

and climbing the slope to the north, the ruins of two temples were discovered upon artificial pyramids placed side by side. In front of each temple and upon the upper terrace of the pyramids stands a monument or stela of limestone. Upon the front face of the best-preserved of these has been sculptured with elaborate detail an inscription in Mayan characters. A gigantic stela broken in two pieces lies upon the lower terrace connecting the two pyramids.

Across the plaza to the northwest stands a third pyramid upon a natural elevation. The temple upon its summit is in ruins. A flight of stone steps leads from the plaza to a broad terrace in front of the pyramid. Six large stelæ stood in a row upon the terrace. Hieroglyphs cover the sides of these monuments, and upon the face of one is an inscription, the first few characters of which form the initial series and record dates in the complicated Mayan calendar.

Elaborately carved human figures, with explanatory groups of glyphs, cover the fronts of the remaining stelæ upon this terrace.

The sculptured stone lintel of the doorway to this temple has an inscription of eighty-one characters upon the upper half of its face. Below this is a group of figures illustrating the return of successful warriors with prisoners and plunder. The priest wears an enormous headdress covered with short, stiff feathers, from the back of which spring five plumes of the sacred quetzal. A short tunic with sleeves covers the upper part of the body, and below this fall the embroidered sash-like ends of the breech-cloth. He wears elaborate sandals with heel-bands coming well up upon the ankle. Beads encircle his wrists and neck. He holds in his hand a spear-like staff of office ornamented with feather work. Before him kneel two warriors with spears in hand presenting a pile of plunder, and a naked prisoner bound with ropes.

North of this temple the ruins lie for the distance of nearly a mile and a quarter, the terraces and the larger pyramids being fairly well preserved. Most of the temples are in ruins.

One of the most interesting of these is built upon the terraced side of a natural elevation upon the eastern side of the plaza at about the center of the ancient city. Ten stelæ and three great altars stand upon the upper terrace of the pyramid and upon the plaza below.

Of the ten stelæ belonging to this temple, the one standing at the southern end of the building and called "stela twelve" by Mr. Maler is of the greatest interest. This has unfortunately fallen and is broken into four pieces. Each piece was photographed, however, and the prints fitted together, making a perfect picture.

The great stone altars scattered here and there in the plaza and in front of the temples consist of oblong or circular blocks with hieroglyphs and occasional groups of figures. The altars are raised upon stone pillars, which are often sculptured upon their outer faces with inscriptions or are cut into the form of grotesque heads.

These ruins differ in many respects from the other ruins of Central America and of Yucatan. Piedras Negras was evidently the seat of a powerful military chieftain, as the sculptures everywhere indicate. The sculptured groups and figures of the ruins of Yucatan and of Quirigua and Copan are almost wholly of a peaceful, religious character, indicating priestly power and a growth in culture and wealth by peaceful means.

M. Molesch, of Prague, recently read a paper before the Academy of Science of Vienna concerning phosphorescent bacteria, upon which he made a number of researches. He obtains a strong light by a collection of these bacteria and can even take photographs with it.

When the bacteria are placed in a culture bouillon contained in flasks of one or two liters capacity, they form a "bacteric lamp" which gives a strong enough light to read a thermometer or see the dial of a watch at a distance of one or two yards. The experimenter thinks that such a bacteric lamp, as it gives no perceptible heat, will be of service in powder magazines and in scientific work. It can be also used under water to attract fish, as the flask can be hermetically sealed. When placed in suitable conditions, the bacteria possess the phosphorescent properties for several weeks.

CALLITYPY—A NEW WAY OF USING THE TYPEWRITER.

BY JACOB BACKES.

How the typewriter and photo-engraver can work hand in hand and perform all the work of the printer I have had occasion to set forth in two articles published in the SCIENTIFIC AMERICAN SUPPLEMENT. Briefly described, the method of doing away with typeset-

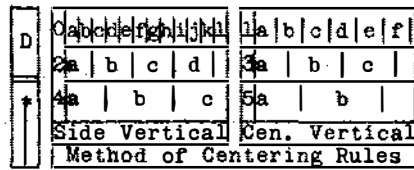
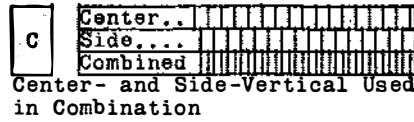
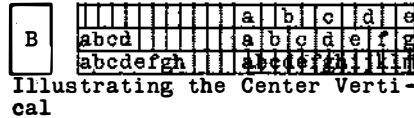
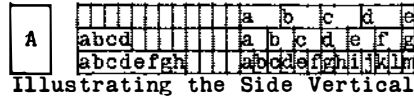


Illustration 1.—Callitype. Reduced From Original in Ordinary Typewriting Size.

ting consists in typewriting the matter to be printed, and in making line engravings therefrom which can be used as printing-plates. The possibilities of thus using typewriters were illustrated in the articles mentioned. It is the purpose of the present article to show the more recent improvements that have been made in "callityping," as this new way of using the typewriter is called.

In the SCIENTIFIC AMERICAN SUPPLEMENT for April

SEPTEMBER 1903							BROOKLYN						
Mo	Tu	We	Th	Fr	Sa	Su	NAMES						
1	2	3	4	5	6	7	Strang, Jb....	1	1	2	3	0	0
8	9	10	11	12	13	14	Sheckard, Jf...	0	0	0	0	0	0
15	16	17	18	19	20	21	Dobbs, of.....	0	2	1	0	0	0
22	23	24	25	26	27	28	Doyle, Jb.....	0	2	13	1	0	0
29	30	31					Dahlen, ss....	1	1	3	4	0	0
							McCreary, rf...	1	1	1	0	0	0
							Flood, Jb.....	1	0	2	0	0	0
							Ritter, c.....	0	1	5	0	0	0
							Garvin, p.....	0	0	0	4	0	0

Illustration 2.—Callitype. Reduced From Original in Ordinary Typewriting Size.

4 last were published specimens of callitypic composition in different sizes of type, in describing which the direction was given to use pen, ink, and ruler in making vertical lines. But in the practical application of this print-typing method it has since been proved that two different vertical marks, added to the machine's type equipment, and adjusted so as to strike at two certain points, relatively to the position of adjoining or adjacent alphabetic or numeral characters,

and bass clefs (clipped in pastings) in illustration 4. Illustration 1.—A. The type for the side vertical is so engraved and positioned that it will strike at the left of the following character, and midway between that character and the one immediately preceding. B. The center vertical is centrally engraved and positioned, so as to strike between two characters, one space distant from each other. C. This is self-explanatory. D. Where letters or columns are an even number of spaces apart, a side vertical liner is used to secure midway position of perpendicular line; and where letters or columns are positioned an odd number of spaces apart, the center vertical is used.

In Illustration 4, f stands for flat; 1, whole note; 2, half note; 4, quarter note; 8, eighth note. As music notation recognizes no third or sixth notes, the figure 6 could be used as an abbreviation for a sixteenth, and 3 for a thirty-second, note. Symbolic corollaries are: s for sharp, n for natural, r for rest, etc., using small letters to show key, pitch, and time, and capitals for expression.

Side and center-verticals should begin and end on two consecutively typed underscores, and each vertical should be just long enough to type an unbroken vertical column when struck under each other. It is important that the paper feed of the machine be as exact as possible, so that the horizontal rulings made by the underscore can be depended on to be equidistant on all parts of the sheet. To test a machine for this, operators make vertical rows of close-lined parentheses, thus:

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(((              (((              (((
(((              (((              (((
(((              (((              (((
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at the middle and extreme margins of the sheet. These rows should have a longer perpendicular length than the circumference of the roller. All parts of the sheet should be closely examined for deviation from perpendicular equidistances between the ends of the parentheses.

In ink pad machines squares, rectangles, etc., are made by typing the left vertical from the upper left-hand corner down; then across; then up; then the carriage is shifted to first position, and a horizontal underscore left to right finishes. In making perpendicular lines the thumb of the left hand continuously holds down the space bar; another finger of same hand strikes the vertical-liner key; and right-hand fingers turn the roller by the knob for successive line changes of striking point. For ribbon machines this manipulation secures little or none of the necessary ribbon movement, therefore columnar lines are made downward only, governing the striking points of the vertical liner by proper settings of margin stop and ordinary use of the line-spacing lever.

The illustrations show the possibilities of the vertical liners in type composition. The original typewritings were photographically reduced to different sizes of characters, and any effect in any size can, of course, be as easily obtained in any other size. Ambitious tabulators, music composers, and draftsmen who use or have access to the writing machine should note that there is room for still further development and improvement.

What to printers is known as bordered, panele and

rule - and - figure work — classes of expensive and exacting type-composition either outside the range or only conditionally within range in the operation of type-setting or line-casting machines — becomes, through the callitypic operation of the writing machine, as facile and economical as ordinary composition.

The comparatively difficult and expensive kind of type-composition known as intersecting-rule and

Illustration 3.—Callitype. Reduced From Original in Ordinary Typewriting Size.

1. Rock of A-ges, cleft for me, Let me hide my-self in Thee;
D.C. Be of sin the dou-ble cure, Save from wrath and make me pure.

Let the wa-ter and the blood, From thy ri-ven side which flowed,

Illustration 4.—Callitype Reduced From Original in Ordinary Typewriting Size.

CALLITYPY—A NEW WAY OF USING THE TYPEWRITER.

give greater satisfaction and are more convenient and expeditious to use than lines made with pen and ink.

The four illustrations herewith constitute the first publication of what can be done by the use of such vertical liners in typewriting. These illustrations were callityped on one unchanged writing machine, and in no case was the paper touched with the hands, from the time it was inserted in the machine until the engraver's copy was finished, with the exception of center matter in Illustration 3, which was callityped on a separate sheet and in pasted, as were also the treble

rule-and-figure work, which has always been a stumbling block to line-casting and type-setting machines, seems to be the destined particular field of callitypy, as in it such typing proceeds almost as rapidly as "straight" matter, could easily be done by the proficient operators of all writing machines, and type-high, ready-for-press callitypes (blocks) could be made from typewritten copy at 5 cents per square inch, in any size of type. In book and news work, nonpareil is the most favored size for the class of composition referred to, and it now costs 14 cents per square inch.