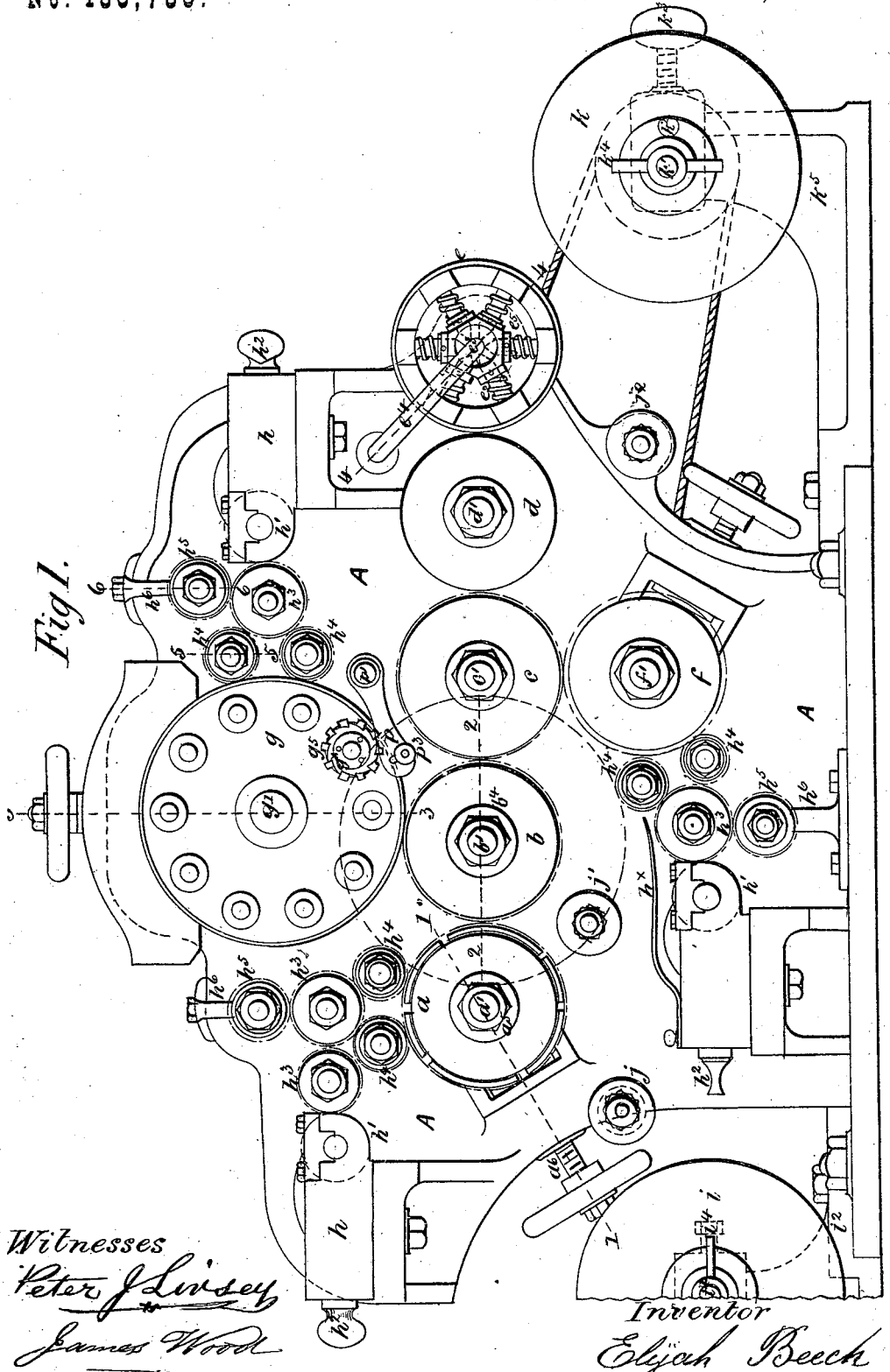
4 Sheets—Sheet 1.

E. BEECH.

PRINTING-PRESS.

No. 186,786. Patented Jan. 30, 1877.

Fig. 1.



Witnesses
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James Wood

Inventor
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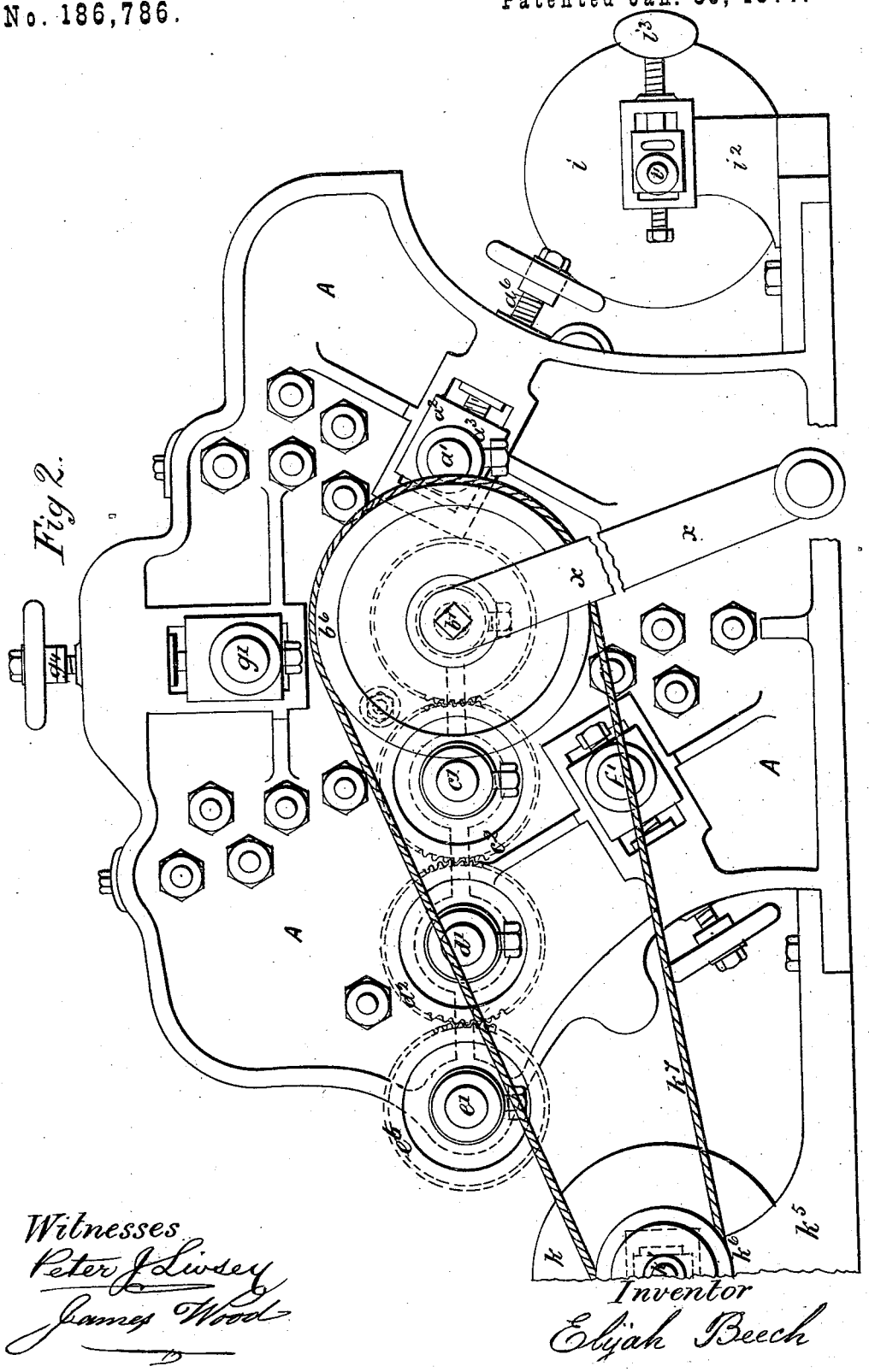
PRINTING-PRESS.

No. 186,786. Patented Jan. 30, 1877.

Fig 2.



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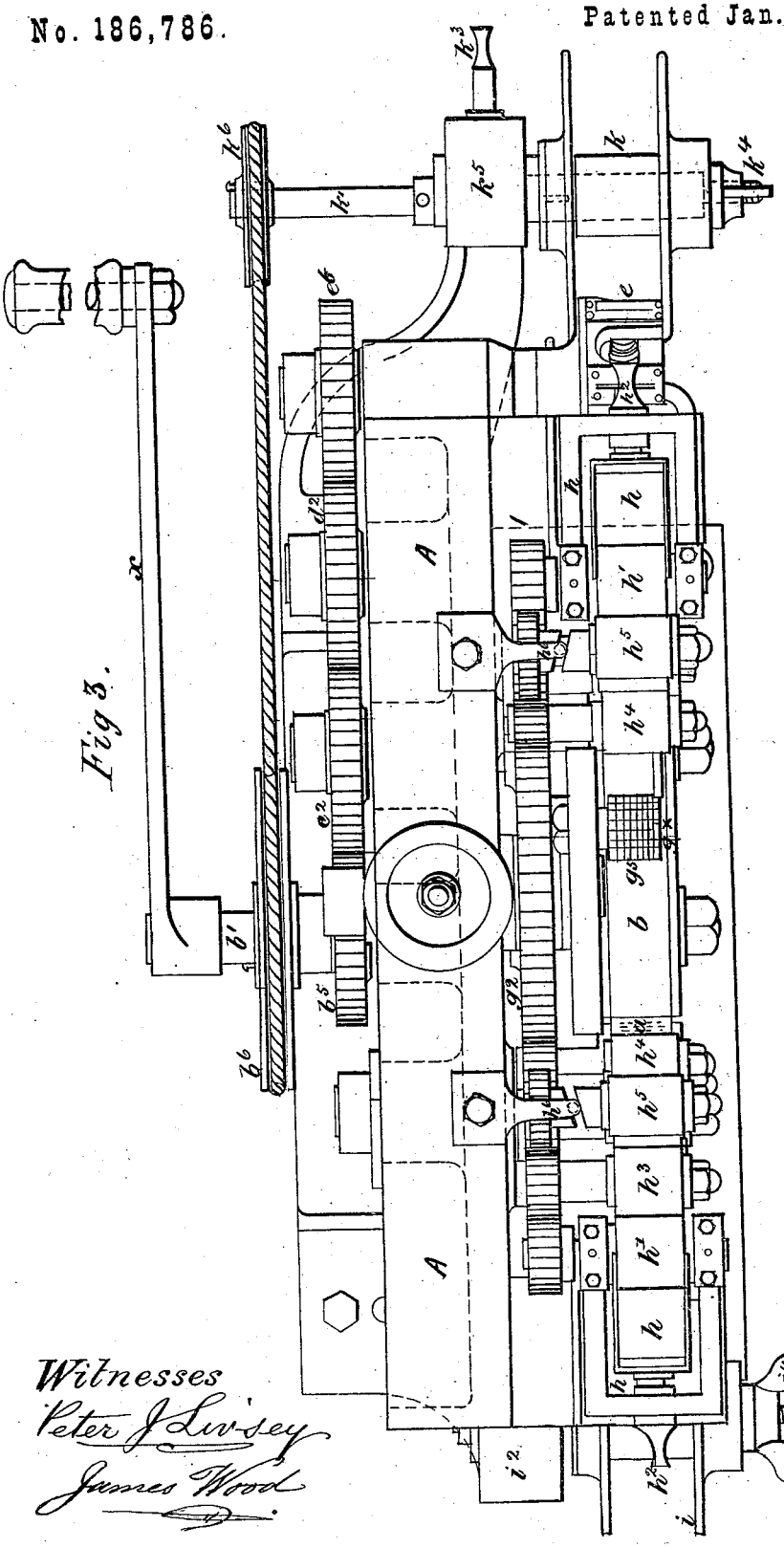

Fig 3.

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No. 186,786. Patented Jan. 30, 1377.

Fig 9.

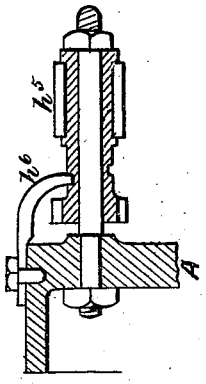


Fig 8.

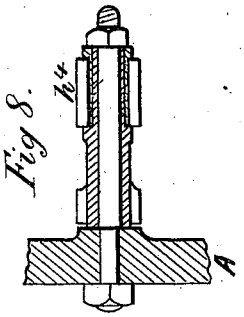


Fig 5.

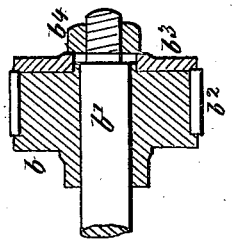


Fig 7.

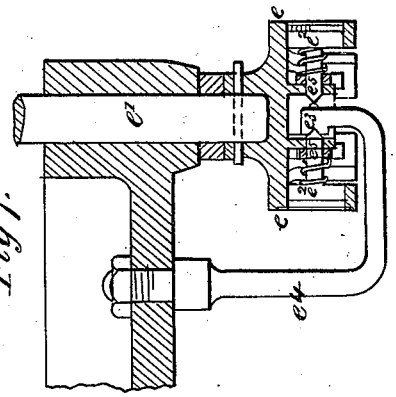


Fig 4.

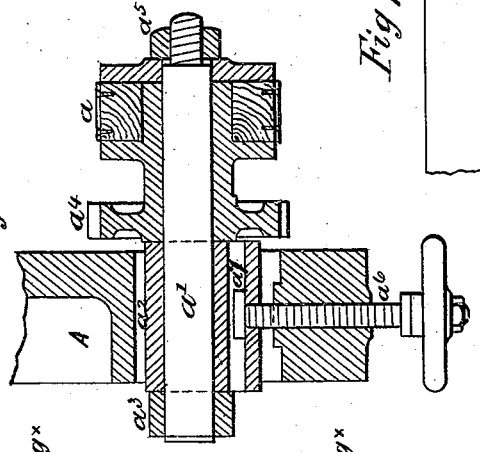


Fig 6.

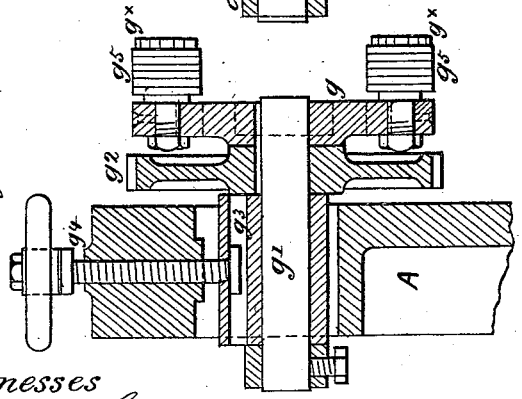
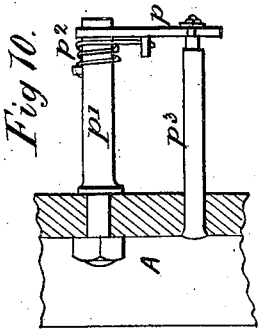


Fig 10.



Witnesses

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James Wood

Inventor

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UNITED STATES PATENT OFFICE.

ELIJAH BEECH, OF MANCHESTER, GREAT BRITAIN.

IMPROVEMENT IN PRINTING-PRESSES.

Specification forming part of Letters Patent No. 186,786, dated January 30, 1877; application filed April 4, 1876.

To all whom it may concern:

Be it known that I, ELIJAH BEECH, of the city of Manchester, in the county of Lancaster and Kingdom of Great Britain and Ireland, have invented an Improvement in Machines for Printing, Numbering Consecutively, and Perforating, of which the following is a specification:

My invention has for its object machinery whereby subject-matter and progressive numbers may be continuously printed upon rolls or strips of paper, card, or other suitable material, which may be also perforated or divided by the machinery into suitable lengths for checks or other documents.

I am aware that machinery for this purpose was described in the specification of British Letters Patent granted to Simeon Sampson, dated the 25th day of March, A. D. 1873, and No. 1,097.

My invention, however, consists, principally, in two or more sets of numerical disks or rings mounted on the side of a revolving face-plate, with the axis of each set parallel to that of the face-plate; secondly, in the combination, with such face-plate, of the type, impression, and perforating drums all geared together; and, further, in the combination of such face-plate mounted in sliding bearings; the type-drums also mounted in sliding bearings, and the impression and perforating drums for the front impression of subject-matter or type. The first and second impression-cylinders, the perforating-cylinder, and perforators, are all placed with their axes in the same horizontal plane as hitherto proposed; but the face-plate wheel or disk carrying the numbering-disks is placed over the first impression-cylinder, and the drum for the subject-matter or type for the back impression under the second impression-cylinder, instead of vice versa, as hitherto proposed. The drum from which the unprinted strip is drawn, and that upon which the printed and numbered strip is rolled, are placed, the former on one side, the latter on the other side, of the machine below, instead of above, the level of the axis of the first-named drums and cylinders, as hitherto proposed, and rotate upon studs fixed in brackets secured to the frame of the machine.

The strip or roll of material to be printed and numbered upon passes from the drum over one and under another guide-roller, under and between the first subject-matter drum and the first impression-cylinder, then over the latter, and between it and the numbering mechanism; then between the first and second impression-cylinders, and under the latter, and between it and the second subject-matter cylinder; then between the second impression-cylinder and the perforating-cylinder, over the latter, and between it and the perforator, under the latter, to the drum, upon which the printed strip of paper is wound. The two subject-matter or type drums and the numbering mechanism have separate inking arrangements formed by a roller working in contact with the ink in the trough, a second roller working in contact with the latter, and the two other rollers, which work in contact with the second roller and with the type, there being also a roller having end motion, to distribute the ink working in contact with the second roller. Each set of inking-rollers is geared together, and with the type-drum which they have to ink.

The shafts of the numbering mechanism and subject-matter drums are arranged in slides, and have screws for adjusting them in relation to the impression-cylinders. The numbering mechanism is formed by ten sets of numbering-disks, arranged in a circle. Each set of disks is placed on a stud forming its axis, which is secured on a disk or face-plate, the axis of each set of disks being parallel to the axis upon which the face-plate rotates, and not at a right angle thereto, as hitherto proposed. Each set of disks is actuated to change its number once for each revolution of the face-plate by a pawl, similar to that used for ordinary paging, fixed on a stud in the framing, and, as the face-plate rotates, the ratchet-wheel of each set of disks, in passing, comes in contact with the said pawl, and this causes the ratchet-wheel to move one tooth, this motion being communicated to the numbering-disks in the ordinary manner.

The arrangement of the figures of the numbering-disks is as follows: When making single impressions—that is, one impression of each number—I make the ten figures of the

units-disk of the first set of disks all of the figure 1, and the ten figures of the units-disk of the second set of the figure 2, and so on; the ten figures of the units-disk of the tenth set of disks all of the figure 0. When so made, the units-disk is secured to the tens-disk, which moves with it and with the ratchet-wheel. All the disks of each set of disks, except the units, are figured in the ordinary manner. For printing duplicate numbers—that is, two impressions in succession of the same number—the units-disks of the ten sets of numbering-disks have each ten figures arranged as follows: For the first and second sets the figures 1 and 6, alternately; for the third and fourth sets the figures 2 and 7, alternately; for the fifth and sixth sets the figures 3 and 8, alternately; for the seventh and eighth sets the figures 4 and 9, alternately; and for the ninth and tenth sets the figures 5 and 0, alternately.

The disks of each set, except the units-disk, are numbered in the ordinary manner. The units-disk is geared or arranged to move the tens-disk at each alternate figure or movement of the units-disk—that is, when the figures 5, 6, 7, 8, and 9 upon the units-disk have printed, and the next movement of the units-disks takes place, they carry forward the tens-disks one figure.

For printing numbers in triplicate—that is, repeating the same number three times in succession—I employ fifteen sets of disks, carried upon the plate or wheel, with the figures on each units-disk arranged as if for duplicate numbering, viz., the first, second, and third sets of disks with the figures of the units-disk engraved with the figures 1 and 6, alternately, and the fourth, fifth, and sixth sets of disks with the figures 2 and 7, alternately, and so on, there being three sets of disks in succession with the figures engraved in the same order, instead of two sets, as for duplicate printing.

I also number consecutively by placing on the plate or wheel five sets of disks, with the figures of the units-disks engraved as for duplicate numbering, namely, with the first, third, fifth, seventh, and ninth of the ten sets of disks above mentioned as used for duplicate numbering.

I also number in duplicate or triplicate, and so on, by fixing upon the plate or wheel carrying the disks two sets for duplicate or three sets of disks for triplicate numbering, and so on, for other repetitions of the same number. The sets of disks last named have their figures arranged the same as for ordinary consecutive numbering.

I also accomplish triplicate numbering by three, six, or nine sets of disks carried round upon a face-plate, drum, or wheel, with the units-disks figured as follows: With three sets of disks the figures are as for ordinary consecutive printing; when six sets of disks are used the units-disks (having ten figures each) of the first, second, and third sets of disks are figured 1 3 5 7 9 1 3 5 7 9, and the fourth, fifth, and sixth sets of disks are figured 2 4 6 8 0 2 4 6 8 0. The units-disk moves the tens after printing the figure 9 in first, second, and third sets, and after figure 8 in the fourth, fifth, and sixth sets, of disks. When nine sets of disks are used on a face-plate or wheel for triplicate numbering, the units-disk of each set has ten figures, as follows: 1 4 7 0 3 6 9 2 5 8, and the tens-disk is moved the first movement after printing the figures 7, 8, and 9, and in commencing to number the first three sets of disks are set at the figure 1, the second three sets of disks are set at the figure 2, and the third three sets of disks are set at the figure 3.

I also accomplish triplicate numbering by ten sets of disks placed upon a drum or face-plate, the units-disk having three, six, nine, or twelve figures upon it, (repeated, if more than three figures,) in the following order, viz: The units for the first set, 1 4 7; for the second set, 1 4 8; third set, 1 5 8; fourth set, 2 5 8; fifth set, 2 5 9; sixth set, 2 6 9; seventh set, 3 6 9; eighth set, 3 6 0; ninth set, 3 7 0; and tenth set, 4 7 0. The units-disk moves the tens-disk at the first movement after printing the figures named as follows, viz: In the first, ninth, and tenth sets of disks at the figure 7; in the second, third, and fourth, at the figure 8; in the fifth, sixth, and seventh, at the figure 9; and in the eighth set of disks, at the figure 6.

Figure 1 is a front elevation, Fig. 2 a back elevation, and Fig. 3 a plan view, of the machine. The remaining figures of the drawings show more clearly the construction of the details, and will be referred to in course of the following explanation.

The machine illustrated by the drawings is intended to operate upon narrow strips or webs of paper or other material; but it is obvious that machines may be constructed to operate upon wide webs of paper or other material upon the same principle, and instead of the shafts being carried on one side frame only, as illustrated by the drawings, two side frames may be used, one upon each side of the operating parts, suitable bearings being formed for such shaft in both side frames, especially when the machine is intended to operate upon wide webs of material.

A is the side frame or plate upon which the mechanism and operating parts are mounted. *a* is the drum upon which the type or stereotype or subject-matter for the front impression is mounted. *b* and *c* are the first and second impression-drums, covered with blanket, india-rubber, or other suitable material, as understood, and *d* is an intermediate drum, covered with india-rubber or other elastic material, for the perforating-drum *e* to act against. *f* is the drum for the type, stereotype, or subject-matter for the back impression; and this drum acts against the second impression-cylinder *c*.

g is the face-plate, which carries the sets of disks that imprint the numbers in passing the front impression-cylinder b.

The two subject-matter drums, a and f, are each mounted in a bearing, which is arranged to slide in the frame, and to be adjusted by a screw. The arrangement of such slide, screw, and drum in each case is illustrated in refer ence to the drum a by Fig. 4, which is a detached section on the line 1 1, Fig. 1, where A is part of the frame. a^2 is a slide fitted in a slot in the frame.

In the slide a hole is formed as a bearing for the shaft a^1, which has a collar, a^3, at that end of the shaft at the back, and the drum a and its connected driving-wheel a^4 are secured on the shaft by a key, and the wood (to which the stereotype is secured by screws) is secured to the drum by a washer and a screw, a^5, at the front end of the shaft a^1.

The adjusting-screw a^6 screws through the frame part A, and its end passes into a hole in the slide a^2, and has a collar, a^7, fixed to it, as shown.

Fig. 5 is a section upon the line 2 2, Fig. 1, showing the construction and mode of securing the impression-drums b and c and the drum d to their respective shafts, illustrated in reference to the drum b. b^1 is the shaft to which the drum is keyed, and b^2 is the elastic material secured by a washer, b^3, in front by the screw b^4 at the front end of the shaft b^1. The shafts for the drums b, c, d, and e work in fixed bearings in the frame A.

Fig. 6 is a detached section on the line 3 3, Fig. 1, showing the mode of mounting the face-plate g for the numbering-disks, and its driving-wheel g^2 upon the shaft g^1. The face-plate g and wheel are keyed upon the front end of the shaft g^1, which is mounted in a sliding bearing, g^3, adjusted by a screw, g^4, arranged, as described, in reference to Fig. 4.

The perforating-drum e is secured by a pin or key upon the end of a shaft, e^1, as shown by Fig. 7, (a section on line 4 4, Fig. 1,) the shaft e^1, working in a stationary bearing in the frame-plate A.

The machine may be driven by a handle, x, as shown in Figs. 2 and 3, or by a belt working in the ordinary manner upon fast and loose pulleys upon the shaft b^1, when the machine is to be driven by steam or other power.

The shaft c^1, d^1, and e^1 of the drums c, d, and e are all in gear with each other and with a wheel, b^5, on the shaft b^1 of the drum b, these wheels c^2, d^2, and e^6 being at the back of the frame-plate A, as shown.

The subject-matter drums a and f, and the face-place g, are geared together by wheels on the shafts a^1, f^1, and g^1 in front of the frame-plate A. A wheel on the shaft b^1 of the drum b gears with a wheel on the shaft a^1 of the drum c also, with a wheel on the shaft g^1 for the face-plate g, and may also gear with a wheel on the shaft c^1 of the drum c, which latter wheel gears with a wheel on the shaft [illegible] upon or connected with the drum f.

The two subject-matter drums a and f, and the figures of the numbering-disks, are each inked by a similar arrangement of rollers, except that the apparatus for the front subject-matter cylinder has an additional transmitting-roller. The construction and mode of mounting and driving the inking-rollers is illustrated by reference to Fig. 8, a detached section in the line 5 5, Fig. 1.

The inking-roller h^4 is secured upon the long boss of the wheel, which rotates upon a stud secured in the frame-plate. One of the inking-rollers, h^5, of each set is constructed as shown by Fig. 9, a detached section upon the line 6 6, Fig. 1. In the boss of this wheel or roller there is a cam-slot, in which the end of a pin, h^6, enters, that is secured to the frame, so that as the roller revolves it is moved to and fro endwise at the same time, to distribute the ink laterally.

Each set of inking apparatus consists of a cistern, h, for ink, in which a roller, h^1, rotates, so as to take the ink upon its surface, the thickness of the layer of ink taken by the surface of the roller being regulated by a bar, which passes the lengthway of the roller, and can be brought close to its periphery, the distance of the bar from the surface of the roller, and thus the depth of the layer of ink being regulated by the screw h^2.

The roller or rollers h^3 are carrying and distributing rollers, and the rollers h^4 come in contact with the type. The roller h^5 is the lateral distributing-roller, and h^6 is the pin which enters its cam-slot. The inking-rollers gear with each other and with the wheel upon the drum carrying type to be inked.

The inking-cistern for the back impression-cylinder has a thin metal cover, $h^\times$, over it, as shown, to protect the web of paper or material operated upon from being smeared by accident and matter from the passing web from falling into the ink.

Each set of the numerical disks g^5 is constructed in a manner similar to those of the ordinary paging-machine, and they are each mounted upon a stud which is secured into the face-plate g, as shown in Figs. 1, 3, and 6. As illustrated by the drawings, there are supposed to be six rings or disks for figures, which will number from 1 to 999,999, but any required number of rings or disks may be employed. The ratchet for actuating the rings or disks is secured to the outer disk or ring in front.

When ten sets of disks are used for consecutive numbering I make the ten figures of the units-disk of each set all of the same figure, such figure being 1 in the first set, 2 in the second set, and so on, the tenth set being 0. When the figures are thus arranged the ratchet and the units and tens ring or disk are secured and move together.

The various modes for engraving the figures for consecutive duplicate and triplicate numbering, and so on, have been hereinbefore described under the second head of my inven-

tion. The ten figures are engraved upon the edge of each ring, a line passing from top to bottom of the figures being at a right angle to the axis upon which the rings revolve, and the axis of each set of rings or disks is parallel to the axis of the face-plate g, which carries them round. The ratchet-wheel $g^{\times}$ of each set of rings or disks has ten teeth, and is actuated to be moved one tooth at each revolution of the face-plate g, by a pawl, p, which is shown detached by Fig. 10. p^1 is a stud secured in the frame-plate A, and the pawl p is placed to oscillate upon the end of this stud, and is forced toward the teeth of the ratchet by a spring, p^2, one end of which is secured to the stud p^1, and coils round it, the other end acting upon a projection from the pawl p. The movements of the pawl are limited by a stud, p^3, secured on the frame-plate A, the end of which passes through a slot in the pawl, as shown. The web of paper or material to be operated upon is wound upon a drum, i, placed upon a shaft, i^1, in a bearing carried by a bracket, i^2, secured to the frame-plate A, and friction to resist the unwinding of the roll to give the required tension to the web is regulated by the screw-nut i^3, the end of which screws against the shaft, or a clip on the shaft i^1.

The flanges of the drum are separate, and are screwed together by the wing-nut i^4. The web, on leaving the drum i, passes over the roller j placed on a stud in the frame-plate, under a similar roller, j^1, between the drums a and b, where the front impression of subject-matter is given over the drum b and between it and the sets of numbering disks or rings on g, where the numbers are impressed, then under the drum c, and between it and the drum f, where the subject-matter is impressed on the back, over the drum d and between it and the perforating-drum e, which carries T-pieces e^2, having rows of points, these T-pieces being forced outward by the cam e^3, formed on the end of a bent stud, e^4, coming into the center of the drum e, the bent stud being secured in the frame-plate A, as shown in Fig. 7, the springs e^5 upon the stem of each T-piece withdrawing the points from the web (the shape of the cam allowing this) after each row of perforations have been made. The printed, numbered, and perforated web passes under the roller j^2 and onto the drum k. The end of the web is first secured to the drum k by being passed round a pin, k^2, which passes through the boss of the front flange of the drum and across its width. The flange of one side of the drum is formed with a boss, and is separated from the other flange of the drum, to which it is secured by a wing screw-nut, k^4, upon the end of the drum-shaft k^1, as shown, the other flange of the drum being connected with the driving-shaft by a pin or key. The shaft k^1 rotates in a bearing, which can be slided to and fro in a slot formed in a bracket, k^5, secured to the frame-plate A, and this shaft has a pulley, k^6, upon it, which is driven by an endless cord, k^7, working upon a pulley, b^6, keyed upon the first-motion shaft b^1. By means of the screw k^3 the tightness of the endless band k^7 upon the pulleys can be regulated. The sizes of the pulleys k^6 and b^6 are such that they give more winding-up speed than is required; but as the slip of the endless band is regulated by the screw k^3 the web is wound up sufficiently tight, and only as fast as it travels through the printing and perforating apparatus.

The second part of my invention is carried into effect by arranging the sets of disks and engraving figures upon their rings, to accomplish the objects referred to in the order hereinbefore described, and by arranging the spring and pin, or two or more springs and pins, to be carried by the units-disk to move the tens in each case at the figures hereinbefore mentioned. In some cases there need be only one spring-pin in each units-disk, (as in ordinary numerical disks;) but this spring-pin is arranged to be acted upon by several separate cam-surfaces, there being one cam-surface for each time the units-disk is to act upon the tens-disk during one revolution of the units-disk, such cam-surfaces being placed at those points in the revolution of the units-disk at which its spring-pin is to act upon the tens-disk. For instance, in consecutive numbering with five sets of disks, or duplicate numbering with ten sets of disks, or triplicate numbering with fifteen sets of disks, when the units-disk of one set is numbered 1 and 6, alternately, and 2 and 7, alternately, and so on, there are five cam-surfaces, and a space between each cam-surface, so that the spring-pin of the units-disk is acted upon every alternate movement of the units-disk to move the tens-disk. When the units-disks of the set or sets, having odd figures, are numbered 1 3 5 7 9 1 3 5 7 9, and the units-disks of the set or sets of disks having even figures are numbered 2 4 6 8 0 2 4 6 8 0; one spring-pin may be used and two cam-surfaces. But in using sets of disks with the units-disk numbered with odd and even numbers, viz., 1 4 7 0 3 6 9 2 5 8, three pins must be used in each units-disk, all actuated by passing one cam-surface.

I claim as my invention—

1. The combination of a face-plate, and two or more sets of numerical disks or rings mounted upon such face-plate, with the axis of each set parallel to that of the face-plate, substantially as and for the purposes set forth.

2. In a machine for printing, numbering, and perforating webs or rolls of paper or other material, the combination of the drums a b c d e f, and face-plate g, (carrying two or more sets of numerical disks or rings, arranged as described,) all geared together, and constructed and arranged to operate substantially as described and shown.

3. In a machine for printing, numbering, and perforating webs or rolls of paper or

other material, the combination of the type-drums *a f* and the face-plate *g*, mounted on sliding bearings, (the said face-plate carrying two or more sets of numerical disks or rings, arranged as described,) the perforating-drum *e*, the impression-drums *b c*, and the drum *d*, constructed and arranged substantially as described and shown.

In witness whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ELIJAH BEECH.

Witnesses:

PETER J. LIVSEY,
Queens Chambers, Market Street, Manchester.

JAMES WOOD,
Queens Chambers, Market Street, Manchester.