(No Model.) 4 Sheets—Sheet 1.

J. H. WHITE.

MACHINE FOR JUSTIFYING MATRIX STRIPS.

No. 311,400. Patented Jan. 27, 1885.

Fig. 1.

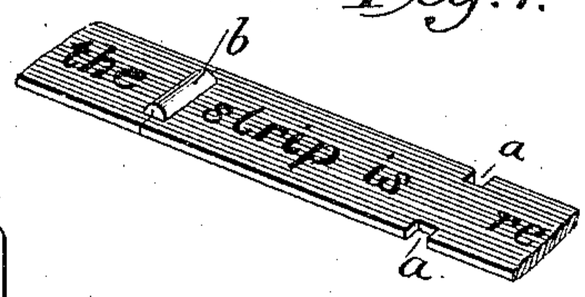

Fig. 2.

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By his attorney

Philip T. Dodge.

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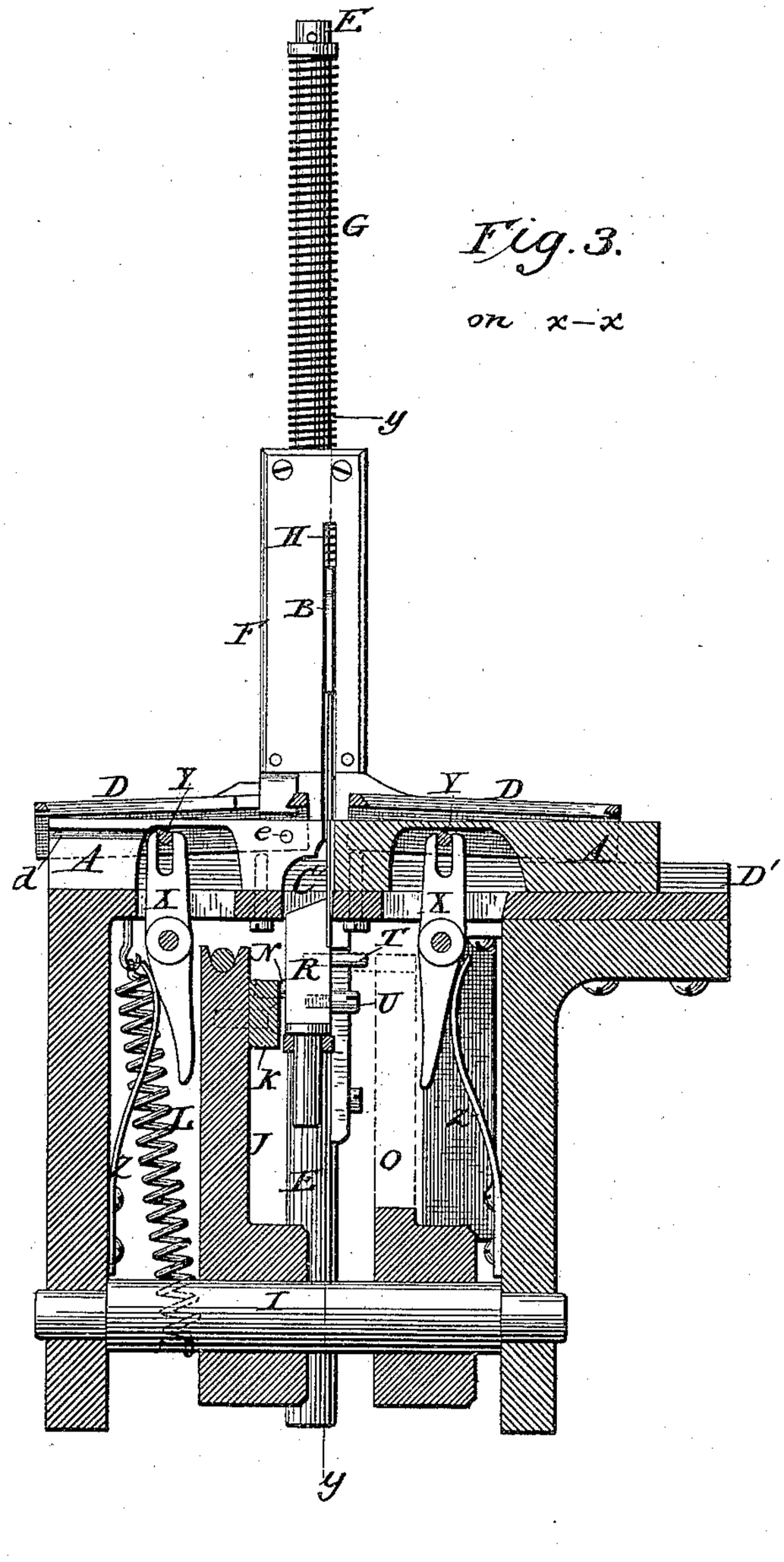

Fig. 3.

on x—x

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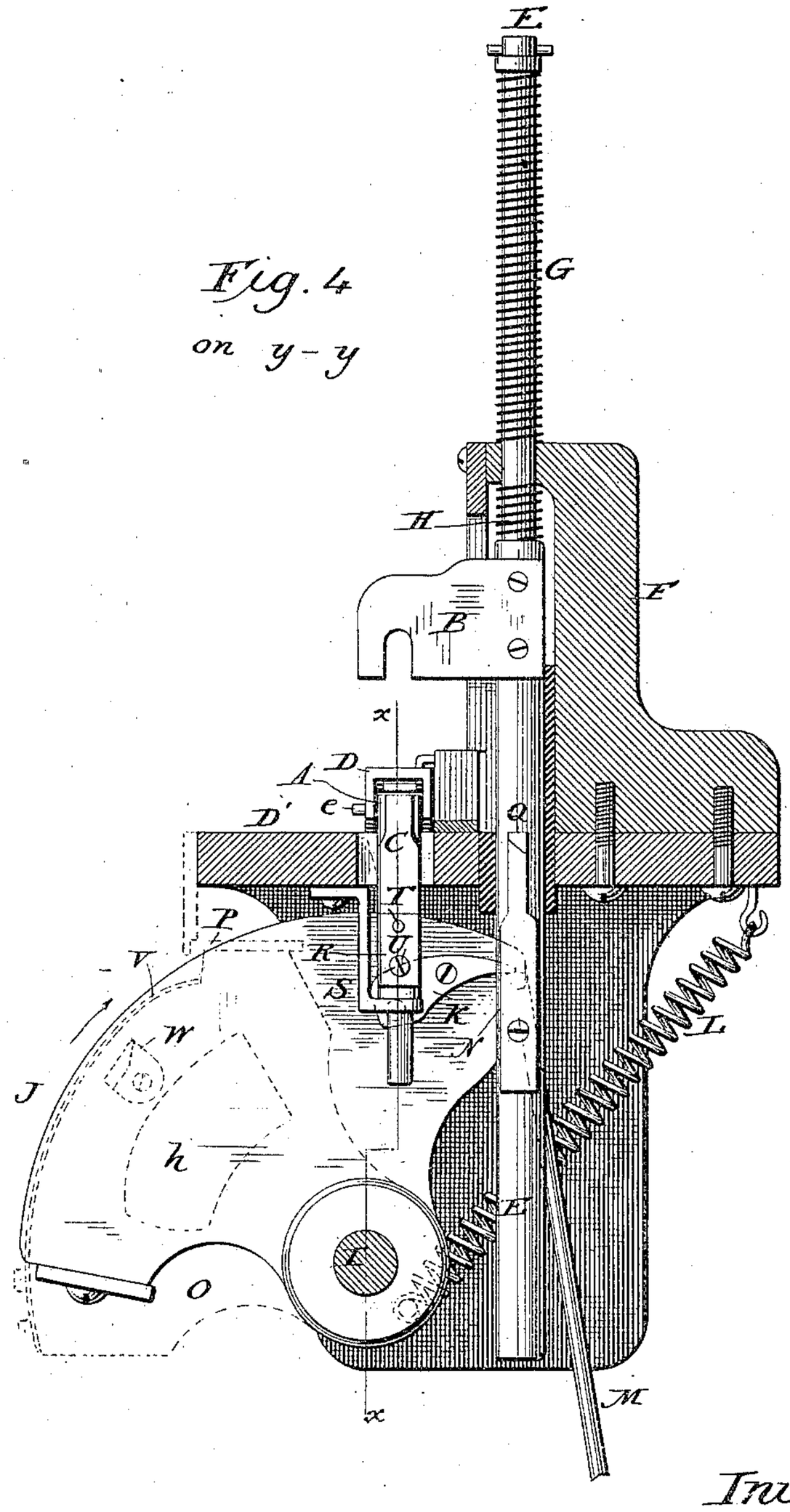
Fig. 4

on y-y



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(No Model.) 4 Sheets—Sheet 4.

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MACHINE FOR JUSTIFYING MATRIX STRIPS.

No. 311,400. Patented Jan. 27, 1885.

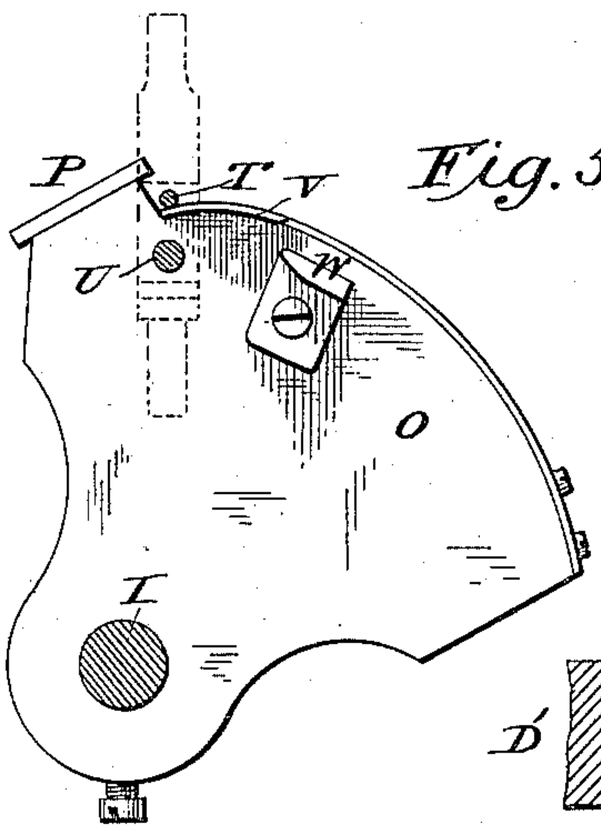


Fig. 5.

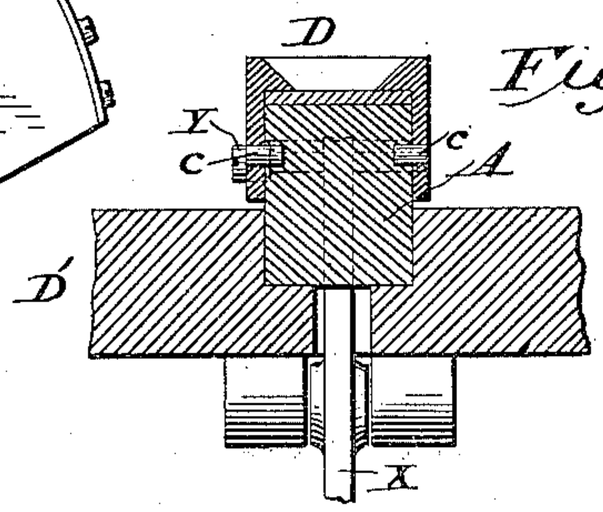


Fig. 10.

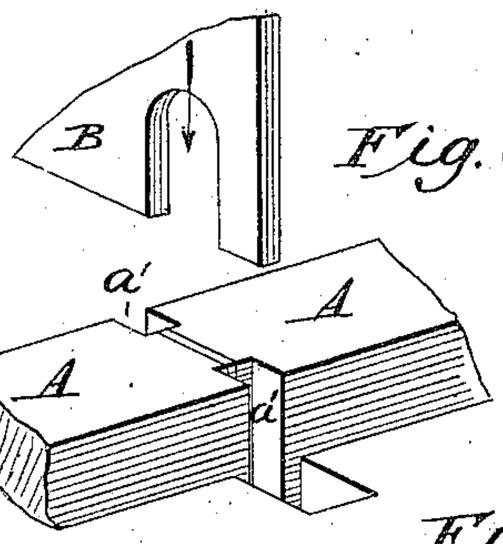


Fig. 6.

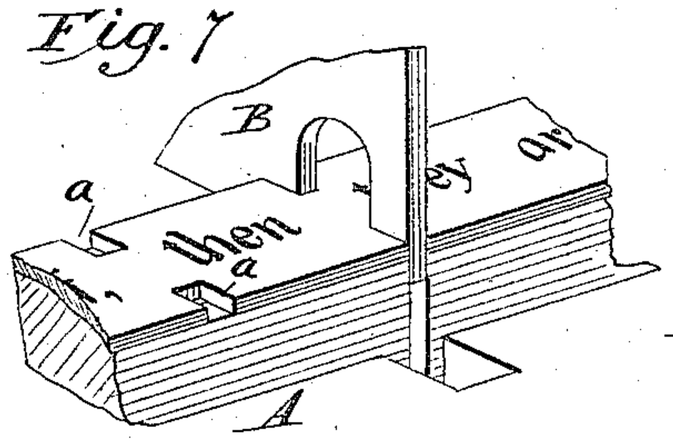


Fig. 7

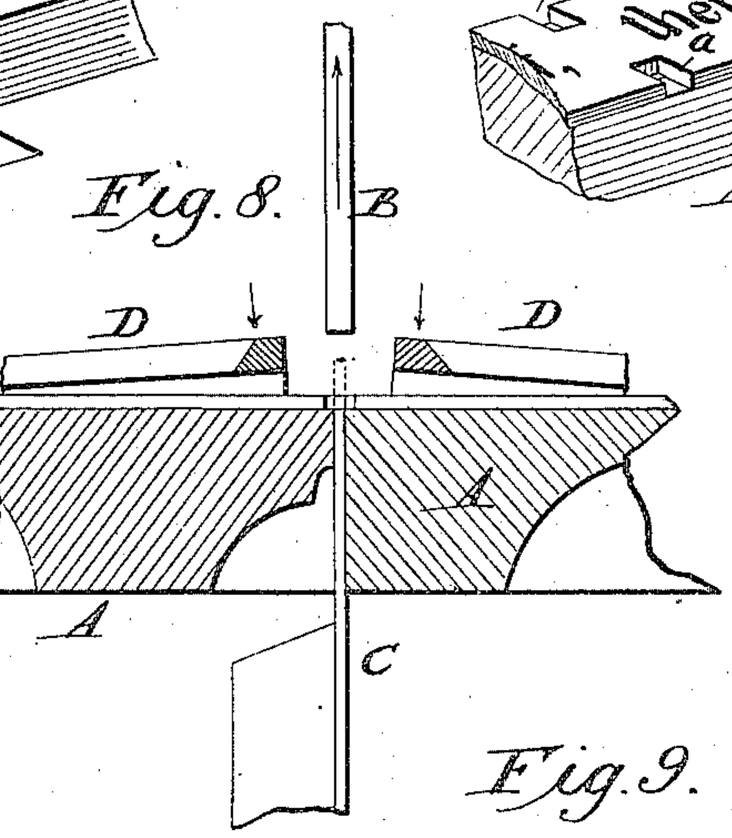


Fig. 8.

Fig. 9.

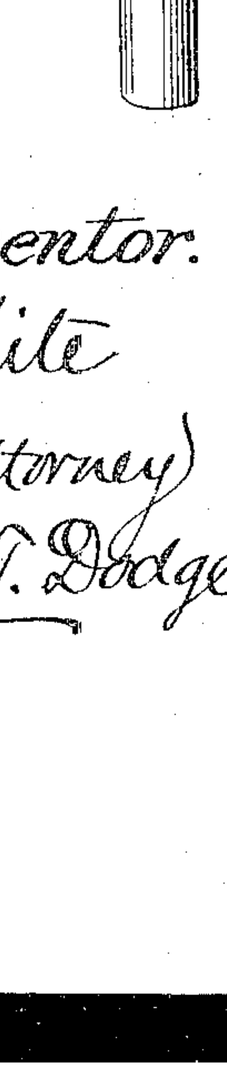
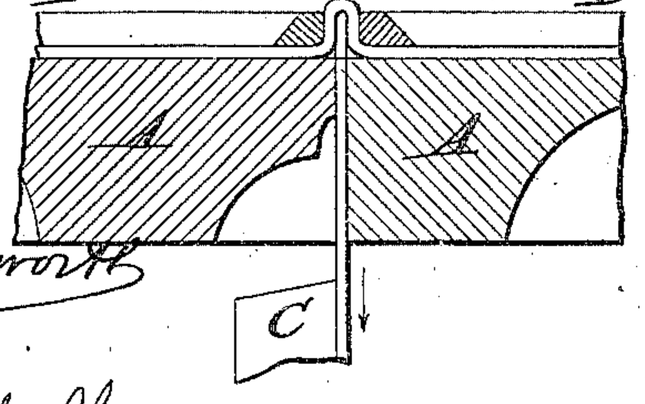


Fig. 11



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Inventor.

J. H. White

By his attorney

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UNITED STATES PATENT OFFICE.

JOHN H. WHITE, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE NATIONAL TYPOGRAPHIC COMPANY, OF WEST VIRGINIA.

MACHINE FOR JUSTIFYING MATRIX-STRIPS.

SPECIFICATION forming part of Letters Patent No. 311,400, dated January 27, 1885.

Application filed March 19, 1883. Renewed November 12, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. WHITE, of Washington, in the District of Columbia, have invented certain Improvements in Machines for Justifying Matrix-Strips, of which the following is a specification.

This invention relates to a machine for justifying that class of matrices for producing printing-bars which consist of a narrow strip of paper or like material having characters indented or impressed in a single line therein.

The present machine is designed as an improvement on the one for which I filed an application for Letters Patent of the United States on the 28th day of February, 1883, and, like the original machine, is designed to incise the edges of the matrix-strip and draw the same together endwise at the point of incision, so as to reduce its length and at the same time produce a rib or elevation thereon.

The improvements consist, more particularly, in the combination, with a fixed notched support, of an incising-knife which acts from above; in the combination, with the above, of a bending device or anvil which acts from below; in the combination, with the support for the matrix-strip, of clamps which engage the matrix thereon and then approach each other to reduce the length of the matrix; in the method of shortening the matrix, consisting in grasping the same on opposite sides of a given point and forcing it together to double or shorten the intermediate portion; in various minor combinations of devices; in peculiar mechanism for operating the knife, the clamps, and the anvil, as hereinafter detailed and claimed.

Referring to the accompanying drawings, Figure 1 is a view of the matrix-strip, showing at different points in its length its appearance before and after justification. Fig. 2 is a perspective view of the operative parts of my improved machine. Fig. 3 is a vertical transverse section of the same on the line *x x*, Fig. 4. Fig. 4 is a vertical section on the line *y y* of Fig. 3. Fig. 5 is a face view of one of the operating-cams. Figs. 6, 7, 8, and 9 are detail views illustrating the forms and various positions of those parts which act directly upon the matrix-strips.

Referring to Fig. 1, it will be seen that the matrix-strip therein represented consists of a narrow strip or ribbon of paper or similar material having letters or characters from which a cast is to be taken impressed or indented therein in a single line. It is the object of this machine to form in the edges of said strip at suitable points incisions *a*, and force the material on opposite sides of said incision together endwise in such manner as to shorten the strip and produce raised ribs or projections *b* thereon, as more fully described in my original application above referred to.

The present machine consists of four leading parts—a flat bed or guide, A, over which the matrix-strip is passed and by which it is supported; a vertically-moving knife, B, designed to incise or nick the edges of the strip; a vertically-moving anvil, C, which rises beneath the strip from the center of the support A, to bow or bend the strip upward at the point of incision, and two vertically and longitudinally moving clamps, D, designed to engage the strip on opposite sides of the anvil and draw its ends together on opposite sides of the point which is elevated by the anvil.

The guide or support A consists of two bars having flat upper surfaces of a width equal to the matrix-strip. The two bars are secured rigidly end to end in line with each other, and have their inner or adjacent ends notched or recessed vertically on opposite sides, as shown at *a'*, Figs. 1 and 6. These recesses correspond in size and form with the incisions or notches which are formed in the edges of the matrix-strip, and are intended to receive the lower cutting end of the incising-knife B, which, descending from above through the matrix-strip upon the supports A, forms the notches or incisions in the two edges of the strip simultaneously, as represented in Fig. 7.

The anvil C consists of a thin blade arranged to slide vertically between the inner ends of the supports A, the width of this blade being equal to that of the reduced or nicked ends of the support, as shown in Fig. 6, in order that the forked end of the incising-knife may embrace or straddle the same in its descent.

The jaws or clamps D consist each of a

plate having substantially a ∩ form in cross-section. They are made of suitable width to cover the top of the matrix-strip, and extend downward past the two edges of the same and past the two edges of the guides A, to which they are loosely connected, as hereinafter described. These clamps are located on opposite sides of the incising-knife and anvil. In operation they are drawn backward from each other, then caused to descend upon and clamp the strip, and finally moved inward toward each other in order to crowd the two ends of the strip toward each other.

The action of the devices is as follows: The incising-knife is first elevated, and the anvil lowered until its upper end is flush with the top of the supports A. The jaws D are also elevated and moved backward from each other, the parts presenting the positions represented in Fig. 8. The matrix-strip is then introduced between the upper surface of the supports A and the under surface of the clamping-jaws D. The knife B descends, as in Fig. 7, and incises the two edges of the strip, and is immediately raised to its original position. The jaws D then descend upon and engage with the strip, and immediately commence a movement inward toward each other. During this movement of the jaws the anvil C is elevated in such manner as to act upon the under side of the strip between the incisions in its two edges and force the same upward between the two ends of the clamps or jaws in the manner indicated in Fig. 9. After thus elevating the strips, and before the jaws have completed their inward movement, the anvil recedes, and the jaws, continuing their motion, close the elevated or folded portions of the strip closely together, the same operation causing the opposite edges of the incisions to meet closely.

Having thus described the leading features and their general mode of operation, I will describe the details of the mechanism by which said parts are supported and operated.

The supporting and guiding surfaces A are secured rigidly in position in or upon a bed-plate, D′, which is preferably grooved to receive them. The incising-knife B is attached at one end to a vertical rod, E, extending through the bed-plate, and guided at its lower end thereby, its upper end being sustained and guided by a bracket or standard, F, bolted firmly to the bed-plate, as shown in Figs. 2 and 4. The knife is guided and prevented from swinging laterally by means of a vertical slot formed in the face of the standard, and through which the knife is extended, as shown in Figs. 2, 3, and 4.

To the upper end of the knife-carrying rod or spindle E, I apply a spiral spring, G, resting at its lower end upon the standard, and acting at the top beneath a collar on the spindle to elevate the knife when it is released. I also apply to the knife-supporting spindle a second spiral spring, H, bearing at its upper end against the under side of the standard F, and at its lower end against a collar upon the spindle. This second spring, which is of comparatively short length, tends to check the ascent of the knife after it has risen some distance above its operative position. The two springs applied as above tend to counteract each other to a limited extent, and the result is that when free from other influences the knife assumes an intermediate position, as shown in Fig. 4, being capable of rising and falling from said position under the action of devices which will be hereinafter described. This application of the springs is made for the purpose of enabling the knife-operating cams, hereinafter described, to act in the proper manner.

For the purpose of depressing the knife, I mount transversely in arms depending from the bed-plate a transverse shaft, I, provided with a sector-plate, J, which plate carries a fixed laterally-projecting cam, K. (Plainly represented in Figs. 3 and 4.) A spiral spring, L, extended from the lower edge of the sector-plate to a fixed connection on the under side of the bed-plate, tends to turn the sector-plate backward to the left and hold the same in the position indicated in Fig. 4. A rod, M, connected to the upper edge of the plate and extended thence downward to a treadle, foot-lever, or other operating devices, serves as a means by which the plate J may be turned forward to carry the cam K past the side of the anvil-bearing spindle E. The spindle is provided on one side with a stud or pin, N, as represented in Figs. 3, 4, and 11, in such position that as the sector-plate J is moved forward in the direction indicated by the arrow in Fig. 4 the cam K will be caused to engage above the stud N and depress the same, thereby forcing downward the spindle E and causing the incising-knife D to act upon the matrix-strip, as before explained. The plate J is moved forward a sufficient distance to carry the cam K past the stud N, thereby releasing the latter, whereupon the spring G, which was compressed by the descent of the knife-supporting spindle, immediately elevates the spindle and knife to their original positions, the stud N being carried upward past the rear end of the cam K, after which the cam-bearing plate J is turned backward to its original position.

Inasmuch as it is necessary to have the stud N stand normally below the point of the cam K preparatory to the action of the latter thereon, it is necessary to have the spindle E, upon which the stud is carried, descend slightly after the cam has moved backward. It is to secure this action that the second spiral spring, H, before alluded to, is applied. The stud having been acted upon by the cam and having been carried upward in rear of the same, as before described, the cam, in passing backward, rides beneath the stud N, which rides over its upper surface. The cam is eccentric upon its upper edge, and in passing backward beneath the stud forces the same, together

with its spindle, slightly upward, thereby compressing the spring H. As soon as the cam has been carried backward clear of the stud N the spring H, reacting, depresses the spindle and stud to their normal position, (represented in Fig. 4,) the stud standing at a suitable point to be engaged beneath the cam as the latter moves forward. It will thus be seen that the stud passes beneath the cam as it moves forward and over the same as it moves backward, that the stud is depressed below its normal position by the forward movement, elevated above its normal position by the backward movement of the cam, and that after the backward movement it again descends to its original position, as shown in Fig. 4. While the spring G serves to sustain the knife in its elevated position, and under ordinary circumstances to elevate the same whenever it is relieved from the depressing action of the cam K, there is a liability of the knife binding in the matrix-strip and failing to ascend under the action of the spring. To remedy this difficulty and to insure the positive elevation of the knife, I mount upon the shaft I a second sector-plate, O, (plainly represented in Figs. 2, 3, and 5 and in dotted lines in Fig. 4,) having on its forward face an inclined surface, P, designed to act against an arm, Q, projecting laterally from the knife, as plainly represented in Figs. 4 and 11. The parts are so adjusted that after the depressing-cam K has ceased its action upon and passed the stud N the incline P rides beneath the arm Q, and thereby forces the knife-bearing spindle upward in a positive manner.

Passing next to the vertically-moving anvil and its connections, it will be seen on reference to Figs. 3 and 4 that the thin blade of the anvil is secured at the lower end to a stop or guide, R, guided at the upper end in an opening in the bed-plate and at its lower end in a depending arm or bracket, S. On one side this stop is provided with two projecting pins or studs, T and U, located one above the other. The upper stud, T, serves as a means of elevating tne anvil, and is acted upon by a spring-cam, V, consisting of an elastic plate secured at one end to the periphery of the sector-plate O, and provided at the opposite free end with a laterally-projecting eccentric lip or portion, as clearly represented in Figs. 4 and 5. This lip stands in such position that as the plate O is turned forward the lip rides beneath the pin T, as represented in Fig. 5, forcing the same upward, and thereby elevating the point of the anvil between and above the paper-supports A in such manner as to bend the matrix-strip upward, as before described, and as represented in Fig. 9.

For the purpose of depressing the anvil after the action of the elevating-cam V, a fixed cam, W, is applied to the said plate O, as represented in Figs. 4 and 5. This cam, located in rear of the cam V, engages the stud U, and thereby depresses the anvil during the forward motion of the plate O. During the backward motion of the plate the rear end of the elevating-cam V yields and rides above the elevating-stud T, and before the completion of the backward movement springs downward to its original position. It will thus be seen that by means of the cams V and W the anvil receives positive upward and downward movements. These cams are so located with reference to the cams by which the incising-knife is operated that the action of the anvil occurs after the elevation of said knife.

Passing next to the clamps or jaws D and the appliances for operating the same, attention is directed particularly to Figs. 2, 3, 4, and 10. Each jaw or clamp is made, as before stated, of a ∩ form. At its rear end it is held and guided by means of studs *c*, passed through its depending jaws and seated loosely in longitudinal grooves *d* in the sides of the stationary paper-support A, this connection permitting the clamp to slide endwise upon the paper-support and also to rise and fall at the inner or forward end. The plates are caused to rise and fall at the free end, and are held down upon the matrix-strip during the forward motion by means of studs *e*, secured to the paper-support A, and extending outward through slots *f*, formed in the depending sides of the clamps. These slots *f* have their outer or rear ends extended horizontally and their forward ends inclined downward and forward, as represented in Fig. 2. The result is that when the clamps are in their outward position the studs *e* rest in the lower ends of the slots *f*, holding the clamps in an elevated position, as represented in Fig. 2. On moving the clamps forward the inclination of the slots causes the clamps to be depressed in such manner as to engage firmly on the upper sides of the matrix-strip, after which the studs, passing into the horizontal portions of the slots *f*, retain the clamps in their depressed position as they move forward toward each other, thus causing them to engage the matrix firmly on opposite sides of the anvil and crowd the two ends or portions positively toward each other as the intermediate portion is elevated by the action of the anvil. The longitudinal motion of the clamps V is secured by means of two vertical levers, X, which are mounted on horizontal axes below the bed-plate and extended upward through the same, their upper ends being forked and arranged with transverse pins Y in the under side of the respective clamps, as shown in Fig. 3. The pins Y pass transversely and loosely through slots or openings in the under side of the paper-supports A, as shown in Fig. 3. thus serving the additional purpose of limiting the upward motion of the clamps. Springs Z, secured firmly to the shaft-supporting arms, act at their upper ends to force the lower ends of the levers X inward, as represented in Fig. 3. The result of this action is that the clamps D are held in their outer elevated positions when released.

For the purpose of operating the levers X,

and thereby forcing the two clamps downward and inward simultaneously, the sector-plates J and O, before referred to, are provided each on its side faces with a cam-surface, *h*, these cams being arranged to operate upon the respective levers X, so that as the plates are turned forward the cams will force the lower ends of the levers outward, and thereby cause the jaws to move downward and inward, as before explained. The location of the cams *h* is such that they operate to move the jaws after the action of the incising-knife and during the descent of the anvil C, their action continuing after the anvil has been depressed, in order to effectually close the folded or elevated portion of the matrix-strip.

From the foregoing description it will be seen that the incising-knife, the anvil, and the clamps are all operated by means of the cams applied to the two sector-plates J and O.

While it is preferred to retain the details of construction herein described, it is manifest that the mechanism for imparting motion to the knife, anvil, and clamps may be modified in various details which will suggest themselves to the skilled mechanic without departing from the limits of my invention.

While it will be necessary in most cases to incise or notch the edges of the matrix-strip, as herein described and illustrated, the incisions may be in special cases omitted and the strip shortened by folding the same upward and drawing the same together on opposite sides of the folded portion. In such case the incising-knife may be omitted and the anvil or bending device used in combination with the movable jaws or clamps.

I do not claim, broadly, herein the method of justifying a matrix-strip by causing its two ends to approach each other in the manner set forth in the application filed by me on the 23d day of February, 1883, No. 85,937. The method of justifying herein described differs from that in the application named, in that under the former method strips were shortened by bending or raising them upward at intermediate points in their length, thereby drawing the two ends together, while in the present instance the strip, grasped at two points, is forced together from opposite directions, thereby causing the intermediate portion to be raised or upset.

I do not claim in this application any features which are described or shown in the prior application above named.

I do not claim herein the matrix-strip having the characters therein as shown, the same being claimed in another application numbered 93,064.

Having thus described my invention, what I claim is—

1. In a machine for justifying strip-matrices, the fixed support having notches in opposite sides, combined with a forked incising-knife acting from above, substantially as described.

2. In combination with the fixed matrix-support, clamping or holding device, the incising-knife acting from above, and the anvil or bending device acting from below.

3. In a justifying-machine, the combination of a stationary bed or support having notches in its opposite edges, clamping or holding devices, and an anvil or bending device arranged to ascend through the support between the notches, substantially as described, whereby the bending and shortening of the previously-incised strip are effected.

4. In combination with a matrix-support, the jaws or clamps adapted, as described, to engage with the matrix and move toward each other for the purpose of folding or doubling said matrix at the intermediate point.

5. In combination with the matrix-support, a movable anvil acting to bend the matrix, and movable clamping devices acting to force the two ends of the matrix toward each other from opposite sides of the anvil.

6. The combination of the matrix-support, the knife and the anvil acting from opposite directions, and the clamps or jaws acting to force the two ends of the matrix toward each other.

7. In a machine for justifying matrix-strips, the combination of two jaws or clamps to engage said strip, and mechanism, substantially as described, whereby said jaws are caused to recede, engage the strip, and finally move toward each other while in engagement therewith, whereby that portion of the strip between the clamps is folded or shortened.

8. The method of shortening or justifying matrix-strips in line form, the same consisting in engaging the strips on opposite sides of a given point and urging the two ends forcibly together, whereby the intermediate portion is doubled or shortened.

9. The combination of the matrix-support, the incising-knife and the anvil acting in opposite directions, the two clamps, and mechanism, substantially as described, for operating said knife, anvil, and clamps in the order named.

10. In combination with the incising-knife, the operating-cam K, and the two springs G and H.

11. In combination with the incising-knife and its spindle, the depressing-cam K and the elevating-cam P.

12. In a justifying-machine, the combination, with a matrix-holding mechanism, of the anvil or bending device C and the actuating-cam V, substantially as described.

13. In combination with the movable anvil, the elevating-cam V and depressing-cam W, arranged to act successively and alternately, as described.

14. In combination with the matrix-support, the vertically and horizontally moving jaws D, levers X, and the cams and springs for imparting motion to said levers.

15. In combination with the matrix-support, the longitudinally and vertically mova-

ble clamp connected thereto by means of the pins and curved slots, substantially as described.

16. In combination with the matrix-support, the movable jaws or clamps D, provided with slots or openings in their upper sides for the purpose of exposing the letters or characters of the matrix.

17. In combination with the incising-knife, the anvil, and the movable jaws, the single shaft I, provided with cams for imparting motion to said parts, substantially as described and shown.

18. In combination with the matrix-support A, the paper-clamps of substantially a ∩ form in cross-section, and means, substantially as described, whereby said clamps are caused to move vertically and longitudinally.

19. In combination with the matrix-support having longitudinal grooves in its side faces, the substantially ∩-shaped clamps D, connected at their outer ends with said grooves and connected at their forward ends with the support by means of pins, and curved slots, as described, whereby the clamps are caused to descend during the forward movement, and vice versa.

20. In combination with the matrix-support and the longitudinally-sliding clamps, the transverse pins Y and operating-lever X, as described and shown.

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