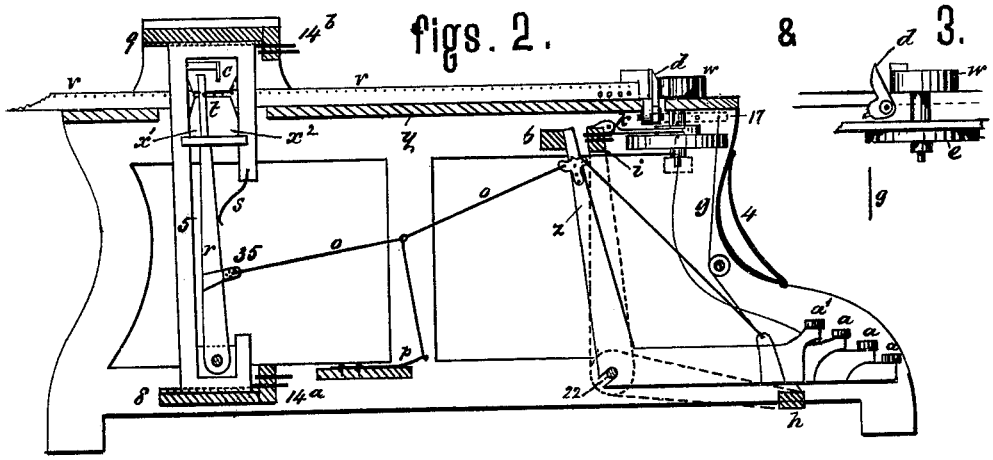
2 Sheets—Sheet 1.

G. P. DRUMMOND.

Machine for Obtaining Printing Surfaces for Reading-Matter.

No. 198,238. Patented Dec. 18, 1877

figs. 2. & 3.



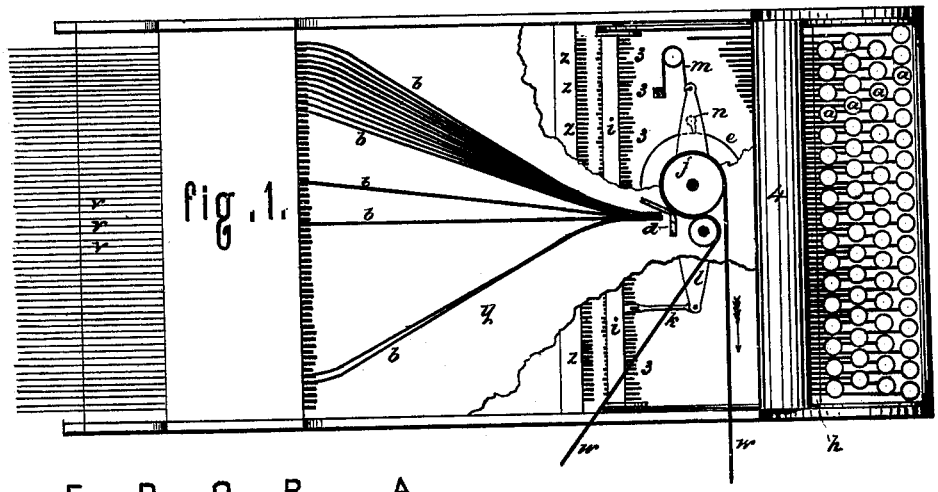


fig. 1.

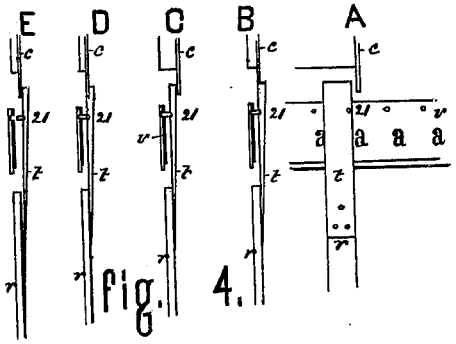


fig. 4.

Witnesses
John Crisp
Henry Crisp

Inventor
Geo. P. Drummond

2 Sheets—Sheet 2.

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Fig. 6.

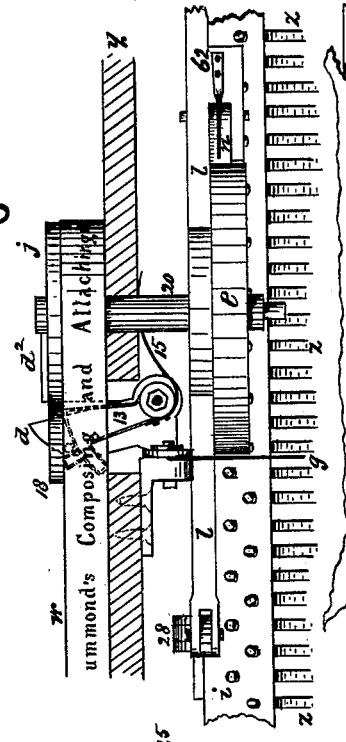


Fig. 10.

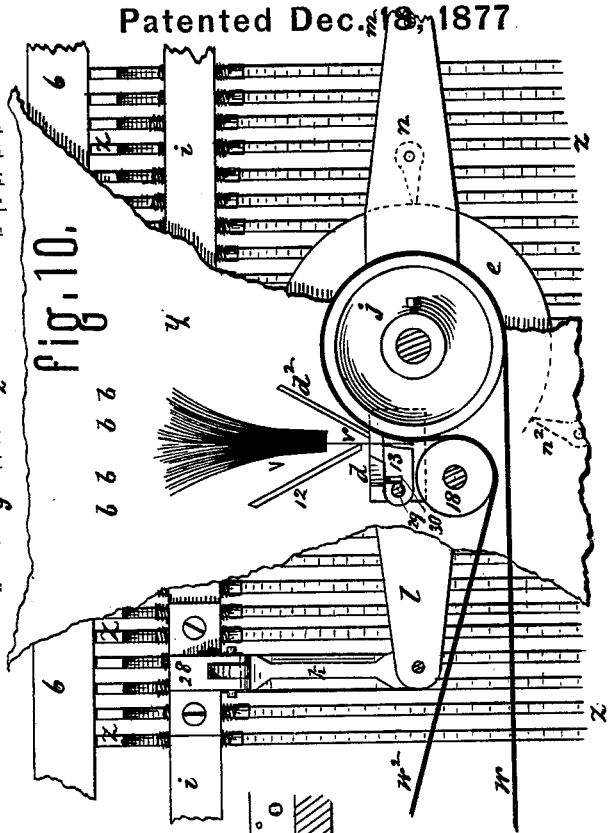


Fig. 5.

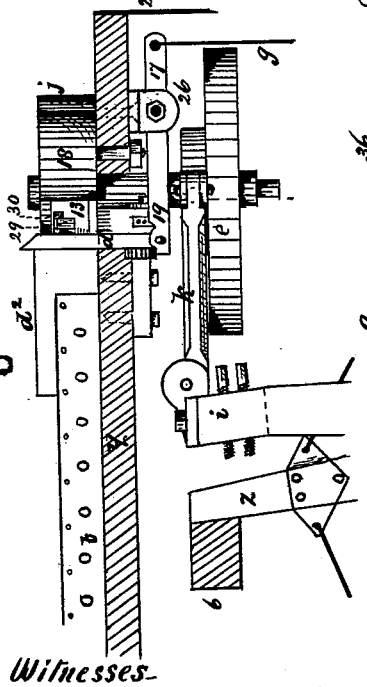
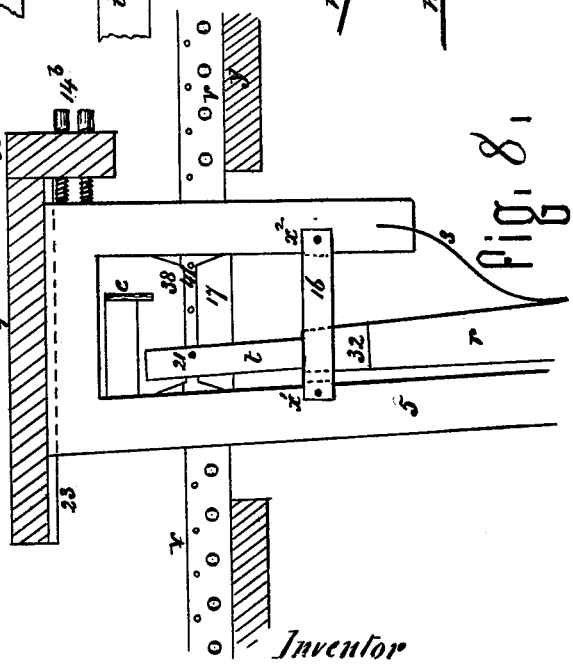


Fig. 8.



Witnesses
John Grieb
Henry Grieb

Inventor
Geo. P. Drummond

UNITED STATES PATENT OFFICE.

GEORGE P. DRUMMOND, OF OTTAWA, ONTARIO, CANADA.

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

Specification forming part of Letters Patent No. **198,238**, dated December 18, 1877; application filed December 27, 1876.

CASE No. 2.

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 and Dominion of Canada, have invented a new and useful Improvement in Mechanism for Employment in the Art of Producing Printing-Surfaces, which is fully set forth in the following specification, reference being had to the accompanying drawings, in all of which like figures or letters of reference indicate like parts.

My invention relates to the production of the various sizes of letter-press, and also displayed and fancy printing, or reading-matter of any printed kind, in large or small lettering, complete and "justified," without the aid of fonts of type or type-setting, and in a more rapid manner than now accomplished by these means to prepare metal or other surfaces or lithographic stones for the press, from which surfaces newspapers, (letter-press or advertisement,) book, and other reading-matter may be printed.

The manner in which this is accomplished is fully set forth and claimed in another application of mine filed cotemporaneously with this, designated as Case 1, and hence need not be described in this, the special construction and arrangement of the mechanism hereinafter described, and its operation in relation to the art named, alone constituting the subject-matter of the present application. In this mechanism is a number of reels containing ribboned paper, each piece of which is printed throughout its extent with some letter of the alphabet, and all in sufficient number and variety to make up any reading-matter which may be required. Each ribbon of paper is operated by its distinctive key, and as each and every letter of any word is required, the corresponding keys depressed in rotation bring forward these letters under a pair of shears, which cuts them off and attaches them in an overlapping order by any adhesive substance to an elastic band. The letters are printed upon the ribbons a short space apart, and when attached to the elastic band the cut-off pieces overlap each other on this space only. The reading-matter attached to this band, as it issues from the composing-machine, is first justified by stretching or straining to suitable lengths of lines, and then removed from the band and deposited, line by line or lines, in succession, on the surface of a sheet of paper by means of a raising and repeating clamping-press, which is to form the subject of another application, and either in this manner or directly from the composing-machine is to be afterward treated, in part or in whole, as shown and described in the application filed cotemporaneously with this, before referred to. The overlapping manner in which the letters are attached to the band readily admits of stretching the band without exposing the open joints.

Referring to the drawings, Figure 1 is a plan view of my improved composing and attaching machine. *a a a* are the fingering-keys. *b b b* are several of the paper-channels, showing the courses by which the paper ribbons are conducted toward the shears *d*. *e* is the feed-wheel. *w* is the elastic band, coated with an adhesive substance. *v v v* are the paper ribbons, printed with the letters of the alphabet, &c., entering the machine from reels placed in convenient positions behind the machine. These paper ribbons pass through the paper-clips *t*, (seen in Fig. 2,) and into the paper-channels *b b b*, only a few of which, to prevent overcrowding in the drawing, are shown. These all end in a point close to the shears *d*. *j* is a wheel, around which the elastic band passes, and which is moved forward by the feed-wheel *e* each time a letter is cut off from the paper ribbons and attached to the elastic band. This feed-wheel *e*, which is underneath the table of the machine, is operated by the key-levers *z z z* striking the cross-bar *i*, which in turn moves the connecting-rod *k*, the lever *l*, and its attached friction-cam or knee-joint *n*. In order to show this machinery more effectually, the table *y* is broken out on both sides of the shears *d*, and the connections between the keys *a a a* and the endings of their levers or arms *z z z* are not drawn. 3 3 3 is a range of

set-screws in the feed cross-bar *i*, for adjusting the various lengths of feed required by each letter. The keys *a a a* are sufficient in number to embrace small letters, capitals, figures, punctuation-points, and various abbreviations necessary for the composition of any reading-matter. The cut-off bar *h*, which underlies all the keys, is attached to the shears *d* by contrivances more fully shown in Figs. 8 and 9, so that any key, in its first stage of depression, brings forward a letter and attaches it to the elastic band, and, further depressed, cuts off that attached letter by striking the cross-bar *h;* and on the back movement of the key—that is, the release of it—the feeding mechanism moves the elastic band ahead to receive the next letter. 4 is the front folding leaf or cover over the fingering-keys.

Fig. 2 is a side elevation of the machine, and shows one of its contained fingering-keys, *a'*, to which are attached the various contrivances, required for carrying forward the paper ribbon. The connecting-wires *o o* join the key-lever *z* with the clip-lever *r*. *v* is the printed paper ribbon, passed through the clip-frame 5, with the pointer 21 of the clip *t* resting through one of the range of holes punched in the paper ribbon. In its forward motion the clip *t* passes under the spring *c;* but in its backward motion it passes over it, which raises the pointer 21 out of the paper and drops it into the next succeeding hole. *h* is the cross-bar underlying all the keys, which is attached to the shears *d* by the connecting-wire *g* and the lever 17, so that a depression on any of the keys first brings forward the paper ribbon, and then cuts off the letter therefrom. *i* is the cross feed bar, which contains the adjusting set-screws 3 3 3, Fig. 1. *k* is the connecting-rod. *e* is the feed-wheel, and *w* is the elastic band. *p* is the cut-off spring, hereinafter explained. 6 is the key-lever back-rest. x^1 x^2 are the clip-lever stops, and 14^a 14^b are ranges of adjusting set-screws for the clip-frames. 22 is the key-lever shaft. *y* is the table of the machine. 8 and 9 are cross-connections in the machine-frame, which have a series of parallel grooves made thereon, into which slide all the paper-clip frames 5. *s* is a spring, to produce the back motion of the levers *r* and the fingering-keys.

When the machine is at rest, the spring *p* bears the middle of the connecting-wire *o o* down toward itself.

Fig. 3 is a front elevation of the shears *d*, looking from the front of the machine.

Fig. 4 shows details, A, B, C, D, and E, of the operation of the paper-clips *t*, attached to the knee-levers *r*, the operation of which, in moving forward the paper ribbons, is hereinafter fully explained.

I will now describe the manner in which the subject-matter is composed and attached to the elastic band *w: v v v v* are printed ribbons entering the machine. The reels containing these are placed at any convenient positions behind the machine. These ribbons are passed under their respective clips *t*, and then through the curved channels *b b*, and up toward the shears *d*, where they come close together, like the leaves of a book.

I would here observe that, to prevent too much crowding in the drawing, only a few of these ribbon-channels are shown; but there is one for each and every key.

Each piece of ribboned paper is printed with some letter of the alphabet, figure, &c., repeated at short intervals throughout its extent, after the manner shown by the letter O, Fig. 5, and contiguous to each letter is a small punched hole, for the purpose of receiving the pointer of the clip *t*. Now, when any letter is required, I depress the key *a'*, Fig. 2, bringing forward the connecting-wire *o*, and moving the clip-lever *r* forward from stop x^1, where it is held by spring *s* till it strikes stop x^2. In doing this the ribboned paper has moved ahead two spaces, and passed one letter between and just beyond the shears. The spring *p* now comes into action, and, although clip-lever *r* has finished its movement, this spring allows the key *a'* to be pressed down farther, this being for the purpose of depressing the bar *h* of the cut-off lever 17, which closes the shears *d*, cuts off the required letter from the ribboned paper, and attaches it to the elastic band *w*. When the letter has been detached, the lever *r* draws back the paper ribbon *v* one space, (one hole,) so that it is clear of the shears, and allows freedom for any of the others to be moved forward. When required again this ribbon *v* is moved, as before, forward two spaces, the letter detached, and it is then moved backward one space. These movements apply to all the ribbons, and are effected in the following manner: As will be seen from the details A, B, C, D, and E, the clip *t* has a twist in its upper extremity, and, in combination with the spring-wire *c*, operates thus: The pointer 21, resting in one of the punched holes, in carrying the paper forward two spaces, passes under the spring *c*, because, as seen in detail B, the clip-twist is lower in front than the spring. The spring under this action is forced out, (see detail C,) but drops back to position behind the clip *t*, when that has brought the paper forward, as seen in detail D. When the clip *t* returns on its backward motion, the spring *c*, being now behind and under, forces the clip *t* outward, raising the pointer 21 out of the hole, as in detail E, thus allowing the paper to remain stationary until the clip passes the spring *c*, when it drops back toward the paper, and its pointer enters the next hole, by means of which it carries back the paper one space, and thus the ribboned paper is carried forward two spaces and back one.

But as each letter is attached to the elastic band, it is necessary to move the band the ex-

act width of that letter. This is accomplished in the following manner: The feed cross-bar *i* (swung from the shaft 22) crosses behind all the key-levers *z*, and, as may be seen in Fig. 1, connects with and operates the feed-wheel *e* by a knee-joint or friction-cam, *n*. This is somewhat similar to the feed mechanism employed in some sewing-machines, excepting that the motion is given to the wheel *e* by the spring *m* on the release or backward movement of the bar *i*. The reason for moving the feed during the back motion of a key is that the letter is cut off and attached at the end of the forward motion, and no feeding could be done until this is accomplished and the length of the feed ascertained by the letter attached.

As will be understood, the feed is required to be longer for an "m" or a "w" than for an "i" or an "l." To regulate this the bar *i* is set-screwed opposite each key-lever, correspondingly to the letter it represents; thus the swing of the bar *i*, and, of course, the feed-crank *l*, is greater for an "m" than for an "i."

I may here state that it is immaterial which way the elastic band feeds—either in the direction of the arrow, or in an opposite direction. In the one case the ribboned paper is inserted underneath the prior cut-off letter, and then detached; in the other case the pieces are overlapped and detached.

Any adhesive substance may be used on the band; or upon the ribboned paper gum may be used, either over the entire surface or on a portion equally contiguous to each letter. A slow-drying adhesive substance is preferable for the elastic band.

The letters upon the keys may be arranged in any convenient manner.

Having now given the general details of the working of the machine, I now add explanations of the enlarged drawings, Figs. 5, 6, 7, and 8, for the better explanation of some contrivances, and more in detail than could be given in Figs 1, 2, and 3. Fig. 5 is an enlarged view of the cut-off and feed mechanism. Fig. 6 is a front view of Fig. 5, and corresponds to Fig. 3. Fig. 7 is a top or plan view, corresponding to Fig. 1, and as in that, so in this, the table is broken to show the mechanism underneath. Fig. 8 is an enlarged view of the upper portion of the clip-frame 5. In Fig. 5, *d* is the shears, d^2 being the other cutter thereof, but also answering, in conjunction with 12, as a guide to conduct the paper ribbons into the opening of the shears *d*. Fig. 13 is the back of the sticking-pad. In Fig. 6 a side view of the sticking-pad 13 is shown, in part, by a double-dotted line, and, as seen, this pad works upon the same center-bearing as the shears *d*, and a spring, 15, is attached to it for the purpose of bringing it forward. In Fig. 7 there is a top view of this sticking-pad, and projecting from it there will be observed a vertical pin, 29, which lies against the horizontal pin 30 attached to the shears *d*, thus keeping back the sticking-pad 13, excepting when the shears close. In Fig. 7 the elastic band enters the machine from w^2, having been previously coated with an adhesive substance, preferably a slow-drying one, as by the admixture of a saccharine substance. The band passes around the guide-wheel 18 and the band-wheel *j*. Now, when a ribboned paper is moved forward, as seen in this figure, two spaces, till it reaches the farther side of the sticking-pad 13, then comes the operation of cutting off the letter. The shears *d* close toward d^2, and are accompanied by the sticking-pad 13, because the latter, being released by the pin 30, is brought forward by the spring 15, Fig. 6. Now the pad strikes the end of the projected ribboned paper and presses it against the adhesive substance on the elastic band *w*, when the shear *d* completes its movement and cuts off the piece, so that the end of the ribboned paper is stuck to the band, and held there until the letter is cut off. Not until the shear *d* returns clear from the cut-off piece does the pin 30 meet the pin 29 and raise the sticking-pad from the band. A reference to Fig. 5 shows how the shears are worked. 17 is a lever, 26 its fulcrum, and 19 is a pin-connection with the shears. The wire *g* is attached to the cross-bar *h*, (seen in Figs. 1 and 2,) underlying all the keys, and when any key is depressed, the wire *g*, being pulled down, raises the shear end of the lever 19, and closes the shears. In Fig. 7 none of the paper-channels are shown, but simply the protruding ends of the paper-ribbons where they come together one space from and in front of the shears *d*. This space refers to those portions of the ribboned paper between the punched holes therein. Figs. 5 and 6, respectively, show the side and front view of the vertical portions of the key-levers *z z z*; but Fig. 7, being a top or plan view, shows, in addition, the horizontal portion of these key-levers, less the keys.

Now, as appears in the three Figs. 5, 6, and 7, opposite the vertical portion of these key-levers is the cross feed bar *i*, having a set-screw opposite each key-lever, for the purpose, as already explained, of determining the length of the feed. Now note that all the key-levers have the same length of stroke; therefore, the farther a set-screw is inserted in the bar *i* up toward any key-lever, the greater movement has the bar *i* forward when that key-lever is struck; and, of course, the less insertion a set-screw has, the less movement is given to the bar *i* when the key-lever opposite this set-screw is struck. On this principle, the setting of every set-screw is regulated to correspond with the length of feed-stroke required by the letter represented on the key-lever opposite. As may be readily understood from Fig. 7, any forward movement produced upon the feed-bar *i* produces a backward movement upon the friction-cam or knee-joint *n*, attached to the lever *l*; but, owing to the setting or inclination of *n* upon the circumference of the feed-wheel *e*, and more particularly the op-

position effected by the second friction-cam or knee-joint n^2, the feed-wheel e is not moved in this backward direction. However, upon the release of the fingering-key, and the consequent freeing of the feed cross-bar i, the spring at m (shown fully in Fig. 1) immediately moves forward the feed-wheel e, because then the setting of the friction-cam n causes it to bind upon the feed-wheel. The band-wheel j is attached to the feed-wheel e, and around the former is the elastic band w.

The friction-cam n^2, of course, does not bind upon the feed-wheel in its movement; but only acts as a check to prevent any back movement. Both cams are held to their places by springs. By these devices, and in the manner explained, is the feeding transmitted to the elastic band during the back motion or release of fingering-keys, which is necessary, as hereinbefore explained, because the paper ribbon is driven forward, attached, and cut off during the forward motion.

To combine lightness in operating the machine, the key-levers $z\ z\ z$, the clip-levers $r\ r$, the cut-off and feed-bars h and i, as also their centered connections, are preferably made of a light tough wood. The setting-screws in the various cross-bars are inserted in a zigzag manner, to combine strength and particularly facility in wrenching them. The elastic band, after the subject-matter has been attached to it, is conducted (as seen in Figs. 1 and 6 more particularly) in the front of the composer or operator upon the machine.

Fig. 8 is an enlarged view of the upper portion of the clip-frame 5, and shows how the ribboned paper is passed into the frame between thin metal folded guides 17 and 38, and the thin metal plate behind, to which they are attached. A horizontal slot, 41, is, however, left, in which reciprocates the pointer 21 in the punched holes of the ribboned paper. In its forward motion the clip t passes under the spring c, but in coming back it passes over it, for the purpose already explained in details A, B, C, D, and E. 23 is a groove into which the frame 5 is slid, and by this contrivance any frame may be readily removed for examination and adjustment without interfering in any way with the other frames. Observe that in Fig. 1 the paper-channels are curved, in order to carry their ribbons up to a central point in front of the shears. This must necessarily result in various lengths of the channels, and therefore this inequality of lengths will bring some of the last letters of the paper ribbons ahead of and some behind the proper point or distance from the shears. In order to secure a proper working of the machine, every last letter must come up to the same point. This is regulated by the ranges of set-screws 14^a and 14^b, Fig. 2, by which the frames 5 are set backward or forward in the grooves until the last letters are brought in line.

As a compensating contrivance for lengthening or shortening the connecting-wire o, Fig. 2, to accommodate the regulation of the clip-frames, immediately before referred to, a number of holes are drilled in the metal ferrule 35, so that the end of the connecting-wire o may be hooked in at the proper length. The punched holes in the strips of ribboned paper are, as may be readily supposed, for the purpose of feeding the paper toward and between the shears with greater exactness and certainty than could be done by simple pressure-clips. Of course notchings in the edge of the paper would answer the same purpose.

The manner of printing and punching, and the machinery for doing it at one operation, I describe and make the subject of a special application.

I may remark here that instead of the elastic band being coated with an adhesive substance, the ribboned paper may be gummed either all over or in part, in conjunction with each letter, and the elastic band wetted.

What I claim in my invention is as follows:

1. The combination of the fingering-keys $a\ a\ a$ with the clip-lever r by the connecting-wire o and with the shears d and pad 13, whereby the letters are cut from the ribbons and attached to the gummed elastic band, substantially as described, and for the purposes specified.

2. The combination of a fingering-key, a', the connecting-wire o, the clip-lever r, and the paper-clip t, substantially as described, and for the object set forth.

3. The combination of the paper-clip t, its pointer 21, and the fixed spring c, substantially as described, and for the purposes set forth and specified.

4. The combination of the converging channels $b\ b\ b$, the shears d, the pad 13, and the elastic band w, substantially as described, and for the purposes set forth.

5. The combination of the fingering-keys $a\ a\ a$ with the spring p, the cut-off cross-bar h, the connecting-wire g, the cut-off lever 17, and the shears d, substantially as described, and for the purposes specified.

6. The combination of the shears d with the sticking-pad 13 and the elastic band, coated with an adhesive substance, substantially as described, and for the purposes specified.

7. The cross feed bar i, having set-screws therein, the connecting-rod k, and the friction-cam or knee-joint n, combined with the feed-wheel e, the band-pulley j, carrying the elastic band w, substantially as described, and for the purposes specified.

8. The fingering-keys $a\ a\ a$ and the attached levers $z\ z\ z$, combined with the cross-feed bar i, graduated for various feeds, substantially as described, and the friction-cams or knee-joints n and n^2, operating on a smooth surface, so as to communicate the various feeds, for the purpose specified, to the elastic band w.

9. The combination of the clip-frames 5 5

with the set of guides 23 and the ranges of set-screws 14^a and 14^b, substantially as described, and for the purposes specified.

10. The combination of the guiding-wheel 18, the elastic band *w*, and the band-wheel *j* with the guides d^2 and 12, substantially as described, and for the purpose specified, of guiding the elastic band and ribboned paper toward one another.

In testimony that I claim the foregoing I have hereunto set my hand this 10th day of November, 1876.

GEORGE PRINGLE DRUMMOND.

Witnesses:
JOHN GRIST,
HENRY GRIST.