

(No Model.)

4 Sheets—Sheet 1.

O. MERGENTHALER.

MATRIX MAKING MACHINE.

No. 304,272.

Patented Aug. 26, 1884.

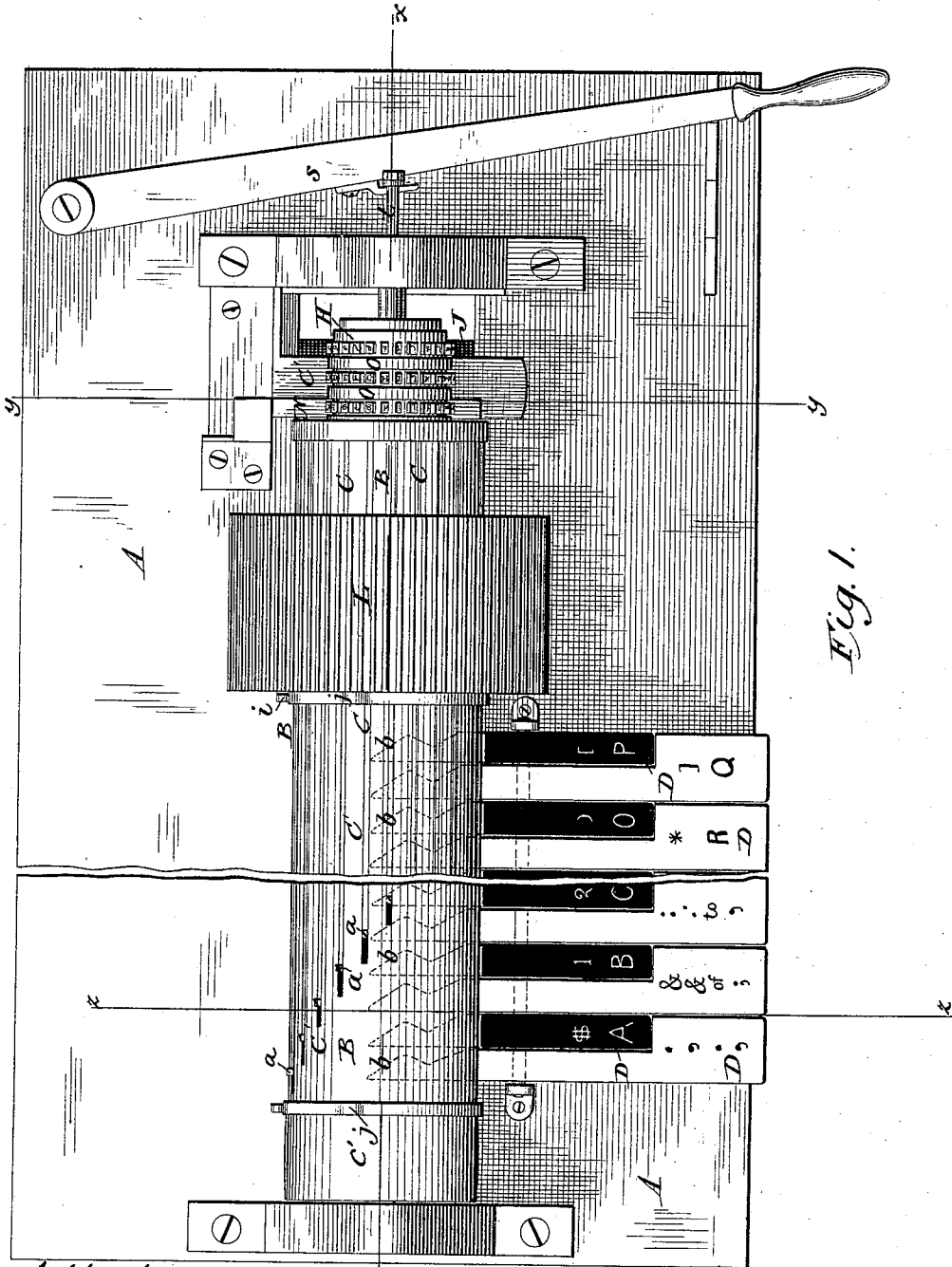


Fig. 1.

Attest.

Sidney P. Hollingsworth
Newton Nyckoff

Inventor.

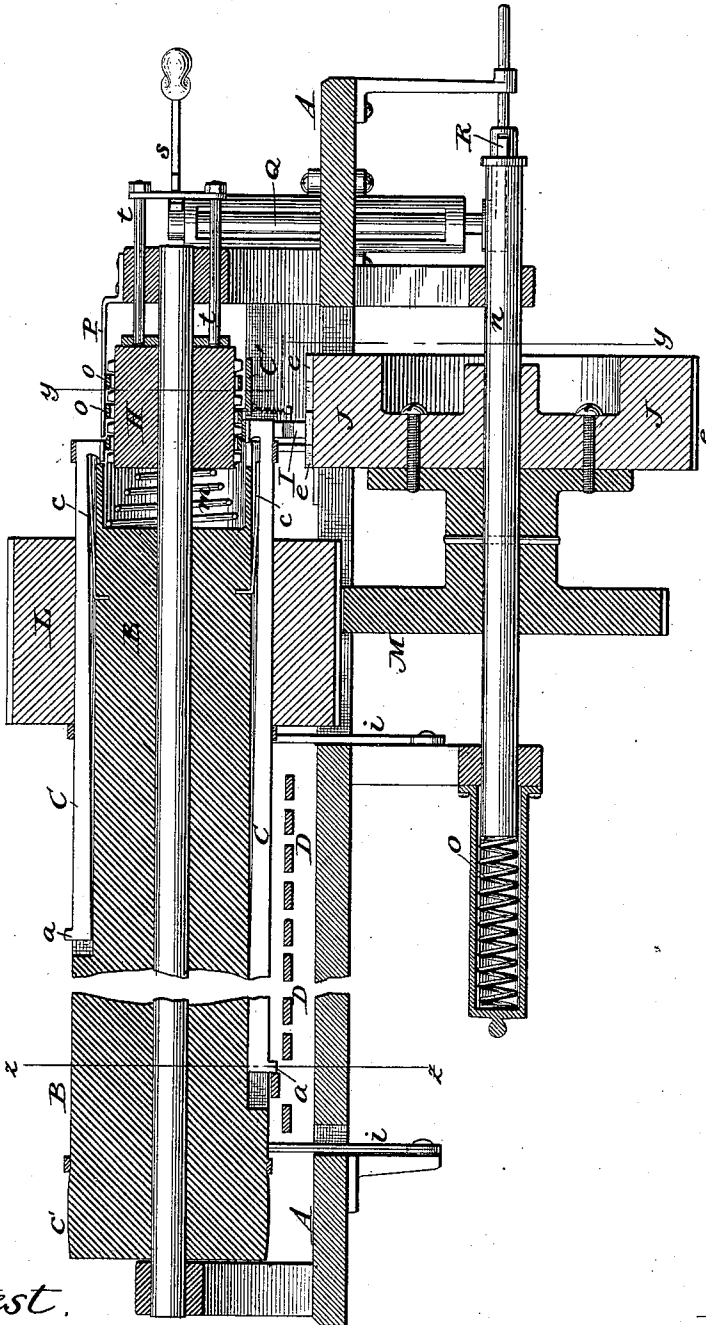
Ottmar Mergenthaler
 By his Attorney
Philip T. Dodge

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*Fig. 2.
on x-x*



Attest.

*Frederic P. Hollingsworth
Newton Dyckhoff.*

Inventor:

*Ottomar Mergenthaler
By his attorney,
Philip T. Dodge.*

O. MERGENTHALER.
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Fig. 3.
on y-y

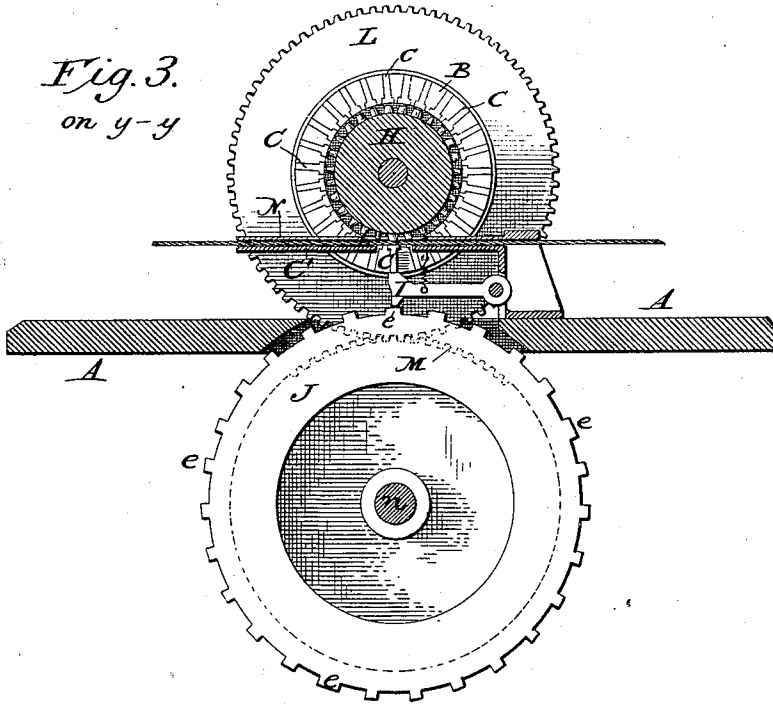
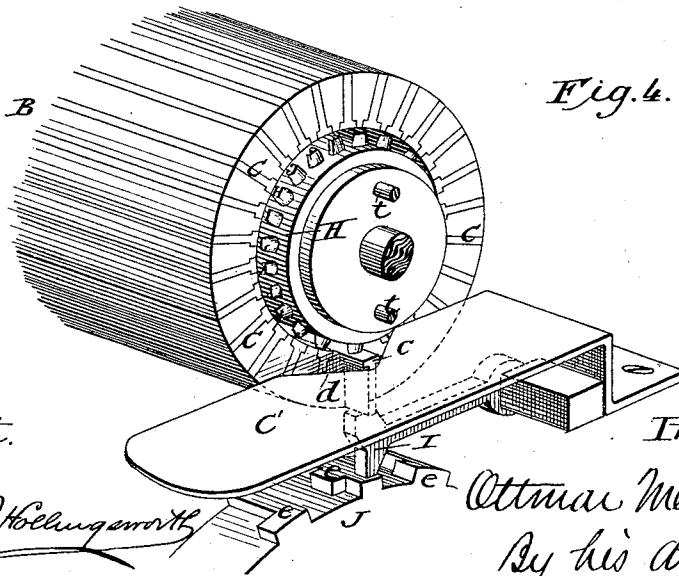


Fig. 4.



Attest.

Sidney P. Hollingsworth
Newton Hyschoff.

Inventor.

Ottmar Mergenthaler
By his attorney
Philip T. Dodge.

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Fig. 5.
on 3-3.

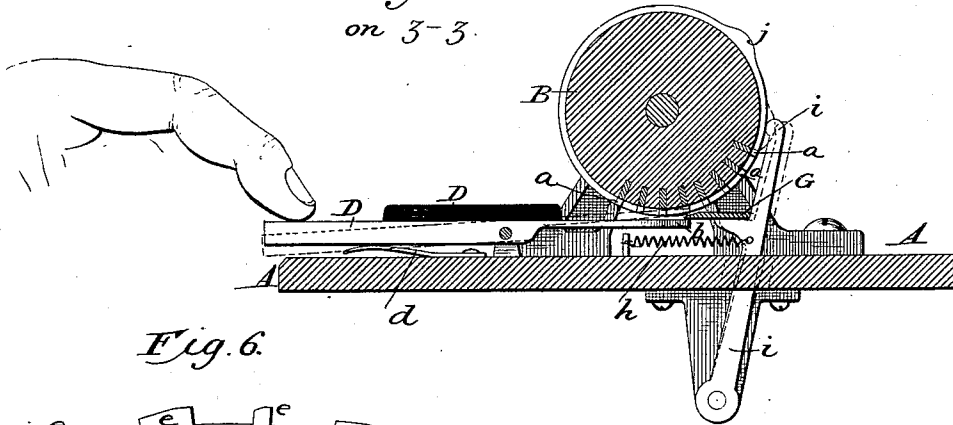


Fig. 6.

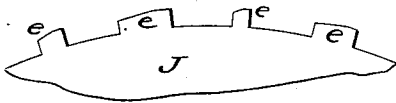


Fig. 7.

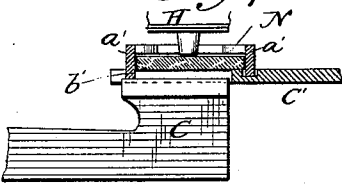
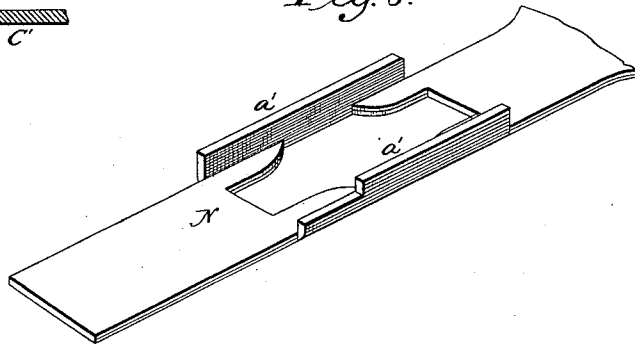


Fig. 8.



Attest.

Sidney P. Hollingsworth
Newton Wyckoff.

Inventor.

Ottomar Mergenthaler
By his attorney,
Philip T. Dodge

UNITED STATES PATENT OFFICE.

OTTMAR MERGENTHALER, OF BALTIMORE, MARYLAND.

MATRIX-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 304,272, dated August 26, 1884.

Application filed March 23, 1883. Renewed May 31, 1884. (No model.)

To all whom it may concern:

Be it known that I, OTTMAR MERGENTHALER, of Baltimore, in the State of Maryland, have invented certain Improvements in Matrix-Making Machines, of which the following is a specification.

This invention relates to that class of power-driven machines which are controlled in their action by a series of finger-keys for the purpose of indenting or printing letters or characters in or upon a continuous strip of papier-maché, or like material.

The invention consists in various mechanisms and combinations of mechanisms, hereinafter described in detail, but more particularly in the combination of a rotary type-wheel having fixed peripheral letters or characters thereon, with a pressure device or mechanism to force and hold the paper against the face of the type, the pressure device arranged to move, when in action, in a path concentric with that of the type; and in a particular form of such device, consisting in rods arranged to move both endwise and radially in a cylinder, at the end of which the type-wheel is located.

It also consists in a pressure-wheel of peculiar construction to force the extended rods or other pressure devices toward the type, to cause their action upon the intermediate strip which is to be indented or printed.

It also consists in a pivoted dog or pressure-piece introduced between the sliding rod and pressure-wheel, for the purpose of imparting motion from one to the other.

It also consists in a series of loose rings encircling the type-wheel adjacent to the type, for the purpose of forcing the paper or matrix strip therefrom after the indentation or impression has been completed.

It also consists in a spring-guide of peculiar form, arranged to hold the strip in the proper position in relation to the type, and in means for relieving the strip automatically from the pressure of said device previous to its being fed or moved forward.

It also consists in various additional features hereinafter explained.

Referring to the accompanying drawings, Figure 1 represents a top plan view of my improved machine, the central portion of the

key-board and cylinder being removed to reduce the size of the figure. Fig. 2 represents a longitudinal vertical section of the machine on the line *x x*, Fig. 1. Fig. 3 is a cross-section of the machine on the line *y y*. Fig. 4 is a perspective view showing the form and relative arrangement of the various parts which have a direct co-operation to effect the printing action. Fig. 5 is a cross-section on the line *z z*. Fig. 6 is a view of a portion of the cam-wheel enlarged. Figs. 7 and 8 are, respectively, a sectional and a perspective view of the spring-guide for the paper strip, Fig. 7 showing also a type and the extremity of a sliding rod.

Referring to the drawings, A represents the frame or bed-plate of the machine, and B a horizontal rotary longitudinally-grooved cylinder mounted in suitable bearings above the bed-plate A, and provided at one end with a pulley, *c*, or equivalent device, by which it may receive motion from a motor or driving mechanism of any suitable character.

C represents a series of sliding rods, which serve as pressure devices to apply the paper against the face of the type, mounted independently in the grooves of the cylinder, and arranged to be moved endwise therein, so as to protrude beyond the end of the cylinder, and also arranged to have a slight radial movement at their outer ends, the slides being either made elastic or operated by springs *c*, as shown, in such manner that, while protruding, their outer ends may be moved slightly inward toward the center, and that, when released, they will immediately spring outward to their original positions. At their inner ends these rods are provided each with a stud or projection, *a*, the series of studs standing, when drawn backward into the cylinder, in a spiral line around the latter, as shown in Fig. 1.

D represents a series of finger-keys designed to effect the endwise movement of the slides. These keys are arranged in a bank or series, in number corresponding to the number of slides in the cylinder. They are mounted upon horizontal pivots, and have their rear ends provided with beveled or laterally-inclined surfaces *b*, located in line with each other immediately beneath the cylinder, in such position that, when elevated, they will

encounter the projecting studs upon the respective slides, each key acting always in connection with the same slide. Springs *c*, acting beneath the forward ends of the keys, hold their rear ends normally in a depressed position out of the path of the projections *a*, in which position of the parts the cylinder and rod are free to rotate without being affected by the keys. When, however, the operator depresses the forward end of either key, its rear end is elevated in such manner that, as the stud of the corresponding slide is advanced by the rotation of the cylinder, the end of the stud will encounter the beveled end of the key and be acted upon thereby in such manner that the slide will move forward in the cylinder and project its end beyond the same, this projection of the slide occurring without interrupting the rotary motion of the cylinder. It will be observed that the series of keys are arranged in the same line longitudinally below the cylinder, and that, consequently, the projection of each slide occurs while it is in its lowermost position, or, in other words, at the under side of the cylinder, and also that the arrangement causes the various slides to be projected, successively, one after another. The return of the slides endwise to the cylinder is effected by means of a fixed plate, *C'*, having a beveled or inclined edge, *d*, as clearly represented in Figs. 1, 2, and 4, against which the projecting ends of the slides act as they are advanced by the cylinder.

It will be seen from the foregoing that the depression of a particular finger-key causes a particular slide to be thrust outward beyond the end of the cylinder when on the under side, and that by means of the beveled plate the slide is immediately returned to the cylinder preparatory to the projection of the next slide, and so on, successively and continuously, the slides being projected, successively, one at a time, although a number of keys may be depressed at the same time.

Devices are shown in the drawings for the purpose of locking the keys automatically in an operative position, to the end that the keys which have been depressed may be locked in an operative position until the corresponding letters are printed, enabling the operator in the meantime to operate other keys. These devices constitute no part of the present invention, but will be made the subject-matter of a separate patent, application therefor having been filed on the 16th day of December, 1878.

It is manifest that the order in which the letters succeed each other on the wheel, and the respective position of the various keys or finger-pieces in the bank or key-board may be such as is found most convenient and best calculated to permit the rapid operation of the machine. If found desirable, any particular letter or character may be used at two or more points in the type-wheel, in connection with a corresponding slide, to increase the printing speed of the machine.

At or within the cylinder *B*, concentric therewith, I mount a type-wheel or series of type-wheels, *H*, arranged to rotate in unison therewith, and each having upon the periphery fixed letters or type arranged in circumferential lines, and also in line with the respective slides of the cylinder, so that each slide, upon being projected beyond the end of the cylinder, will extend directly over or opposite a corresponding type in the type-wheel, for the purpose of forcing the paper thereon, as hereinafter explained.

There may be one or more of the series of type differing in form, style, or size, in order to adapt the machine for printing in different styles. Each series will contain a complete alphabet and such additional characters as are ordinarily employed in connection therewith, and will be arranged in a circumferential line of the wheel. In the accompanying drawings I have, for the sake of convenience, illustrated four series or lines of type. In order that one or another of these series may be brought into action at will, the type-wheel is made movable upon its axis in the direction of the length of the cylinder, so that one or another of the series of type may be brought into line to cooperate with the protruding ends of the slides. The strip of material which is to be printed or indented is passed beneath the type-wheel in such position that the protruding slides will be extended beneath the strip in position for the strip to be acted upon by the slides beneath and thrust upward thereby against the corresponding type. For the purpose of thus forcing upward the extended slides, I mount beneath the type-wheel, upon a fixed pivot, a dog or presser-bar, *I*, as clearly shown in Figs. 2, 3, and 4, the free end of this dog being in such position that each slide is projected directly above it. Beneath this dog I mount a large rotary presser or feed wheel, *J*, having at its periphery a series of teeth, *e*, to act upon the dog *I*, and force the same upward against the under side of the extended slide, thereby forcing the slide inward toward the center, and causing it to press the paper strip against the corresponding type, as plainly represented in Figs. 3 and 4.

The general action is as follows: The strip being passed beneath the type-wheel, as shown in Fig. 3, and a particular letter-key, *D*, being depressed, the key causes the corresponding slide *C*, when beneath the cylinder, to move outward beneath the strip below and opposite the corresponding type of the type-wheel just previous to the end of the slide riding upon the end of the dog *I*. As soon as the slide passes upon the dog, as shown in Figs. 3 and 4, an appropriate tooth, *e*, of the presser-wheel *J* acts beneath the dog *I*, and forces the same upward, causing it in turn to force the end of the slide *C* upward and press the strip against or upon the type. As soon as the tooth of the wheel *J* passes the end of the dog *I*, the latter falls, and the slide is immediately forced back within the cylinder.

The next slide which is projected operates in like manner, and so on, repeatedly. It will be noted that the strip is clamped and held between the type and slide, and that, as they move forward in concentric or parallel paths, they serve to carry the strip forward preparatory to the indentation or impression of the next letter, the type and slides thus arranged serving as a feeding mechanism, and dispensing with the special devices ordinarily used in machines of this class for that purpose. It will also be noted that as the type and the pressure slides move forward together, and without changing their relative positions, a square, direct, and positive pressure is obtained upon the strip; that the parts have no tendency to make the impression deeper on one side than on the other, as would be the case were the pressure to be applied by means of surfaces revolving about different centers.

In order that the cylinder, the type-wheel, and the pressure or cam-wheel may move in perfect accord, a gear-wheel, L, is secured upon the cylinder and arranged to engage with a corresponding wheel, M, secured to the side of the pressure or cam wheel.

In order to apply a gradual and powerful pressure to force the strip upon the type, and at the same time to secure an easy action of the machine, the teeth *e* of the pressure-wheel are beveled or inclined for a portion of their length, as shown in detail in Fig. 6, so that they act with a wedge-like or cam action to force the dog and slide upward. The length of time for which the slide is forced up against the strip in printing each letter depends upon the circumferential length of the face of the corresponding teeth of the pressure-wheel J. These teeth are made of a length corresponding to the width of the corresponding letter, the wide letters being printed by means of correspondingly-wide teeth on the pressure-plate. This variation of the width of the pressure-teeth admits of the teeth which caused the impression of the wide letters being given a longer and more gradual inclination than those which print the narrow letters, and consequently the machine is enabled to apply the heavy pressure required for the indentation of the wide letters with the same ease and smoothness that it causes the indentation of narrow letters.

In order to properly hold and guide the strip being printed, and prevent it from being accidentally moved during the intervals between the impressions, I pass the strip over the surface of the fixed plate C', before referred to, and apply thereto a spring-guide, N, (such as clearly represented in Figs. 3, 7, and 8,) the guide consisting of a flat elastic finger fastened at one end and extended beneath the face of the type-wheel, being cut away at the center, in order that the wheel may work down through the same, and being provided on opposite edges with depending flanges *a'*, to engage over and guide the edges of the strip. At one edge the guide is provided with a de-

pending lip, *b'*, in position to be acted upon by each of the slides C, as the latter is elevated to cause the printing operation, as clearly represented in Fig. 7. Immediately previous to the commencement of the printing action, as the slide C is elevated to clamp the paper against the type, the end of the slide, acting upon the lip *b*, lifts the spring N from the paper strip, releasing the latter previous to the impression, and retains it in this position until after the completion of the impression, thus releasing the strip and permitting the same to move forward with freedom. The instant, however, that the slide passes the lip *b'* the spring-guide immediately falls and retains the strip in position, so as to prevent it from being moved until the next type and slide come into action thereon.

In order to force the strip, after the indentation of each character therein, squarely and directly off from the type without danger of marring or injuring the matrix, and also to prevent the strip from accidentally feeding too far, I mount around and at each side of the type-wheel, or of each line of type, a loose ring, O, capable of a slight radial movement, and above the wheel I mount a fixed spring, P, which bears upon and forces said ring downward. As each slide is forced upward to cause an impression or indentation, it acts upon the rings and forces them upward, in order that the strips may pass freely upon the type; but as the slide falls the rings, relieved from their action, are forced downward by the spring P and caused to force the strip squarely off from the type. As before stated, the type-wheel is provided with several lines or series of characters of different styles, and made movable in the direction of its axis, in order that one or another of these series may be brought into action. To secure the proper action of these different type it is necessary that there shall be a corresponding number of pressure-wheels, or a corresponding series of projections upon the one pressure-wheel, as represented in the drawings. It is to be understood that for each type or character upon the type-wheel a tooth or projection of corresponding form and length is provided upon the cam or pressure wheel.

As each series of type is brought into action, it is necessary that the corresponding series of cams upon the type-wheel shall also be brought into action. It is therefore necessary that the pressure-wheel shall have a lateral movement corresponding with that of the type-wheel, and that it shall be shifted in unison therewith. This may be accomplished by appliances of any suitable character. In the present instance, the arrangement for shifting the type and pressure wheels simultaneously is constructed as follows: A spiral spring, *m*, applied to the axis of the type-wheel assists to move the same to the right. The pressure-wheel is mounted upon a shaft, *n*, movable lengthwise in its bearings, and acted upon at its inner end by a spiral spring, *o*, mounted

in a fixed casing which tends to move the wheel to the right. A vertical rock-shaft, Q, mounted at the outer end of the machine, is provided at its lower end with an arm or lever, R, acting upon a swiveled cap or connection at one end of the pressure-wheel shaft *n*, and also provided at its upper end with a hand-lever, *s*, acting upon a yoke, *t*, which bears loosely against the outer end of the type-wheel. The rock-shaft Q causes the two levers, R and *s*, to move in unison, so that upon moving the hand-lever to the left the type-wheel and pressure-wheel are moved to the left, and that upon moving the hand-lever to the right the type-wheel and pressure-wheel are moved, under the action of the springs, to the right. In this manner it will be perceived that the type and pressure wheels may be moved instantly, and the machine adjusted to print one or another style of characters, as may be required. While the best results are secured when the pressure device or dog I is used between the sliding bars, and while there are several advantages consequent upon this use of the dog, it may be dispensed with and the pressure or feed wheel arranged to act directly upon the slides to force them toward the type. The details of construction shown in the drawings are considered the best that can be employed; but the machine may be varied in many minor points without changing the principle of action or departing from the limits of my invention.

I believe myself to be the first to construct a printing or indenting machine in which the type and the devices which sustain the paper or other material against the pressure or impression of the type advance in concentric rotary paths.

I believe myself, also, to be the first to combine a wheel the teeth of which have concentric extremities, but are of different lengths on the circumference, with a printing or indenting machine, so that the wheel causes the printing or indenting action of the type.

The above features I claim, broadly, and irrespective of the peculiar form, size, or arrangement of the minor parts or details.

I am aware that a rotary cylinder having longitudinally-sliding rods therein has been combined with a cam to retract the slides; but the cam was arranged at the rear end of the cylinder, instead of at the front as in my machine, and necessitated the prolongation of the rods and grooves the entire length of the cylinder, and also necessitated the construction of the slides with oblique cam-grooves therein or studs thereon—a construction which rendered the cost much greater than under the plan represented by me, and also increased materially the friction and the power required to operate the machine. Under my construction each slide and groove requires to be extended only to its key, the necessity of using the grooves or studs in the slides is avoided, and the cam is made to serve the additional purpose of a paper support, if desired.

I am also aware that a rotary cylinder has been provided with longitudinal slides arranged to project movable type therefrom. I believe myself to be the first to combine, with a wheel having type fixed peripherally thereon or therein, a series of slides revolving in unison with the wheel and arranged to be protruded beyond or opposite the faces of the respective type.

The present invention is restricted to those matters and things which are hereinafter claimed; and as to all matters which may be described or shown but which are not claimed, the right is reserved to make the same the subject of a separate application.

Having thus described my invention, what I claim is—

1. The combination of a type-wheel provided with fixed peripheral type, a cylinder concentric therewith, and a series of longitudinal sliding rods mounted in said cylinder and arranged to be extended endwise therefrom opposite the respective type.

2. The combination, substantially as described and shown, of a rotary type-wheel, rotary presser devices to sustain the paper against the type, and supporting and operating means, substantially as described, to carry the presser devices, during their action, in a path parallel with that of the type.

3. The combination of a rotary wheel and type sustained by said wheel and facing radially, a presser device opposed to the face of the type, and operating mechanism, substantially as described, which permits the type and presser devices to move in parallel concentric paths.

4. The combination of a rotary wheel provided with fixed type, a rotary cylinder or carrier concentric with and rotating in unison with the wheel, radially-movable presser devices, substantially as described, carried by the cylinder and opposed to the faces of the type, and means, substantially as described, for forcing the presser devices toward the type during the rotary motion, whereby the presser devices are caused to advance with the type while holding the paper thereon.

5. In combination with mechanism, substantially as described, for supporting and operating the same, a rotary wheel having fixed type, and presser devices, substantially as described, opposite to the faces of the type, and having both a rotating movement about the axis of the wheel and a movement to and from the faces of the type during such rotation.

6. In combination with the rotary cylinder, the slides arranged to protrude endwise therefrom, the keys operating directly on the slides to project the same, and the cam-plate located at the front of the cylinder, and acting to push the slides inward.

7. The combination of the type-wheel and the cylinder provided with the endwise-moving slides, and a toothed pressure-wheel arranged to force the slides upon the type, substantially as set forth.

8. The combination of the type-wheel, the cylinder B, the sliding and radially-moving rods, the dog I, and the toothed wheel J.

5 9. In a printing or indenting machine, the combination of the rotary type-wheel, one or more encircling rings, O, and a spring arranged to act upon the rings, substantially as and for the purpose described.

10 10. In combination with the type-wheel provided with fixed type, the cylinder B, slides C, and pressure devices arranged to act upon said slides, the pressure device N, and a device, substantially as shown, arranged to raise said pressure device from the strip previous to
15 each impression or indentation.

11. In combination with the type-wheel and an intermediate pressure device, substantially as shown, a pressure-wheel, J, having teeth c, inclined or beveled, substantially as and for
20 the purpose described.

12. In combination with the wheel having fixed type, a cylinder concentric therewith, and slides mounted in the cylinder, and each capable of moving both endwise and radially

in relation to the cylinder, in order to operate 25 in conjunction with the faces of the type, substantially as described and shown.

13. The combination, in a printing or indenting machine, of an impression device acting upon or against the type, and a wheel to 30 operate said device provided with teeth having concentric extremities, but of different lengths on the circumference.

14. In combination with a wheel provided with a series of fixed type, means, substantially as described, for sustaining the paper against the type, and a pressure-wheel, to 35 cause the impression, having teeth with concentric extremities, but of varying length on the circumference.

15. The combined pressure and feed wheel having the teeth with concentric ends, but of varying widths and inclinations on the circumference. 40

OTTMAR MERGENTHALER.

Witnesses:

JULIEN P. FRIEZ,
CHARLES W. LETSCH.