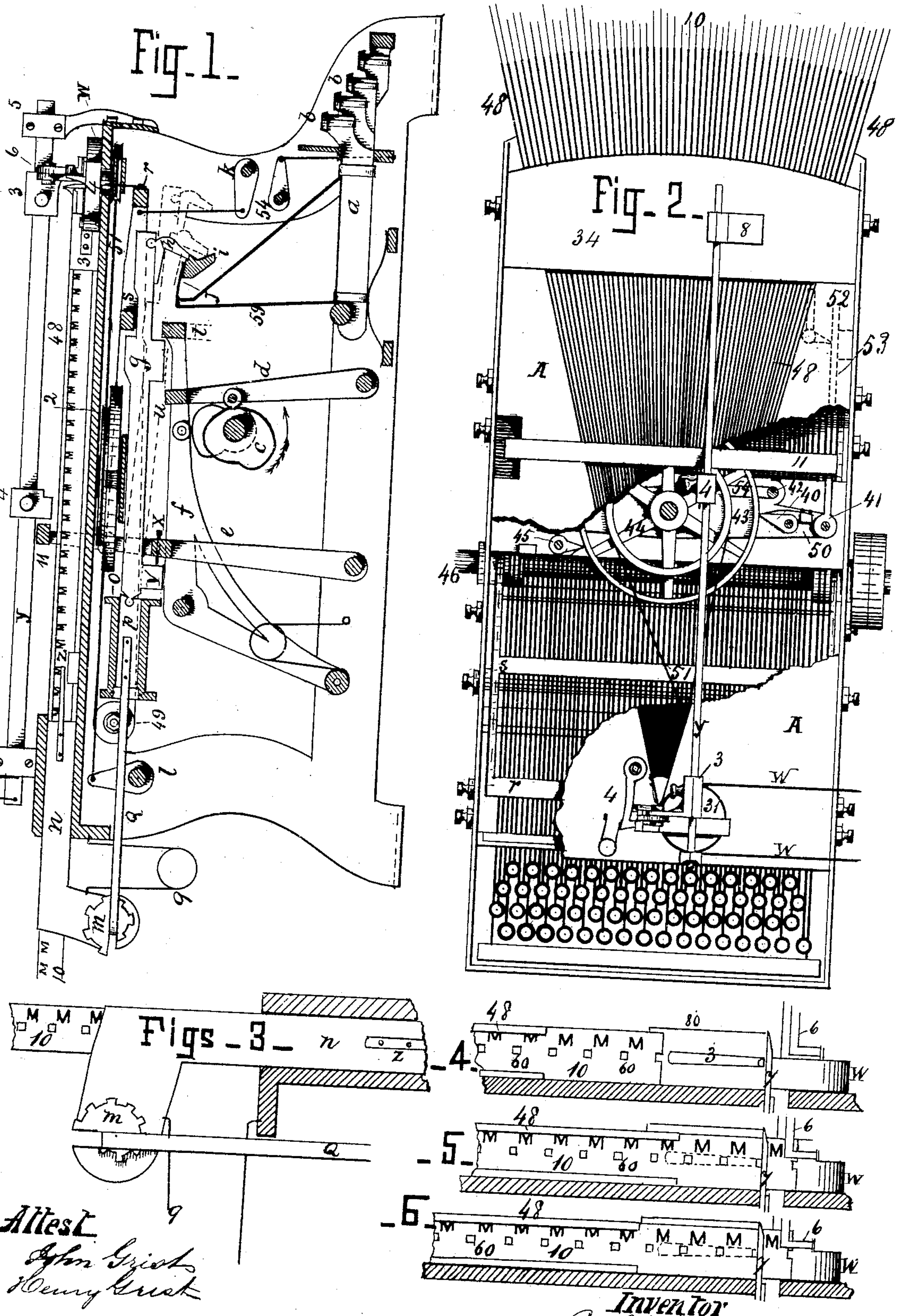
G. P. DRUMMOND.

Machine for Obtaining Printing Surfaces for Reading-Matter.

No. 198.240.

Patented Dec. 18, 1877



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3 Sheets—Sheet 2.

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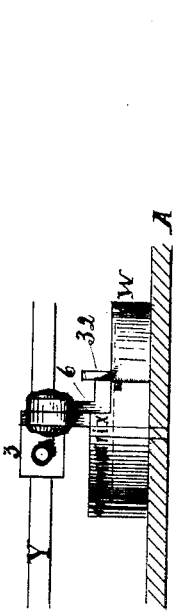

Fig. 11.

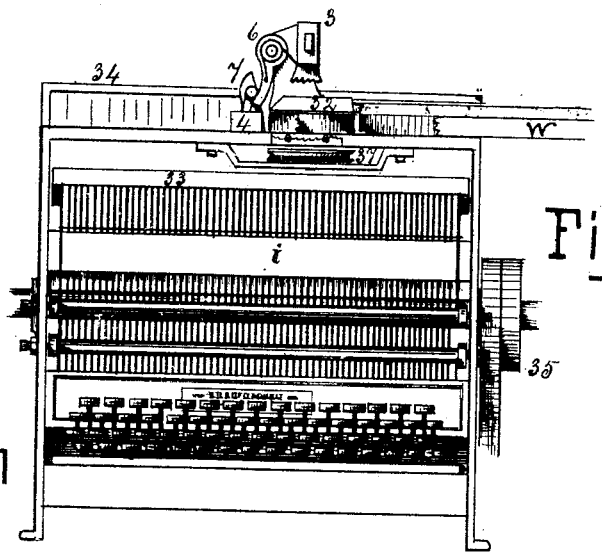

Fig. 7.

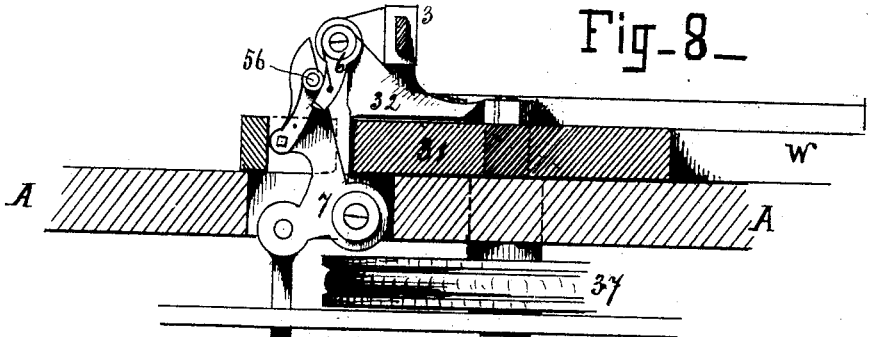

Fig. 8.

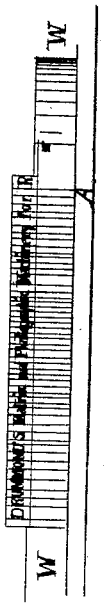

Fig. 10.

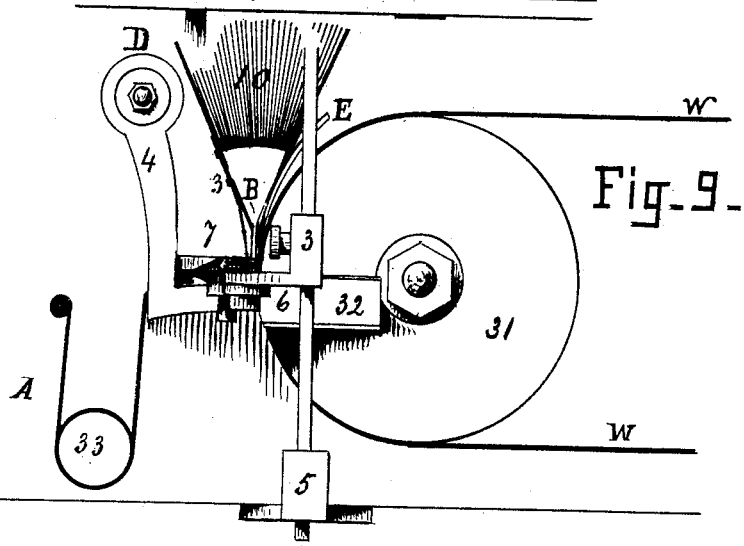

Fig. 9.

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Fig. 12.

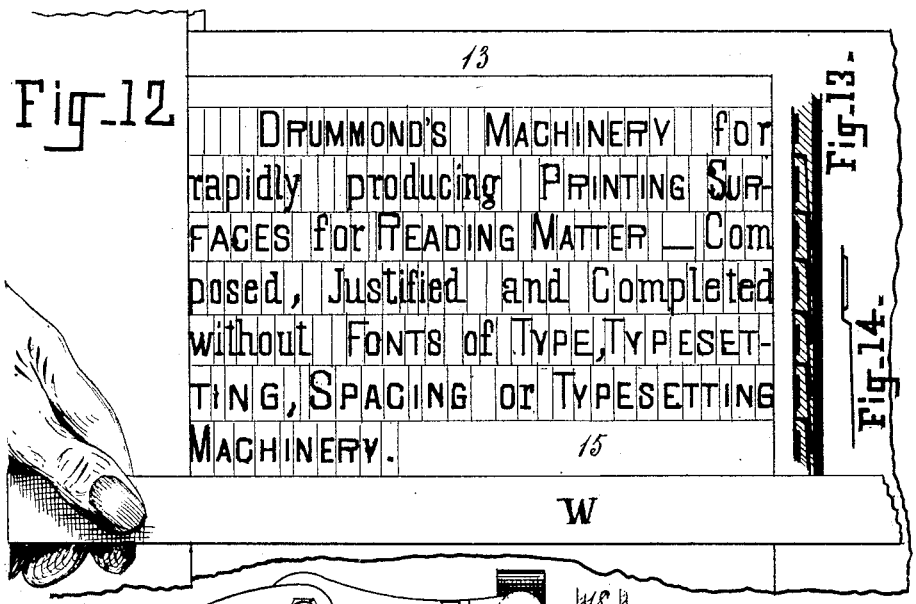


Fig. 13.

Fig. 14.

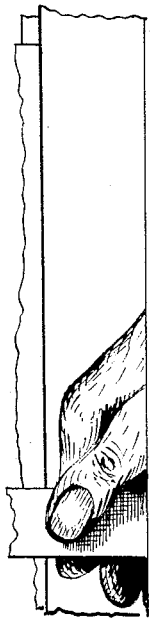


Fig. 15.

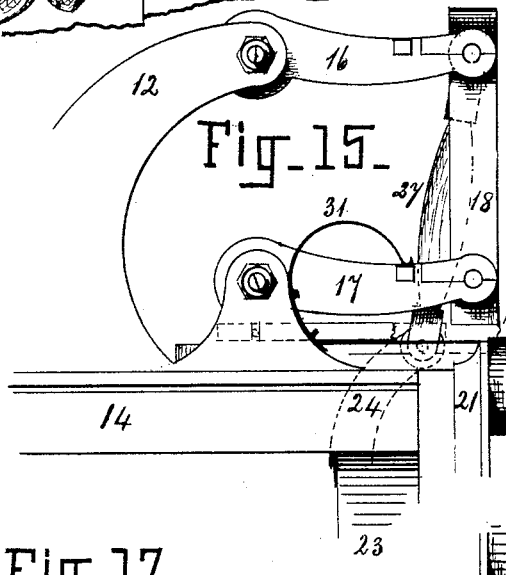


Fig. 16.

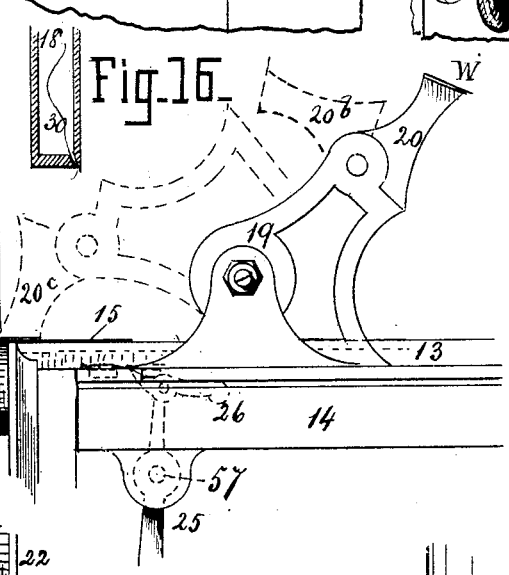
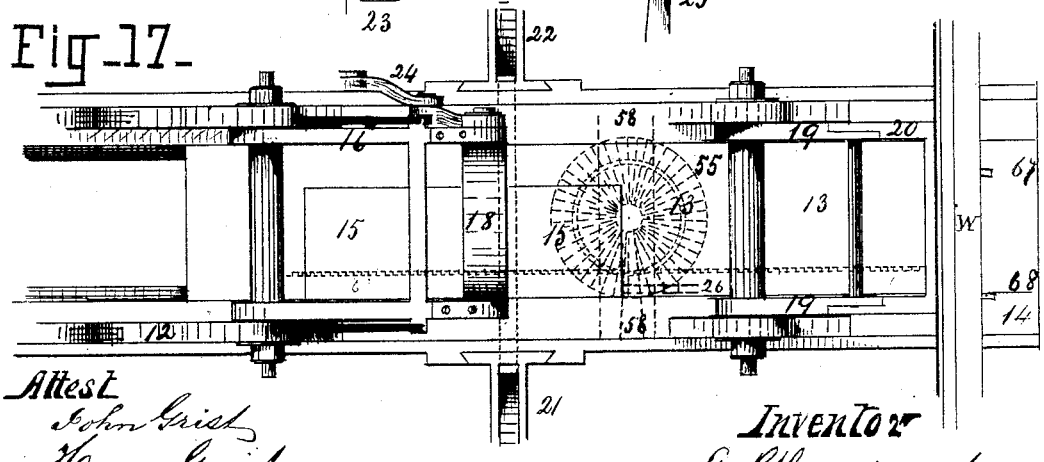


Fig. 17.



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UNITED STATES PATENT OFFICE.

GEORGE PRINGLE DRUMMOND, OF OTTAWA, ONTARIO, CANADA.

IMPROVEMENT IN MACHINES FOR OBTAINING PRINTING-SURFACES FOR READING-MATTER.

Specification forming part of Letters Patent No. **198,240**, dated December 18, 1877; application filed October 31, 1877.

CASE NO. 5.

To all whom it may concern:

Be it known that I, GEORGE PRINGLE DRUMMOND, of the city of Ottawa, in the county of Carleton, in the Province of Ontario, Canada, have invented new and useful Improvements in Machinery for Obtaining Printing-Surfaces for Reading-Matter, which are fully set forth in the following specification and in the accompanying drawings, in all of which like letters or figures of reference indicate like parts.

The object of my invention is to form the subject-matter to be printed into a matrix or molding-surface, by first composing it in a suitable composing-machine, which cuts the matriced letters from reels of ribboned paper and attaches them to an elastic band, from which, by means of a suitable clamping-press, they are deposited in justified lines, in page or column, into which metal may be poured for the purpose of producing a stereotype.

Figure 1 is a side elevation of the composing-machine, sectioned longitudinally. Fig. 2 is a top view of the same machine, having the table broken to show the mechanism underneath. Figs. 3, 4, 5, and 6 are details, showing the manner in which the ribboned paper is cut off and attached to the band, and the various positions assumed during its operation. Fig. 7 is a front view of the machine. Fig. 8 is a front view of the shears and section of the elastic-band wheel. Fig. 9 is a top view of Fig. 8. Figs. 10 and 11 are details of attaching the matriced letters to the elastic band. Figs. 12, 15, 16, and 17 are views of the clamping-press. Figs. 13 and 14 are sections of the molding-surface and matriced paper, respectively.

A brief outline of the operation of this machine is as follows: The letters are matriced and printed on ribboned paper 10 10 10, as shown in Figs. 3, 4, 5, and 6, and of which Fig. 14 is a section. This is done in a ribbon printing and matricing press, which forms the subject of another application.

The reason for printing the letters at the same time that they are matriced is that they are more readily read for the purposes of arrangement or correction for taking a photographic proof of them after they are arranged either in lines, pages, or columns.

These prepared paper ribbons are inserted into channels 48 48 48, Fig. 2, and converge upon a central shears, 7, Fig. 9. Here, by means of the mechanism hereinafter described, the required letters are cut off and attached to an elastic band, *w*, which is coated with an adhesive substance of resin and oil. The subject-matter then presents the appearance shown in Fig. 10, the blank spaces on the ribboned paper overlapping like slate or shingles on a roof. These matrices are then formed into a molding-surface, (under the clamping-press shown in Figs. 12, 15, 16, and 17,) which, when dried, is ready to produce a stereotype from. The rubber band is used for the purposes of justifying the lines prior to their being clamped down in the manner seen in Fig. 12.

The operation of the mechanism to carry out the foregoing is as follows: The cam *c* on the rapidly-revolving shaft 46 produces a constant vibrating movement upon the arms *d* and *f*, to which cross-bar connections *t* and *u* are fixed, which underlie all the key-actions *g* and *h*. Now, when I require a letter, I depress the key representing it. This brings forward the hammer *j*, and throws off the sustaining-catch *h*. The lever *g* then drops, as represented, and is immediately caught by the vibrating-arm bar *u*, which drives it forward, together with its attachments, the sliding guide *p*, draw-spring *q*, sliding guide *n*, and ribboned-paper channel 48.

The movement of all these projects the first letter on the ribboned paper through the shears 7, Fig. 5. The vibrating arm *f* and its cross-bar *t*, Fig. 1, now commence to rise, and, coming underneath the advanced lever *g*, raise it, and with it the overlying cut-off lever-bar *s*, centered at 49. This raises the shear-bar *r*, and cuts off the letter, which is stuck to the elastic band by the sticking-pad 4. The action of this pad is fully described in my application for composing, attaching, and photographing machinery for reading-matter. After the letter has been cut off and attached, the feed-wheel 31 feeds the band ahead the width of such letter as may have been attached.

The bar *t* then raises the drop-lever *g* clear of the top of the bar *u*, and, being thus relieved, the spring 9 throws the combined drop-action and ribbon-paper mechanism back to its original position.

The feeding mechanism consists of the lever *e*, having the cross-bar *x*, containing the set-screws for each letter, and operates, by the lever 50, friction pawls or cams 40 and 45, the friction-wheel 44, belt-pulley 43, and belt 51 to elastic-band pulley 31. The action is more fully described in my application for composing, attaching, and photographing machinery for reading-matter, with the feed of which it is identical, with the exception that there is here added a friction pawl or cam, 52, operating upon rod 53 for the purpose hereinafter explained, and also a connecting-bolt, 42, adjustable along the slot 54 for the following reasons: This machine is equally applicable as a composing and attaching machine to operate for the same end and purpose described in my application for composing, attaching, and photographing machinery for reading-matter, when it is used for composing from matriced letters. These, being much smaller than is necessary for letters which may be photographed from, require a shorter feed; therefore the bolt 42 is slid along the slot 54 toward the center of the wheel 44; and proportionately to the size of letter required or used in the machine is the adjustment of the feed-connection 42 to or from this center.

It will be observed from Fig. 10 that the cut-off pieces of paper which have been attached to the band overlap each other only in part, and that they are cut in the shape of an L, that portion in which the letter is matriced not overlapping.

It will also be observed in Fig. 14, which is a section of the ribboned paper matriced, that the paper is creased so as to allow the ready deposit and adhesion, by paste, of lines one after another on a flat surface, of which Fig. 13 is a section, and Fig. 12 a front view. To accomplish this end, the following action of the shears and its connection is thus described.

Fig. 4 is the normal position of the ribboned paper 10 and channel 48, Fig. 3 being the entrance end of channel. 80 is a short channel immediately contiguous to the shears 7; but of the ribboned-paper channels 48 48 there are a number equal to the number of letters or signs required in the composition. The end of the ribboned paper in each of these channels 48 48 projects beyond the channels, as seen in Fig. 4, just into the entrance of the short channel 80, and this is the normal or stationary position of all the ribboned papers and their channels 48 48.

The manner in which, when a letter is wanted, these ends of the ribboned paper are singly driven forward into the short channel 80, between the shears 7, cut off, fed, and then returned to their original position, is now described.

The letters have contiguous punched holes, in which a pair of small spring-pointers or pawls operate—one, *z*, as a check, the other, 3, as a feed. When a key is struck the ribboned paper is driven forward, as seen in Fig. 5. It is here caught on the point of the spring 3, close to the shears 7. While retained in this position, and before the letter is cut off by the shears, the paper-channel retires to position, Fig. 6, thus advancing the paper along the channel—that is, feeding it; and in this manner is every paper ribbon fed, so as to be ready when required again. The secondary shears 6 then cut the gap, and the shears 7 cut the entire piece off, after which the ribboned paper and its channel go back together to their original position, as in Fig. 4. The secondary shears 6, being attached to the slide-bar *y*, are operated on by the feed-bar 11 against the adjustable butt 4, in such manner that the shears are moved forward the distance required by the letter to be cut off and attached, whether it be an m or an i or other letter.

In Fig. 8, 6 represents the secondary shears; 7, the main shears; 56, a friction-roller attached to drive 6 simultaneously; 32, trough for cuttings; 31, elastic-band wheel; 37, belt-wheel; *w*, elastic band; A, machine-table.

In Fig. 9, 10 is the ribboned paper; 7, shears, and E their inside cutting-blade; 6, shears; 4, sticking-pad; B, the neck-channel; 3, the spring paper-pawl; *w*, the elastic band; and 32, the cutting-trough.

Fig. 11 is intended to represent the action of the secondary shears and relation to the attached letters, being a view from the side in Fig. 1. Fig. 10 is a back view of the attached paper, band, and band-wheel. Fig. 7 is a front elevation.

The speed at which the machine is run is about two hundred and fifty revolutions a minute; consequently, the execution of the movements herein described is accomplished with extreme rapidity.

From description of Figs. 4, 5, and 6 it will be remembered that the paper-channel 48, on a key being struck, advances to position, Fig. 5, and then recedes to position in Fig. 6 before finally returning to its position. To do this, it is necessary to make the outline of the eccentric-cam *c* conform, and therefore the whole mechanism of the machine must also recede. This must be prevented in the feed-wheel 43, and to this end the bar 53 and the friction-pawl 52 are attached, so as to prevent any retrograde movement until the friction-pawl 52 is raised. The feed-wheel is thus prevented from feeding until the letter has been cut off and attached. The forward movement of the machine sets the feed-wheel 20 so as to operate on the back movement only. *k*, *l*, and 54 are parallel-motion rocking bars. *m* is an adjusting-eccentric.

In Fig. 1 all sectional parts cross the machine, and to every key is allotted a similar mechanism, as shown in the parts *h g v p q* 9.

m n z 48, and also a reel of ribboned paper, 10, having its distinctive letter. The sectioned cross-bar *x* contains the adjusting set-screws for feeding each letter proportionately, and these set-screws are operated upon by the lugs *v* attached to each drop-lever.

The matriced letters having been cut off and attached, as appears in Fig. 10, the next operation is to detach them and form them into a molding-surface by means of the clamping-press, Figs. 12, 15, 16, and 17. In these figures *w* is the elastic band; 13, the table, movable by the pawl 26. 15 is the mold-basis; 16, 17, 18, 27, 24, the clamping mechanism; 23, an oven. 20 is the justifying-platform for the elastic band; and 55, 58, 57, 26 is the feeding mechanism for the table 13.

When I have attached such reading-matter as I require to the elastic band, I place it conveniently, and draw it across the adjusting-platform of the swinging knee 19 and 20, holding it with my hands, similarly as in Fig. 12. I then swing it to position 20^b, justify the length of my line to the set-gage 67 and 68, then swing down on the mold-basis 15, on which there is a coating of pasty composition of paste and plaster-of-paris, toward the clamp. I then move forward the table 13 by the pawl 26 and the treadle-lever 25. This carries the line of matrix-letters on the band under the clamp 18. I then withdraw the handle 27 with the lever 24, bringing down the clamp upon the line of reading-matter.

Now, I may state here that the table-bed 13 is kept warm by the oven 23, and as the adhesive substance on the elastic band is resin and oil, this melts, or rather softens, and the band is readily detached, leaving the letters embedded in the pasty composition, which hardens by the same means as softens the resin. In this manner I carry along the elastic band and deposit the next line, and so continue until I have finished my page or column.

In carrying out the foregoing, the consistency of the pasty composition, its drying properties, extent of coating, and so on, are readily determined by practice and the speed at which the operator can justify and embed.

As appears from Fig. 16, the clamp is hollow, and this chamber contains tissue-paper 30, which is discharged as the embedding is continued. This is an important feature for preventing clogging of the clamp, and the overruning of any paste coming up through the joints between the letters into the hollow of the letters.

As the finished stereotype-mold passes from the clamp it appears covered with this sheet of tissue-paper, and remains so until the whole is perfectly dried in the usual stereotype-oven, when it is simply passed over a flame and the tissue-paper burned off. It is then ready for casting the metal in the usual way, after first dusting off the ash.

Should the stereotype-plate not be perfectly level or true, it may be readily made so by leveling its face downward on a slab, and abrading or planing the back. When the ribboned paper is matriced and creased it is also printed on the bottom of the matrix at the same time, which is necessary for the object of taking a photograph-proof for the purposes of correction.

I have to state that in many instances, and especially in setting up from manuscript, an important feature not to be lost sight of is the probability of correction being required. I have provided for this contingency in such a manner as to render its being as readily accomplished, and as quickly, as under the present system of correcting movable type.

Practice upon the keys of the composing-machine will insure an accuracy not obtainable under the present system of hand setting and distribution; but authors' and editorial corrections or other changes in manuscript will always be necessary.

To provide for this, when I have reason to believe it will be required, instead of directly clamping down the subject-matter upon the basis on the press-table, I proceed after the following manner: I place upon either of reels 21 or 22 ribboned paper of the same dimensions as that printed and matriced, but in this instance only creased, and I justify and clamp down upon this ribboned paper from the elastic band in the same manner as previously. I afterward cut the lines and set up in a suitable grooved frame, and from this take a photographic proof for correction. It will be readily seen that my lines may now be transposed or moved about, or "leaded out," or they may be cut out and carried forward or backward where more than a line has to be put in or taken out, as the case may be. When correction has taken place, I clamp them readily down on the matrix-basis without the swinging frame 20 or the justification.

Matriced letters may be used in some instances of larger or smaller type, or the lines may be required to be farther apart (leaded out) than ordinary. I have provided an adjustable feeding mechanism to the table 13 to meet this case.

On the under side of the table 13, 55 is a guide, with an opening or tapering slot, corresponding to spaces between the spokes. In this tapering slot works the ratchet or pawl 26.

It will be apparent, as the lever 25 is slid over toward the wheel-center on the bar 57, that the swing of the lever becomes more confined.

The shears, pad, feed-wheel, and their connections (seen in Fig. 9) may be transposed to the opposite side of the mouth-channel B, in this way sticking the letters to the other side of the band. This renders the detaching, as seen in Fig. 12, somewhat more convenient.

Before concluding it may be distinctly stated that the same result—that is, the stereotype or an electrotype plate may be produced by

turning the embossed (relief) side of the ribboned paper in the composing-machine outward, and fixing them down in page, column, or line, in the manner already described for obtaining a matrix-mold, but in this instance producing the letters in relief, or the reverse of a matrix-mold. A matrix-cast may now be obtained from this relief-mold in either metal or other suitable substance, from which cast a stereotype or an electrotype plate may be taken. Of course the matrix-cast must be made of such material as may be most suitable to the stereotype or electrotype, as the case may be.

In using the relief side of the ribboned paper, the creasing of it is not necessary; but each line may be indented in the clamping-press as it is clamped down.

It will be observable that proofs may be readily taken of the relief-letters, if necessary for correction. This manner of using the ribboned paper gives greater relief to the letters by making greater depressions between the lines and words, but requires a double manipulation of the mold. The use of the secondary shears may also be dispensed with. Any unevenness in the stereotype or electrotype plate may be removed by placing the face down on a level plate, and treated as before described, or more quickly by placing thereon a layer of sand, and subjecting the whole to hydraulic pressure.

I may finally state that as the pieces of ribboned paper are cut off and attached like slate on a roof, the lap and relap give them a slight incline when clamped down to a level surface; therefore I prefer to matrix the letters in the ribboned paper slightly deeper on one side, this being for the purpose of bringing them more nearly to the level and to counteract this incline.

What I claim as my invention is as follows:

1. The improvement in the art of producing printing-surfaces, which consists in first detaching the characters of the subject-matter from previously-prepared strips of paper, then attaching them to an elastic band, by means of which the lines are justified, and finally transferring the subject-matter to a page or column basis.

2. The art of producing surfaces for printing reading-matter from, which consists in first detaching the letters of the subject-matter from paper or other suitable material, having the letters matriced and printed therein or embossed thereon, and then attaching them to an elastic band or surface, from which they are removed and formed into a solid matrix or relief-mold, from which a stereotype or electrotype is obtained.

3. The paper-strip carriers, the fingering-keys, and the scissors, in combination with the intermediate mechanism, substantially as described, whereby the strips of paper are fed forward and the separate letters detached upon the depression of the keys.

4. The combination of the fingering-keys *b b* by the knee attachment 59 and the hammer *j* with the sustaining-catch *h* and the drop-levers *g*, substantially as described, and for the purposes specified.

5. The combination of the drop-lever *g*, parallel slide *p*, the draw-spring *q*, and the channel-guide *n* with the paper channels or carriers 48, substantially as described, and for the purposes specified.

6. The combination of the paper channel or carrier 48 and the channel-guide *n*, provided with the spring-pawl *z*, substantially as described, and for the purposes specified.

7. The combination of the drop-lever *g* and the channel guide and carrier mechanism by the connecting draw-spring *q* and draw-slide *p* with the revolving eccentric *c*, the vibrating arm *d*, and the cross-bar *u*, for the purpose of feeding in the paper, substantially as described.

8. The combination of the channel or carrier 48, the channel-guide *n*, provided with the pawl *z*, with the short channel 80, provided with the pawl 3, substantially as described, and for the purposes specified.

9. The combination of the revolving eccentric *c*, the vibrating arm *u*, and cross-bar *t* with the drop-lever *g*, the shear-lever *s r*, and the double shears 7 and 6, substantially as described, and for the purposes specified.

10. The combination of the drop-lever *g*, the feed-arms *e*, and the cross-bar *x* (containing the adjusting set-screws) with the feed-wheel 43, by the lever 50, and the feeding and check friction-pawls 40 and 45, substantially as described, and for the purposes specified.

11. The combination of the cross-bar *x*, having set-screws therein, with the drop-lever lugs *v* and the channel guide mechanism carrying the ribboned paper, substantially as described, and for the purposes specified.

12. The combination of the feed-arm *e* and cross-bars *x* and 11 with the slide-bar *y* and the secondary shears 6, substantially as described, and for the purposes specified.

13. The combination of the channel or carrier 48, the stationary short channel 80, having the spring-pawl 3, main shears 7, secondary shears 6, and elastic band *w*, substantially as described, and for the purposes specified.

14. The combination of the elastic band *w*, having the subject-matter attached thereto, the swinging adjusting-platform 19 and 20, the drop-press 18, and the matrix-basis 15, substantially as described, and for the purposes specified.

15. The combination of the press 18, provided with a slot for the tissue-paper 30, with the bed 13, carrying the matrices formed into a molding-surface, substantially as described, and for the purpose specified.

16. The combination of the reels 21 or 22, having ribboned paper thereon, with the elastic band having the matriced or embossed subject-matter thereon, substantially as described, and for the purposes specified.

17. The combination of the oven 23 and the

table 13, carrying the matrix-basis 15, coated with a pasty composition, with the elastic band, carrying the matriced subject-matter, for the purpose of aiding in removing the latter from the band and consolidating it on the matrix-basis, substantially as described.

18. In the composing-machine, the combination of the lever *e*, having the cross-bar *x*, provided with adjusting set-screws and the bolt 42, and lever 50, having the slot 54, with the mechanism carrying the ribboned paper for the purpose of increasing the feed proportionately throughout, and substantially as described.

GEORGE PRINGLE DRUMMOND.

Witnesses:

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HENRY GRIST.