rules:—

All horizontal members are light or "hair" lines except in the 2, 5, 7, and the alternative style for the 3, given in the last line of Plate VI.

All vertical members are heavy except those of N, the first stroke of M, and the right side of U.

All inclined lines extending upward to the right are light lines, except in Z and 7.

All inclined lines extending upward to the left are heavy.

No two heavy members, straight or curved, join or cross each other, except the two straight lines forming the left-hand side and the vertical stem of the Y. When two curved members join each other, as at the right side of B, R, and 3, they must become fine lines before joining.

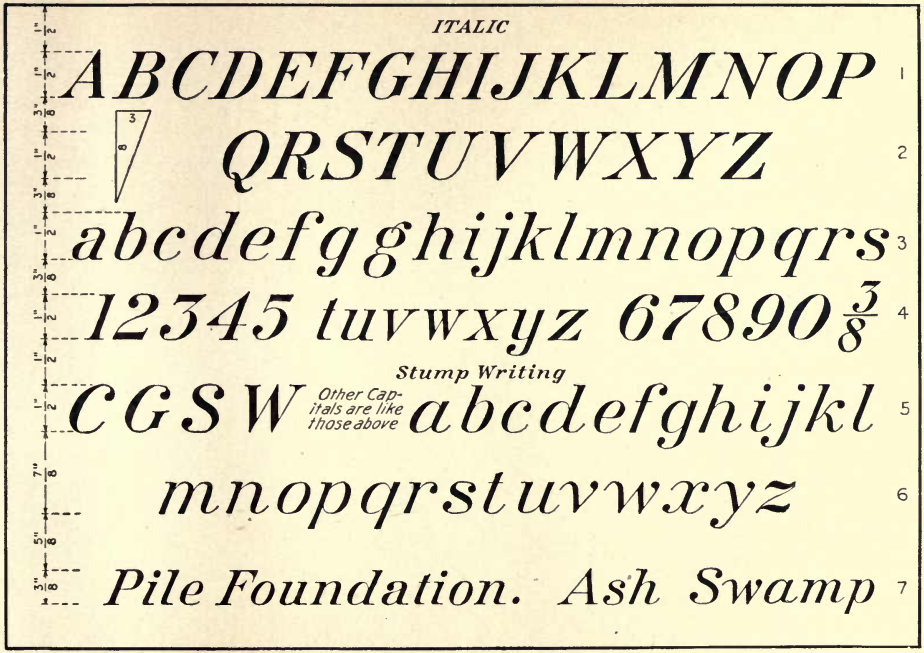

ITALIC
ABCDEFGHIJKLMNOP
QRSTUVWXYZ
abcdefgghijklmnopqrs
12345 tuvwxyz 67890 3/8
Stump Writing
CGSW
Other Capitals are like those above
abcdefghijkl
mnopqrstuvwxyz
Pile Foundation. Ash Swamp

Plate VII

66. Special Method of drawing W and M. The following method will be found useful in drawing the W. In Fig. 10 let 1–2–3–4 be the space to be occupied.

From 1, start the first member, guessing at its direction.

Bisect, at 5, the space remaining between 2 and the first member as started, and place 6 vertically below 5.

At 7 bisect the distance 3–6, and draw the first and second members.

From 2 draw the fourth member parallel to the second, and work in the third, which must be parallel to the first.

In drawing the M, sketch the first and fourth members, bisect the remaining space between them on the lower limiting line, and to this bisecting point draw the second and third members.

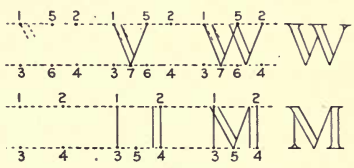


Fig. 10

67. Italic Roman. Plate VII. The inclined or Italic Roman may be derived from the upright Roman by the process explained in Art. 40. Most draftsmen prefer to modify slightly the Italic letters which would be obtained as strict derivatives of the Modern Roman. The modifications shown on the Plate consist, in the capitals, in making them slightly narrower; in carrying the curve of the fillets farther down the stems, and in extending horizontally along the limiting lines, the top of C and G, and both the top and the bottom of S.

68. Lower-case Italic. The lower-case letters might be derived strictly from the Modern Roman lower case, but a less formal treatment is usually given them. The following points

concerning the letters in lines 3 and 4 of Plate VII, as compared with Modern Roman, should be noted: the spur, instead of an upward curve which terminates the **a** and **t** on the lower limiting line; the rounded forms at the base of **b**, the right side of **e**, and the middle of **y**; the two forms for **g**, neither being like the Modern Roman; the spur extending to the right only at the base of **i** and **l**, and in the last stroke of **h**, **k**, **m**, and **n**; the terminations of **s**, and finally a general tendency to accentuate horizontal lines, as in the flattening of the top and bottom of **s**, and in many places — as at the foot of **i** — by bringing the left edge of the stroke nearly to the lower limiting line before turning it into the horizontal spur.

For *Stump Writing*, see Art. 73.

69. Roman Old Style. Plate VIII. As the name implies, Roman Old Style is the alphabet used by the ancient Romans. As their work was done long before the day of printing with types, the examples of their lettering have come down to us either as carvings in stone or as writing with reed pens — usually the former. Letters were also made in metal and fastened to stone.

It should not be supposed that there was uniformity of shape and proportion in all ancient Roman lettering; for then, as now, lettering was a matter of design, and each designer was at liberty to follow his own taste. However, certain characteristics and principles of design were rigidly adhered to, and we have inherited some beautiful forms.

The alphabet given in Plate VIII shows the forms and proportions generally adopted for this style. The figures on the Plate show the ratios of widths to height, and thus indicate general proportions. The following points concerning details of design should be studied: —


ROMAN OLD STYLE
ABCDEFGHIJKLMNO
PQRSTUVWXYZ
acdf1234567890 jnsv
STUDY OF
FIREPLACE
IN THE
DINING ROOM
SCALE ¾ IN. = 1 FT.
PLAN OF
FILTER BEDS
FOR
ROUND POND
1908

Plate VIII

The *thin lines*, including the spurs, are not hair lines. This style was used for inscriptions, to be read from a distance, and very fine lines were not used as they produced letters not easily read; the fine lines would be lost and only a jumble of heavy lines would be visible. The Modern Roman lettering is now sometimes used in street signs, but it is obviously illegible as compared with the more solid Old Roman and the still more solid Gothic.

The *thick lines*, on the other hand, are less heavy than those of the modern style, being but three-fourths of a unit wide.

The *spurs* are short, and the *fillets* run to the ends of the spurs, but are not quite tangent. Fillets are introduced on *both sides* of the stems, a treatment that goes far to relieve the letters of an angular appearance.

The *kerns* are drawn at a considerable angle with the vertical, and this also reduces the sharpness of some corners.

The lower ends of C and G do not follow the corresponding curve of O, but are slightly flattened.

70. Lower-case Letters and Figures. These were unknown to the ancient Romans, as the lower-case letters are an invention of modern times, and numbers were expressed by combinations of letters with a line drawn horizontally above the combination.

The full alphabet of the lower-case letters is not given in the Plate; but the letters shown on line 3 show types of variation from the lower-case letters on Plate VI, and by noting the following points of difference the whole alphabet can be drawn readily: —

Heavy strokes ending in a curve at the lower limiting line, as at the base of a, taper *gradually* to a point.

The *bulbs* terminating the upper ends of a, c, etc., are elongated and irregularly pear-shaped.

Spurs at the upper ends of vertical stems, except in q, slope slightly downward to the left.

71. Old Roman for Architectural Work. The Old Roman style is much used by architects for all classes of lettering. Large titles are formed of capitals carefully executed and made solid faced, while for minor titles and sub-titles the letters are often left in outline as shown in the lower left-hand portion of Plate VIII. Even the small lettering in the body of drawings is often based on this style, the capitals only being used. Sometimes the heavy strokes are brought out slightly; sometimes a single uniform stroke is used for all parts of the letters, the ceriphs and kerns alone serving to identify the letters with the Old Roman style.

Note also in the title composed of outline letters that the lines of the title begin on a common vertical, an arrangement by which the problem of centering the lines about an axis of symmetry is avoided. This arrangement is often used (especially in architectural drawings) for titles of minor importance, the proper position in this case being in one of the left-hand corners of the drawing.

72. Design of Letters in Roman Inscriptions. Plate IX. The alphabets given in Plate VIII, commonly called Old Roman, depart somewhat from the designs as shown in the ancient Roman inscriptions. These departures are partly for the purpose of meeting the exigencies of printing from type, but they show also radical differences in design.

During the fifteenth century several Italians made detailed studies of the lettering in the best Roman inscriptions. Among these was Felicianus of Verona, who, in the latter part of that century, published an alphabet which in his opinion embodied the best designs. His

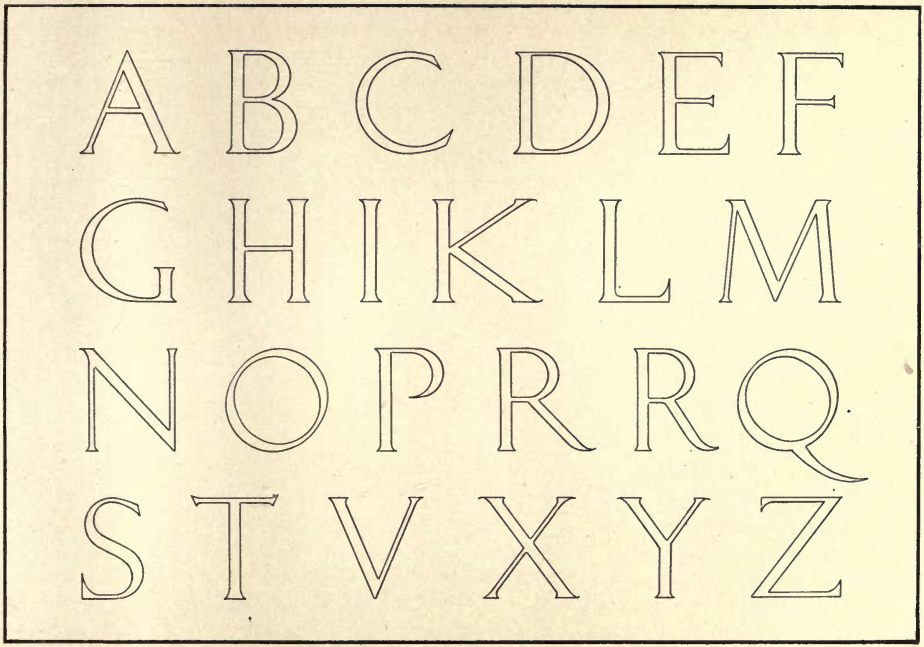


Plate IX

alphabet, as shown in the Ephemeris Epigraphica, Vol. 1, is given in Plate IX. The proportions of many of these letters are quite different from those of Plates VI and VIII. The lines are graceful, and much more free and elastic than those of the Modern Roman style (Plate VI).

An inspection of inscriptions by architects and artists of repute on modern buildings and monuments will show that the forms found in the ancient Roman carvings are still the model. Such inspection shows also that the proportions of letters are varied to suit different conditions. Note, for instance, the two R's of Plate IX. The first is used when such letters as T, V, and Y follow the R, the extended tail serving to fill the large blank area which would otherwise exist between the letters. The second form of R is used when followed by B, L, etc., where there is no large area between the letters. When R is followed by A, the tail of the R should be drawn in even more closely, to avoid a large area between the tops of the R and A. For similar reasons, the L may be narrower when followed by A or O than when followed by T, V, or Y.

The idea that good lettering is a matter of design rather than adherence to fixed rules of proportion, is emphasized by the fact that the typical alphabet shown by Felicianus and his contemporaries differed from each other.

73. Stump Writing is the name given to a modification of Italic letters. The lower-case alphabet is given in lines 5 and 6 of Plate VII. The capitals are those of the ordinary Italic alphabet, with the exceptions noted in line 5.

Stump writing is much used in government topographical work for notes and other data which may be written in small letters. For the best result, stump writing is executed with single strokes of a very fine and flexible pen, such as Gillott's mapping pen, the heavy strokes

being formed by spreading the nibs. This requires great skill and constant practice, but when properly done, gives a finish to the letters which cannot be equaled by any other method.

74. Examples.

1. Draw Plate VI.
2. Make a title of the following : —

   Grading plan for Golf Links at Riverside Park. Scale 60 ft. to 1 in. Date.

   Use Modern Roman letters one-half inch high for "Golf Links" and "Riverside Park," and Gothic for the remainder of the title.
3. Make a suitable arrangement of the following for a title : —

   Pratt Library. Detail of Main Hall. (Scale.) Date.

   Use Roman Old Style, all capitals for the main portions, capitals and lower-case for the date. Show a "graphical" scale of 4 ft. to 1 in. See Plate XV for an example.
4. Draw the words *Hall of Records* in two lines, using Ancient Roman letters (Plate IX) as large as will be well accommodated on a standard sheet.

Single-stroke Gothic.

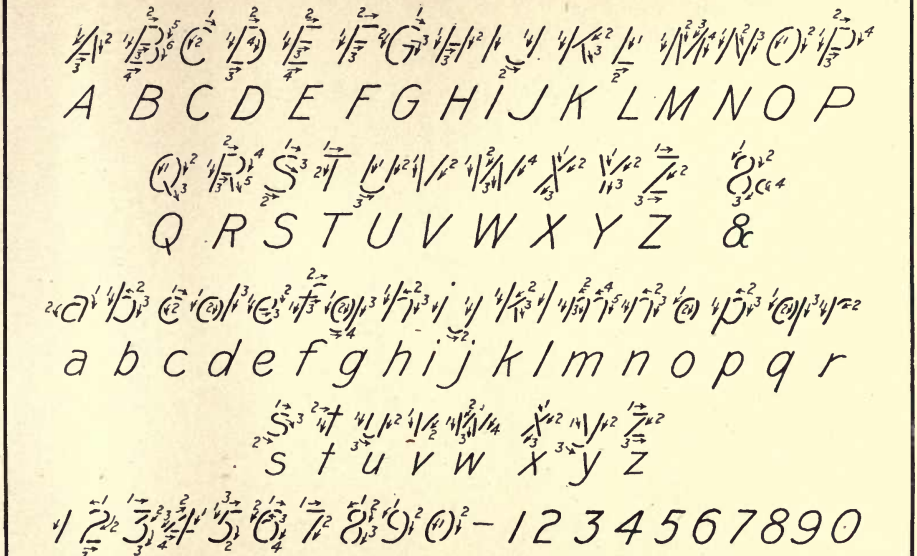


Plate X

CHAPTER VII

SINGLE-STROKE AND MISCELLANEOUS LETTERS

75. The Use of Single-stroke Letters. By far the greatest amount of lettering found on most plans, especially working mechanical drawings, is that used in descriptive notes, sub-titles, etc., formed by single, uniform, and usually light strokes of the pen, without preliminary penciling. Such lettering is shown on Plates X, XI, XII, and XIII, and is usually called single-stroke lettering.

It is simply small Gothic lettering of either the upright or the slant form, but its successful execution requires some special study.

76. The Pen. It is of the utmost importance that the pen be well adapted to the work and that it be held and used in a proper manner. Each member of the letters must be made with a single clean stroke of the pen without any subsequent touching up, and the members must be of uniform thickness. This means that the pen must be of the right degree of coarseness to yield a line of the proper thickness without spreading the nibs; that the point be smooth; that the pen be "broken in" so that the ink will flow freely; and finally, that it be held with both nibs squarely on the paper with a light uniform touch.

Plate XII will give an idea of the character of lines obtained by the use of several pens adapted to this work.

Pens are best "broken in" to work freely by long-continued use. A new pen may be improved by drawing it many times over the surface of some hard rough paper, using consid-

erable pressure as if drawing very heavy lines. When held to the light, the nibs should be seen to be very slightly separated, otherwise the thick India ink will not flow freely. If the separation is not obtained by the process just described, the nibs may be bent backward with the fingers (both nibs being bent at the same time), or they may be hammered very slightly on the convex side.

The pen must be cleaned frequently, a piece of bleached cotton cloth being most suitable for this purpose.

77. Direction of Strokes. In Plate X the alphabet is analyzed as to the order and direction of strokes, the small figures indicating the order, and the arrows the direction. It must not be supposed that no other order of strokes is permissible; for instance, of the four strokes composing E, those marked 2, 3, 4 may be drawn in any order with respect to each other. It is obviously best, however, to draw stroke 1 first. The coarseness of the pen and the freedom with which the ink flows will change conditions considerably, a coarse pen and very freely flowing ink necessitating great care to avoid making a blot. With a fine pen, trouble of this sort is less likely to occur, and the strokes as given on the Plate may be somewhat simplified. For instance, the C, J, O, and S may be drawn with single strokes. Many expert letterers form the habit of always making the letters as if under the worst conditions, and use the same number of strokes whether or not conditions are favorable for neat work.

The general considerations governing the order and direction of strokes may be stated as follows: —

1. For long upright lines the pen works much better (especially if it is fine) when drawn downward rather than upward. This is one reason for drawing the right side of O with a downward stroke.

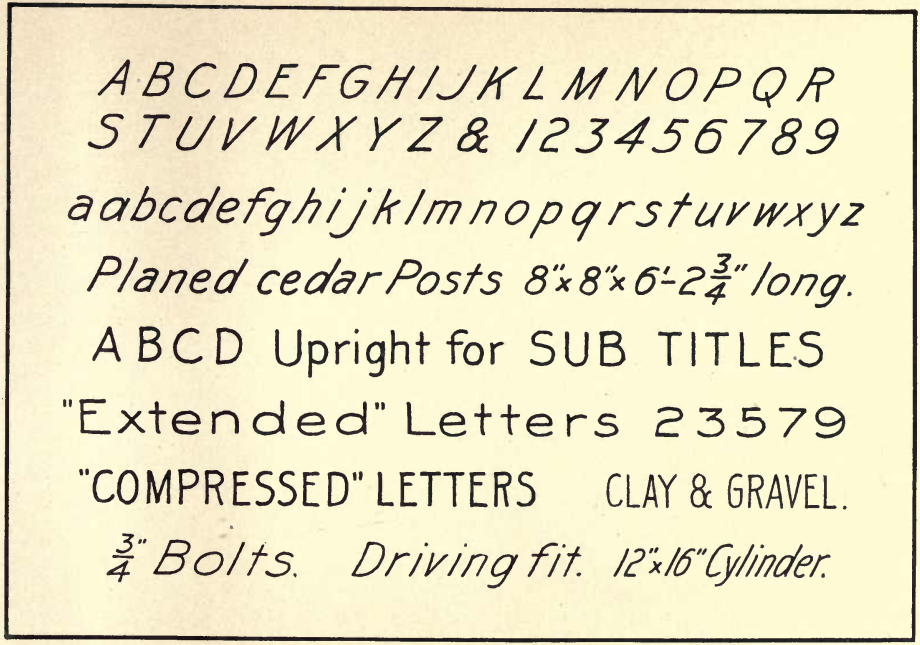

ABCDEFGHIJKLMNOPQR
STUVWXYZ& 123456789
aabcdefghijklmnopqrstuvwxyz
Planed cedar Posts 8"x8"x6'-2¾" long.
ABCD Upright for SUB TITLES
"Extended" Letters 23579
"COMPRESSED" LETTERS CLAY & GRAVEL.
¾" Bolts. Driving fit. 12"x16" Cylinder.

Plate XI

2. Ink is likely to run from the pen and form a blot if the pen is moved upward to the left; hence, the short stroke to the right and slightly downward at the top of C, G, S, and 6, and at the bottom of J and S.

3. Ink tends to run into an acute angle between two lines, especially if the second line is drawn away from the vertex. This filling-in of angles must be studiously avoided. Special care is needed in forming the angles at the top of A, M, N, and W, since the second stroke forming these angles is directed away from the vertex. It is well to allow the first stroke to dry before the second one is drawn. Less trouble will be experienced with the equally acute angles at the bottom of M, N, V, and W, since the lines are drawn toward the vertex in each case.

The reason will now be apparent for strokes 2 and 4 in m, and for similar strokes in several other lower-case letters.

78. Special Treatment. Some letterers avoid the possibility of a disagreeable filling-in at angles by leaving a very small open space between the ends of the lines forming the angles. For instance, the top of A may be treated as shown in the analysis of that letter on Plate X, rather than as shown in the finished form below it. Even in such places as at the top and bottom of O, where there is but slight danger of trouble, a space is often left between the ends of strokes. The effect is far preferable to a filled-in angle, or to the inaccurate meeting of two strokes.

79. Practice. Since single-stroke lettering must be done without going over the lines repeatedly to make corrections and without preliminary penciling, considerable informal

practice is usually necessary to overcome the difficulties suggested above, to form the letters well, and to preserve a uniform slant.

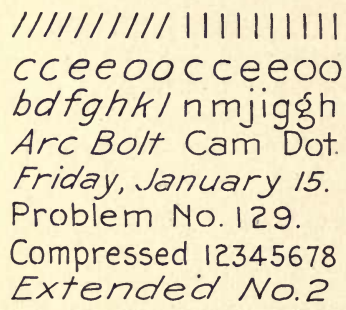


Fig. 11

Fig. 11 gives some suggestions for informal practice. The ends to be attained in drawing the straight lines are smoothness, uniform weight, equal length, and uniform direction.

Note carefully the special features of curves in the inclined letters as shown at (*e*) Plate IV, and explained in Art 40.

This preliminary practice should be done on smooth paper, or better still on tracing cloth of which the surface has been rubbed with chalk, talc, or "pounce" to remove all greasiness. The directions given in Arts. 76 and 77 must be kept carefully in mind. The student should sit in any easy position, with as little weight as possible resting on the forearms (especially the right one), and he must be very careful to hold the pen lightly, as if writing ordinary long hand.

80. The Slope for the slant letters is the same as for Gothic letters, Art. 39. As an aid to preserving the proper direction, it is well to rule a few pencil lines across the limiting lines at the correct angle, whether for inclined or vertical strokes.

In drawing the upright strokes remember that it is much better to err on the side of inclining them backward (that is, upward to the left), rather than slightly forward. Indeed some very good letterers never draw a strictly vertical line.

Examples of Single-stroke Gothic.

"Extended" Upright Letters

"Compressed" Upright and *Slant Letters*

HEAVY STROKE-Ball-Pointed Pen 506F

MEDIUM STROKE- Gillott's 404 Pen

Light Stroke-Gillott's 303 Pen

Very light Stroke- Gillott's 170 Pen

The most generally used letters are the light stroke slant or upright letters about this size. 12345678

Figures, when written with lower-case letters, have the height of t.

Finished Weight=35 #

Length over all 25'-4½"

Plate XII

81. Titles composed of Single-stroke Letters. Single-stroke letters are often used for the titles of simple working drawings. Plate XIII shows such a title taken directly from an actual drawing. It is somewhat reduced in engraving, the length of the longest line of the original being $7\frac{1}{4}$ inches.

82. The Centering of the Lines may be accomplished by one of the methods of Art. 59, but the skilled draftsman usually reaches the result by even a simpler method, as follows: The limiting lines for all lines of words having been drawn, the longest line is penciled in with extreme roughness, the sole purpose being to determine that the line, when finally lettered in ink, will end at about the desired distance from the edge of the sheet. This longest line having been inked, a vertical pencil line is drawn through its center, to mark the required center of the remaining lines.

One of the lines adjacent to the longest line is next roughly penciled, the only object being to find out about how long the line will be when finally inked. Some attempt is made at the same time to center the penciled line. No erasure is made, however, even though the line may prove to be very much off center. The draftsman then measures with his eye the distance to right or left at which the line should have been started to be accurately centered, and, at the point thus determined, begins his lettering in ink. As his work along the line progresses, he compares his inked work with the pencil draft to make sure that the inked and penciled lines will be of the same length, and that therefore the inked line will be centered about the vertical pencil line.

It will sometimes happen that, in the rough pencil draft, the line is estimated longer or shorter than is desirable for the height of letters to be used. This fact will be discovered

when the inking of the final letters is well under way. Unless the error is great, it will not be necessary to erase work already done, for by a discreet compression or extension (as the case may require) of letters and spaces, a correction of the original error of judgment may be made.

83. Single-stroke Figures. Nothing more effectually defeats the purpose of a working drawing than illegible figures. It is always desirable that figures be not only legibly, but also neatly drawn. Moreover, on many drawings the dimensions are so numerous that the careful execution of the figures becomes as important as that of the small lettering.

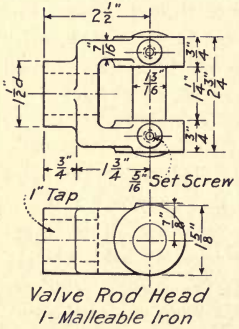


Fig. 12

Fig. 12 shows an example of dimensioning. Figures must stand out clearly by themselves. They must never be written directly on lines of the drawing, but should be separated from them by a clear space. This precaution is especially important if the drawing is to be reproduced by "blue-printing" or by a photo-engraving process.

The break in the dimension line should not be greater than is necessary to admit the figures comfortably; otherwise a ragged appearance is given to the dimensioning.

84. The Height of Figures for use in conjunction with lettering is the height of **t** for that lettering; that is, figures are intermediate in height between the capitals and the class of lower-case letters which contains **a** and **c** (Art. 24).

Commonwealth of Massachusetts

Metropolitan Water Works

Wachusett Reservoir

Details of Railing for Quinepoxet and Stillwater River Bridges

Scales, Full size, half size and 1½ ins. = 1 ft.

May 25, 1904.

For spacing of posts see
Sheet No. 11 for Quinepoxet railing,
" " 7 " Stillwater "

Plate XIII

85. De Vinne. Plate XIV. This modern face is a modification of Old Roman which has found some favor among draftsmen. No lines are very light; hence lettering in this style "blue-prints" well, and is well adapted to photo-reduction. The letters may be extended or compressed, and may be used with good effect in conjunction with the Gothic style. See Plate XV.

86. Open-faced Gothic. Plate XVI. Line 1 shows an open-faced or outline letter which has a limited legitimate use; namely, the indication of certain features among other details, in such a manner that the lettering may be found easily but not be disagreeably prominent. For instance, a state map may contain so much lettering to show towns, rivers, etc., that the county names in small letters would not be readily found, nor would they cover sufficiently the areas occupied by the counties. On the other hand, letters large enough to cause the county names to extend across the desired area might, if of solid face, look disagreeably prominent. In this case an open-faced letter will serve the desired purpose while avoiding the undesirable features.

87. Block Letters. Plate XVI. Lines 2 and 3 show a device by which prominence may be given to letters without increasing their size. Open-faced letters may have heavy lines added to the right-hand and lower sides of their members, or a line or lines may be drawn near these sides of black-faced letters. In either case the effect is that of letters cut from material of considerable thickness, and fastened to a background.

The value of this treatment is doubtful. Block letters may be justified where there is a real need of prominence, with but limited room for the lettering. Otherwise plain letters, well designed and carefully executed, are more likely to be satisfactory.

88. "Shadow Letters." Plate XVI, line 4, shows an application of "shadow" letters which may be derived from the block letters of line 2 by omitting the light lines of the block letters. These shadow letters should be used with caution. They are not well adapted to use in titles, but may be employed to a small extent to indicate some prominent feature in the body of a drawing. They should be used only when Roman or plain Gothic letters have been used for other features so freely as to necessitate a change for the sake of variety.

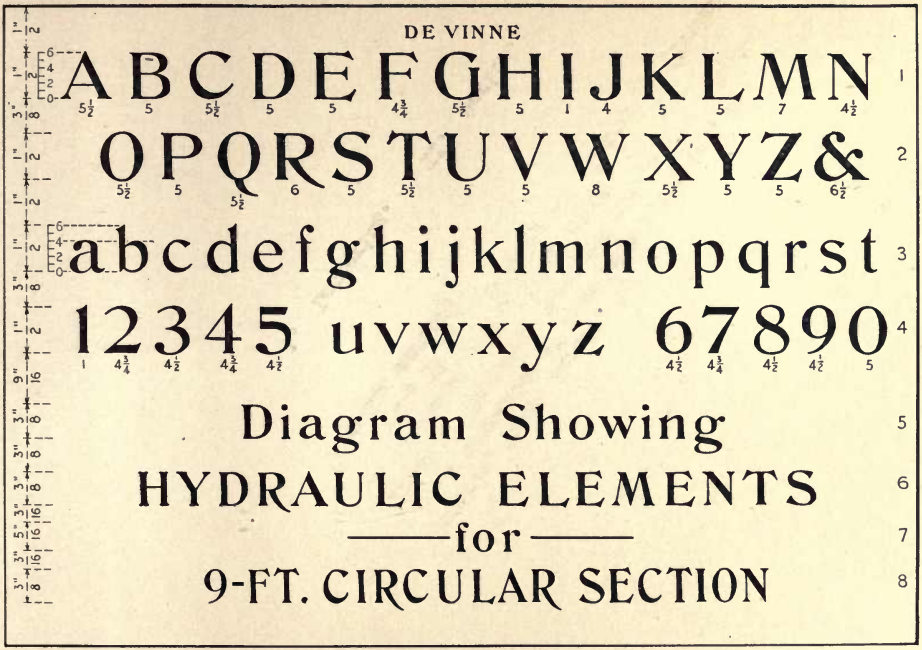

DE VINNE
A B C D E F G H I J K L M N
O P Q R S T U V W X Y Z &
a b c d e f g h i j k l m n o p q r s t
1 2 3 4 5 u v w x y z 6 7 8 9 0
Diagram Showing
HYDRAULIC ELEMENTS
for
9-FT. CIRCULAR SECTION

Plate XIV

COMMONWEALTH OF MASSACHUSETTS

METROPOLITAN WATER WORKS

SUDBURY DAM

SOUTHBOROUGH

RECORD DRAWING

• 1899 •

Plate XV

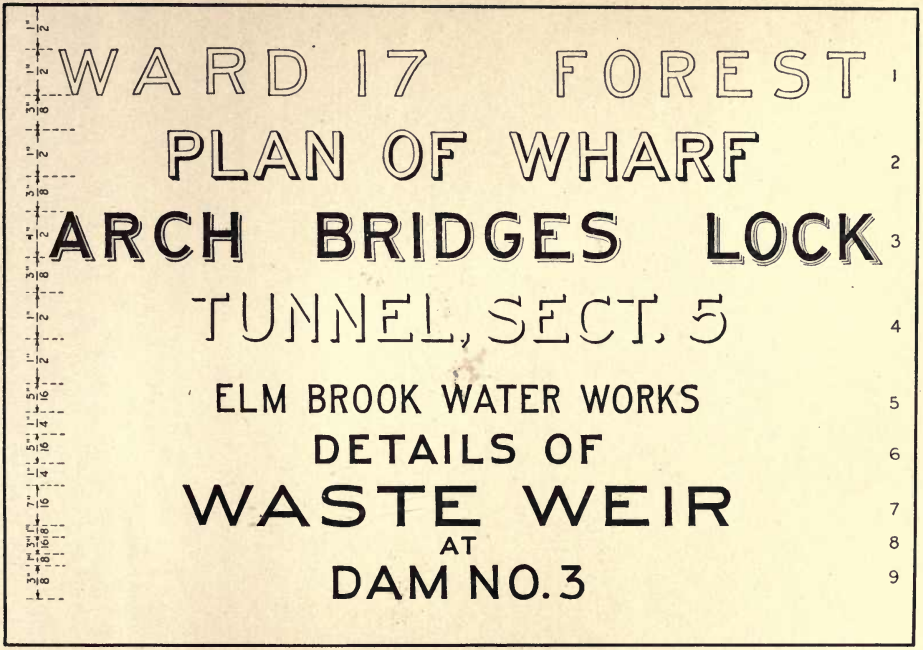

WARD 17 FOREST
PLAN OF WHARF
ARCH BRIDGES LOCK
TUNNEL, SECT. 5
ELM BROOK WATER WORKS
DETAILS OF
WASTE WEIR
AT
DAM NO. 3

Plate XVI