4 Sheets—Sheet 1.

W. SCOTT.

Printing and Folding Machine.

No. 221,704. **Patented Nov. 18, 1879.**

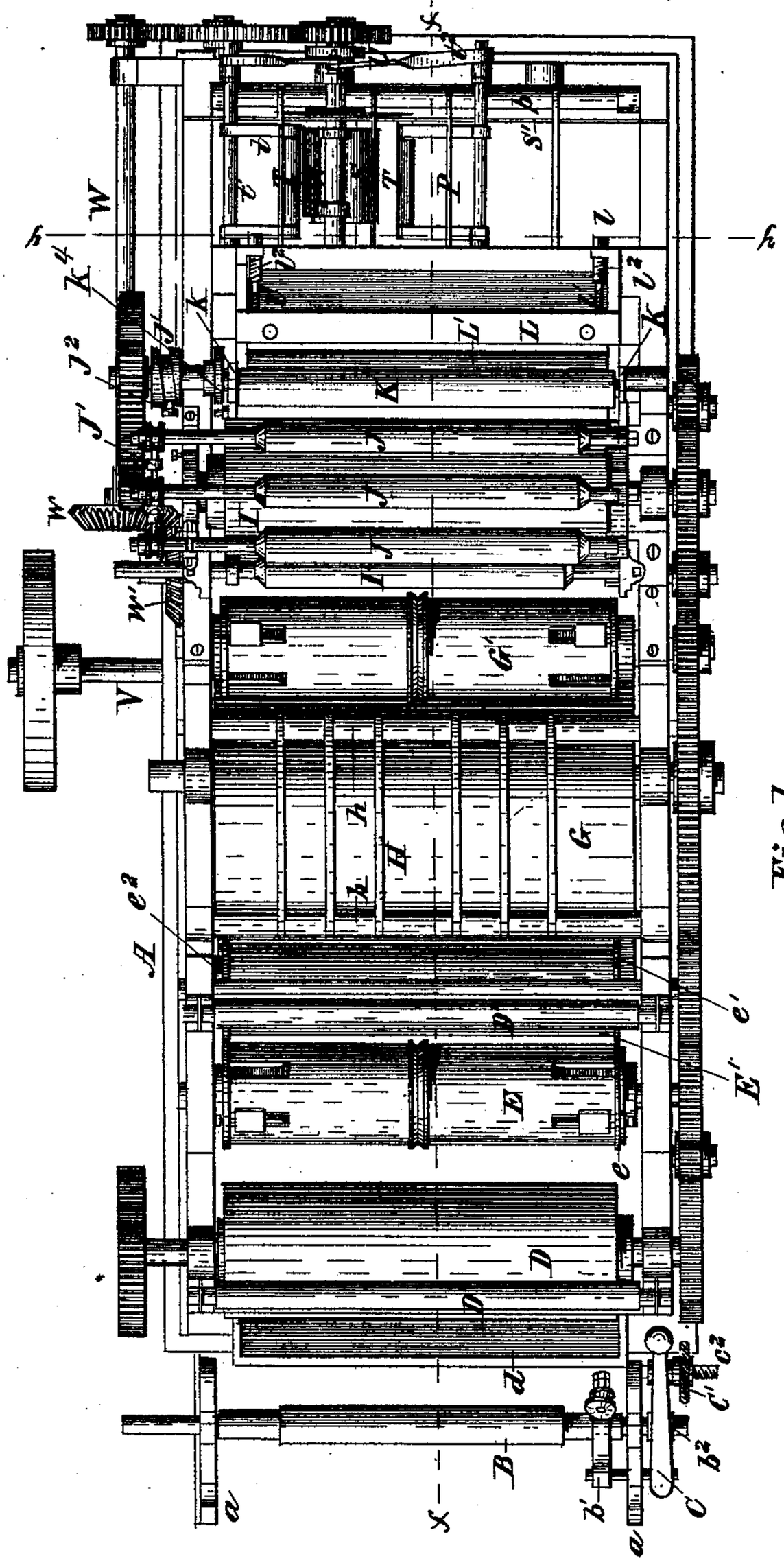

Fig 1

Witnesses

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4 Sheets—Sheet 2.

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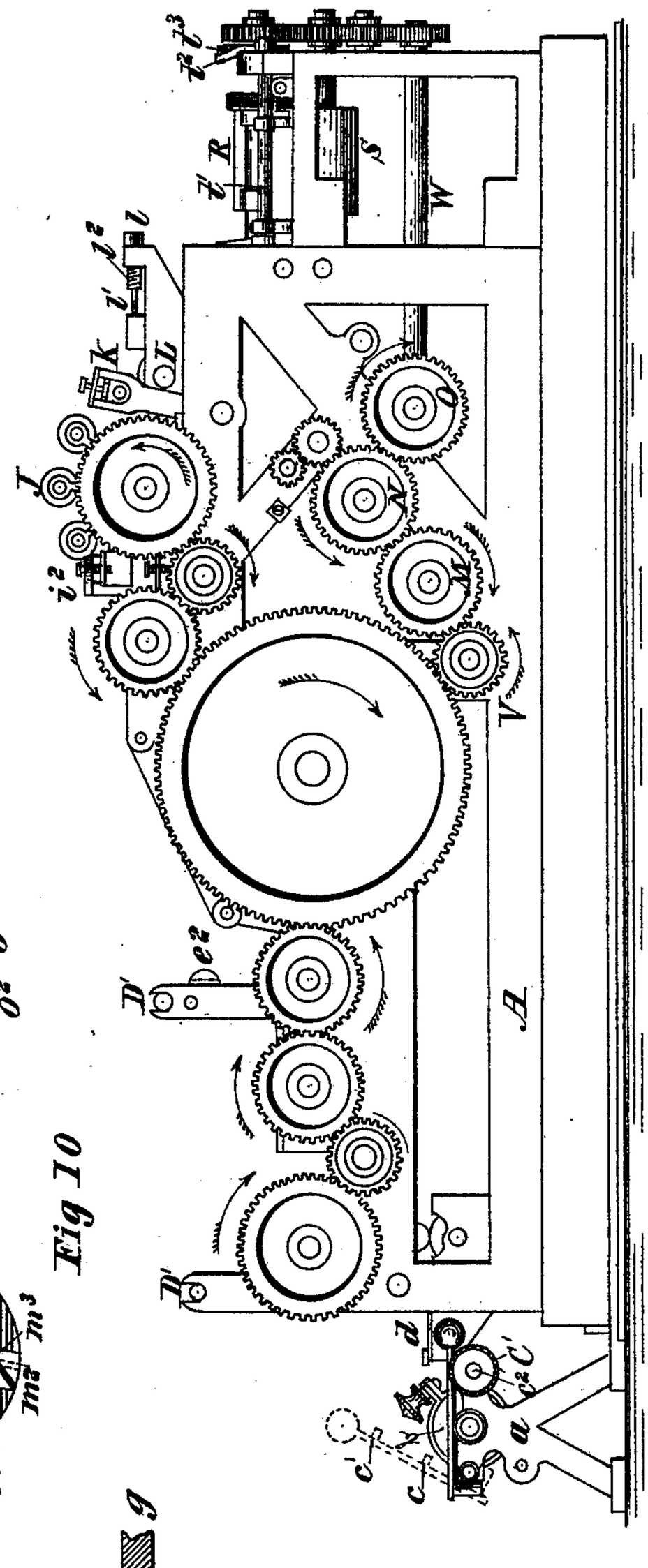

Fig 2

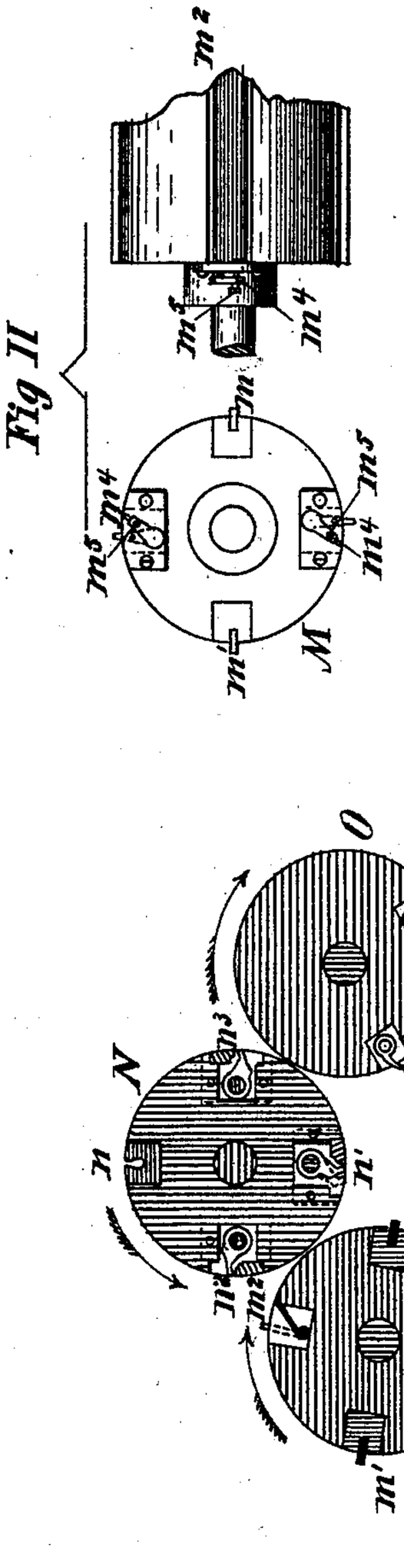

Fig 11

Fig 10

Fig 12

Witnesses

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4 Sheets—Sheet 3.

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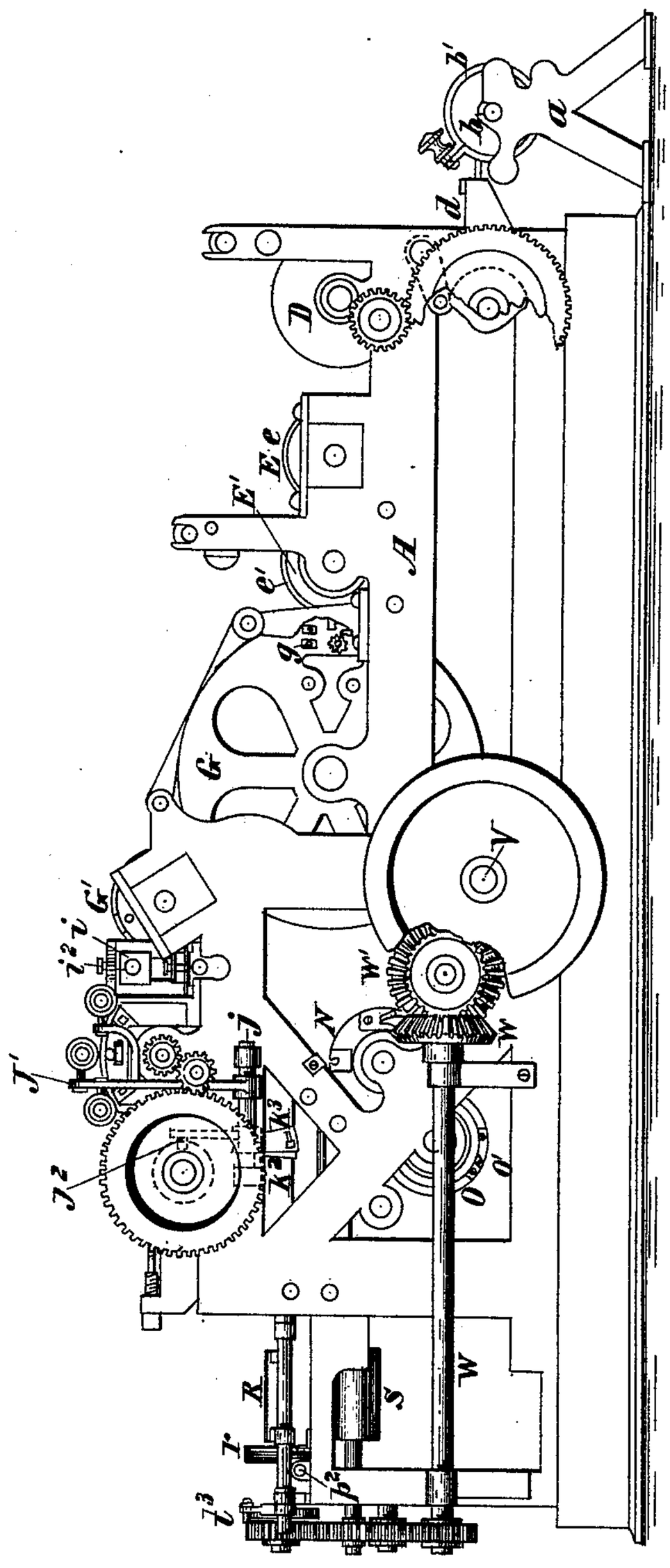

Fig 3

Witnesses

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4 Sheets—Sheet 4.

W. SCOTT.

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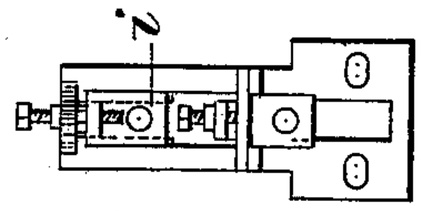
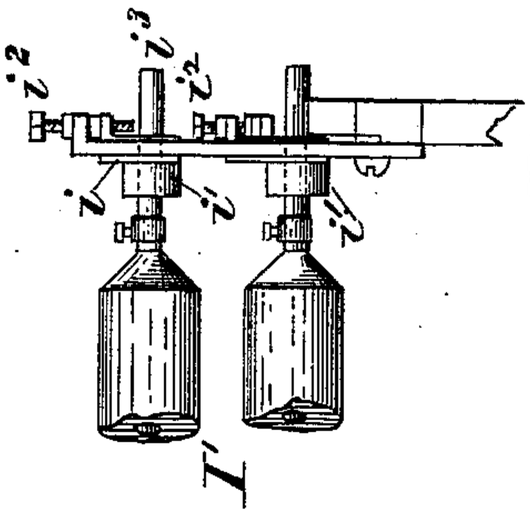


Fig 5



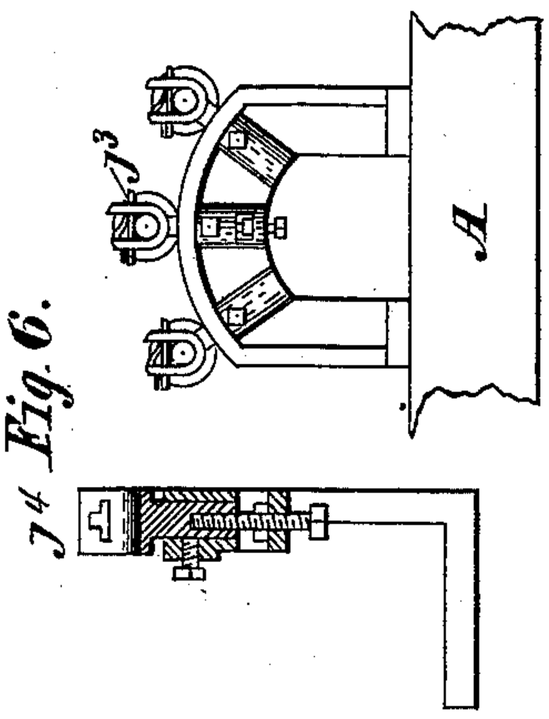


Fig 6.

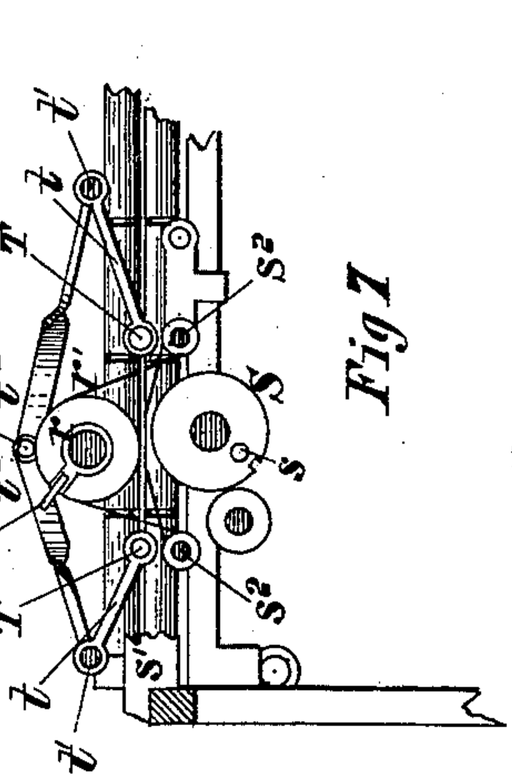


Fig 7

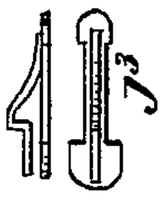


Fig 9

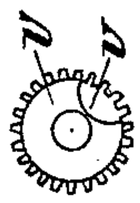


Fig 8

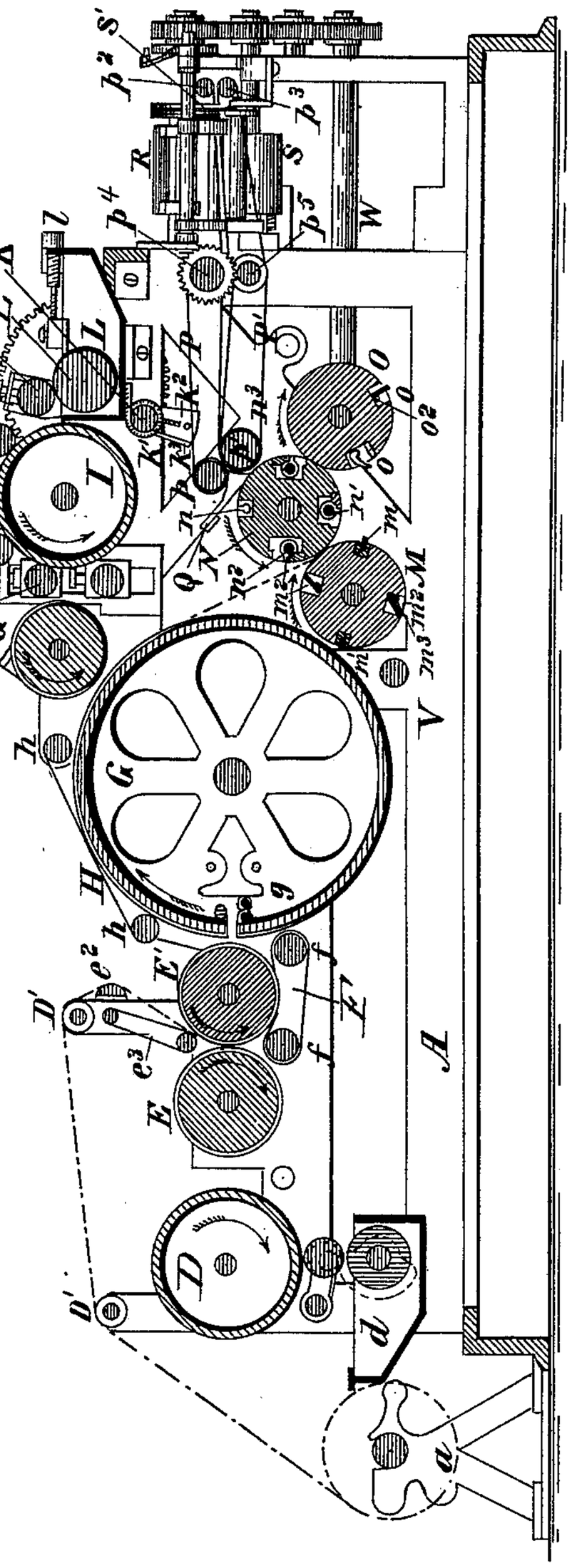


Fig 4.

Witnesses

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UNITED STATES PATENT OFFICE.

WALTER SCOTT, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN PRINTING AND FOLDING MACHINES.

Specification forming part of Letters Patent No. **221,704**, dated November 18, 1879; application filed July 28, 1879.

To all whom it may concern:

Be it known that I, WALTER SCOTT, of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Printing and Folding Machines, which is fully described in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a plan view of a printing-machine and folding-machine embracing my improvements; Fig. 2, a front-side elevation of the same; Fig. 3, a rear-side elevation of the same; Fig. 4, a longitudinal section of the same, taken on the line *x x*, Fig. 1; Fig. 5, detail views on an enlarged scale, showing the bearings of the form-inking rollers; Fig. 6, similar views, showing the bearings of the distributing-rollers; Fig. 7, a detail transverse section on an enlarged scale, taken on the line *y y*, Fig. 1; Fig. 8, an elevation of the cam and pinion on the outer end of the shaft of the folding-blade; Fig. 9, detached views of the spring-pins which are used to hold the distributing-rollers in place; Fig. 10, a transverse section, on an enlarged scale, of the three rollers for cutting and making the first folds in the sheets; Fig. 11, an end and detail side elevation of the male cutting-cylinder, on an enlarged scale; and Fig. 12, a detail view of one end of one of the rods for attaching the blanket to the cylinder provided with a removable point.

The first part of my present invention relates to improvements in the printing-machine, and the second part to improvements in the folding mechanism, which receives the printed sheets directly from the printing-machine and folds them.

The invention consists in various special devices and combinations of devices relating to printing and folding machines, all of which will be hereinafter more fully described, and pointed out particularly in the claims.

In the drawings, A represents the main frame, which supports the printing and folding mechanism, and in which the various cylinders and rollers belonging to the machine are mounted in suitable bearings. The printing-machine is of the class now generally known as "web printing-machines."

At the front end of the machine are two standards, *a*, in which is mounted the shaft B, on which the roll of paper is placed and secured in any usual way. This shaft is provided at one end with a disk, *b*, which is embraced by friction-clamps *b'*, provided with a tightening-screw, whereby the friction may be regulated.

It is desirable to provide for the adjustment of the paper roll lengthwise to bring the sheet into proper position on the printing-cylinders. To provide for this a collar, b^2, is attached to the shaft B outside of one of its end bearings, the collar having a circumferential groove. A lever, C, is jointed at one end to the standard *a*, just in front of the collar b^2, the connection being made by a gimbal-joint, so that the lever may be vibrated both vertically and horizontally. The lever is provided on its under side with two pins, *c c'*, the first of which is arranged to fit in the groove of the collar b^2, while the outer one drops into a similar groove in a nut, C', on a threaded pin, c^2, attached to the standard just back of the shaft B. It will thus be seen that by turning this nut the outer end of the lever will be vibrated in a horizontal direction, thereby giving an end adjustment to the roll of paper. The lever is free to be swung back to permit the removal of the shaft whenever it is desired to change rolls.

An ink-distributing cylinder, D, is mounted in the front end of the frame, and is supplied from the ink-fountain *d* below in the usual way, and is provided with distributing-rollers, which, however, are not shown in the drawings, at this end of the machine.

The plate-cylinder E is of ordinary construction, and provided with suitable clamps for fastening the printing-plates thereto.

An impression-cylinder, E', is arranged to run in connection with the plate-cylinder, and each is provided at the ends with bearing-flanges *e e'*, of such width as to run constantly in contact, thereby preserving the distance between the surfaces of the two cylinders, which sometimes is varied by the wearing of the bearings, thereby causing an unequal wear of the edges of the printing-plates.

Supporting-rollers D' are mounted in upright standards, being arranged about over the cylinders D and E, respectively, and to the back of

the standards of the inner roller a friction-bar, e^2, is attached, the surface of which is convex. A drop-roller, e^3, is mounted in the usual vibrating frame, which is also pivoted to the same standards, the roller being arranged to drop onto the impression-cylinder E′. A series of carrying-tapes, F, are arranged underneath the impression-cylinder E′, being mounted on ordinary rollers *f*, and running in contact with the impression-cylinder.

In rear of the impression-cylinder E is mounted the second impression-cylinder, G, which is of much larger size than the former, and is provided with the usual blanket and tympan-sheet. The front end of the blanket is attached to the cylinder by means of a rod, *g*, passing through loops in the end of the blanket; and to facilitate the insertion of the rod it is provided with a pointed end, *g′*, Fig. 12, secured to the rod by a screw-thread, so that it may be readily removed from one rod and attached to another. In other respects the attachment of the blankets is in the ordinary way.

A second plate-cylinder, G′, is arranged in the proper relation to the cylinder G, and is similar in construction to the cylinder E, these two cylinders G and G′ being provided with end flanges, like E and E′, if desired.

A series of tapes, H, are arranged to run in contact with the upper portion of the cylinder G, being carried by ordinary tape-rollers *h*, as shown in Fig. 4 of the drawings.

The second ink-distributing cylinder, I, is of usual construction, and the well-known reciprocating ink-distributing rollers J are arranged to run in contact therewith. The rollers J are reciprocated lengthwise in the usual way by means of the lever J′, which is attached to a rock-shaft, *j*, which is oscillated by a grooved cam, *j′*, on the shaft of the ink-fountain roller, in the groove of which a pin enters, which is on an arm, j^2, attached to the rock-shaft. The rollers J are secured in the open bearings, which are provided at one end with spring-pins j^3, as shown in Fig. 6 of the drawings. The spring on these pins is bent to form a shoulder, as shown in Fig. 9 of the drawings, by means of which the springs are held in place after they are inserted in the holes in the forked bearings. The spring is also narrower than the pin, and the upper portion of the slot j^4, through which the pin passes, is narrower than the lower portion, so as to admit the spring only, and the upward pressure of the journals will therefore be prevented from coming on the spring and depressing it, so as to permit the pin to slip from its place and make the fastening insecure.

The form-inking rollers I′ are mounted in bearings *i*, which are fitted in yokes *i′*, Fig. 5, in which they are adjustable vertically by means of adjusting-screws i^2. The journals i^3 of the form-rollers are extended at one end, so as to be of about the same length as the distributing-rollers, and the bearings at this end of the rollers are made so that the extended journals may slide back and forth therein, to permit the rollers to be removed when lifted from the bearings at their opposite ends.

By this construction the form-rollers are adapted for use as distributing-rollers, so that after they are worn so as to be unfit for further use as form-rollers, they may still be utilized for some time longer as distributing-rollers.

The ductor roller K has its bearings in vibrating arms *k*, the bearings being adjustable vertically in guide-slots in said arms by means of suitable screws. The arms *k* are attached to a rock-shaft, K′, around which is wound a spiral spring, *k′*, which operates to hold the roller away from the distributing-cylinder and in contact with the fountain-roller. An arm, k^2, is placed loosely on this rock-shaft at the back side of the machine, and a second arm, k^3, is here fastened to the rock-shaft and extended below it, being provided at its lower end with a transverse slot, as shown in Fig. 3 of the drawings. The loose arm k^2 is fastened to the arm k^3 by a screw which enters a slot in the latter, and by means of the slot and screw the loose arm may be adjusted on the rock-shaft. The loose arm carries at its upper end a pin, against which a cam, k^4, Fig. 1, also attached to the shaft of the fountain-roller, is arranged to bear, and is of such form as to vibrate the ductor-roller at suitable intervals to transfer ink from the fountain-roller to the distributing-cylinder.

It will be seen that the cams *j′* and k^4 are both on the fountain-roller shaft; that ductor-roller and the distributing-rollers are both vibrated by the rotation of the same shaft, and this shaft is driven by suitable gearing from the ink-distributing-cylinder.

The ductor L is mounted on the ink-fountain by means of suitable slots and screws, so as to permit it to be adjusted to or from the fountain-roller L′. The adjustment of this ductor is effected by means of differential screws *l*. These screws are each provided with two threads, *l′*, at the inner ends, and l^2 near the outer ends. The inner ends of the screws are considerably smaller than the threaded portion l^2, and the threads at *l* are finer than at l^2. The inner ends of the screws enter threaded holes in the ductor, and the threaded portions l^2 are supported in screw-bearings on the ink-fountain.

It is evident that the movement of the ductor by a single turn of the screws will be equal to the difference between the pitch of the thread, and so I am enabled to obtain a nice adjustment of the ductor.

I have shown and described the complete inking-apparatus at one end of the press only. It will be understood, however, that the first ink-distributing cylinder at the front end of the machine is provided with all of the devices which have been mentioned above in connection with the second distributing-cylinder.

I will now proceed to describe the cutting and folding mechanism. Just in rear of the impression-cylinder G, and underneath the second

inking apparatus, are three cylinders, M, N, and O, the first of which is provided with cutting-blades and creasers, the second with cutting-grooves and folding-gripers, and the third with transferring-gripers and folding-blade. The arrangement of these cylinders is shown in Fig. 4 of the drawings, which arrangement, as well as the general construction of the cylinders, is substantially the same as shown in a prior application of mine filed May 21, 1879; but in some particulars the construction of these cylinders is different, so that their operation is considerably different from that described in my prior application.

The cylinder M is provided with a stationary cutter, m, a stationary creaser, m', and two creasers, m^2, attached to rock-shafts m^3, the purpose and operation of which will be presently described.

When ordinary sheets are to be cut and folded the creasers m^2 are turned down in their holding-grooves, as shown in full lines in Fig. 10 of the drawings, and are consequently inoperative.

The cylinder N is provided with a cutting-groove, n, and three sets of folding-gripers, n', n^2, and n^3, the last two of which are inoperative except when half-sheets are to be used.

The cylinder O is provided with a set of transferring-gripers, o, and a creaser, o', which is also mounted on a rock-shaft, o^2, both of which devices are inoperative when half-sheets are folded.

In folding ordinary sheets the creaser o' is thrown up, as shown in full lines in Fig. 10 of the drawings, in which position it projects slightly beyond the circumference of the cylinder and is operative.

Upper and lower carrying-tapes, P P′, are arranged to take the folded sheets from the cylinder N and convey them to the rear end of the machine, the inner tape-rollers, $p\,p'$, being arranged just above and in rear of the cylinder N, and the outer rollers, $p^2\,p^3$, at the extreme rear end of the machine, there being also an intermediate pair of guide and supporting rollers, p^4 and p^5, which, however, are not absolutely necessary. Stripping-guides Q are arranged between the rollers P P′ and the cylinder N, the latter being provided with circumferential grooves, in which the ends of the guides lie. Instead of these guides, however, a series of tapes running around the cylinder N may be employed, as in the prior application above mentioned.

At the rear end of the machine is a rotating folding-blade, R, and a cylinder, S, provided with a series of folding-gripers, s, the creaser and cylinder being arranged at right angles to the cylinders M N O, and so that the folded sheets will be carried in between the creaser and cylinder by the tapes P P′, substantially as shown and described in my prior application filed March 30, 1876, so that the sheets may be folded at right angles to the previous folds.

A gage-bar, s', is arranged just in front of the tape-rollers $p^2\,p^3$ for the usual purpose of stopping the sheets. Just underneath the path of the sheets are rollers s^2, Fig. 7, arranged one on each side of the griper-cylinder, and above these rollers are two drop-rollers, T, mounted in arms t, attached to rock-shafts t' on each side of the creaser. Arms t^2 are fastened, respectively, to the outer ends of the rock-shafts t', and are arranged to project inwardly therefrom, being hinged or pivoted together at their inner ends, where one of them is slotted to permit a vibrating movement of the two.

A cam, U, Figs. 1 and 8, is mounted on the shaft of the creaser, just underneath the jointed arms t^2, upon which a pin, t^3, projecting rearward from the joint of the two arms, rests. The cam is provided with a depression, u, which permits the pin to drop at a certain point in the revolution of the cam, and the parts are so arranged that this will occur just as the creaser takes the sheet to crease it into the gripers on the cylinder below. This dropping of the jointed arms permits the rollers T to drop at once upon the stationary rollers below, which are driven by a pulley, r, on the shaft of the creaser, and a band, r', running thence to the roller-shafts.

It will thus be seen that at the very moment the sheet is taken by the creaser it will be started in a movement to one side of the machine by the action of the rollers and the creaser and griper-cylinder combined. The folded sheet may be delivered in any well-known way, and if additional folds are necessary additional folding devices must be provided; but their attachment will be readily understood without further description.

The machine shown in the drawings is a double printing-machine, and hence the sheet must be divided, which is accomplished by means of a rotary cutter on the roller p^4; but in case this intermediate roller is not employed, this cutter should be mounted on the roller p or on some other suitable shaft.

It will, of course, be understood that the shafts and cylinders of the machine are provided with suitable gearing, and in this machine the entire printing and folding mechanism is driven from a single shaft, V, as described in my application of May 21, 1879, and as shown in Figs. 2 and 3 of the drawings, in which the train of gears is shown with arrows, indicating the direction of their revolutions.

The folding mechanism at the extreme rear end of the machine is driven by a shaft, W, on the back side of the machine, the front end of which is provided with a bevel-gear, w, engaging with a similar gear, w', on the back end of the shaft of the cylinder M, as shown in Fig. 3 of the drawings, which, in turn, is driven from the shaft V, as shown in Fig. 2 of the drawings.

In operation the web is carried up from the roll over the supporting-rollers D′, and thence down in rear of the friction-bar e^2, and between the drop-roller e^3 and the impression-cylinder

E′ to the cylinders E E′, where it receives the first impression. The friction-bar straightens the web and takes out all creases or wrinkles, and the drop-roller starts the sheet in between the printing-cylinders.

The operation of the printing-machine from this point has already been sufficiently described above to enable others to understand it.

The end of the printed web drops from the cylinder G into the cylinders M and N, is carried around on the cylinder M, and is cut and receives its first fold by being creased into the cylinder N, as described in my application of May 21, 1879.

The gripers n' hold the sheet, so that it is carried around by the cylinder N in the direction indicated by the arrow in Fig. 10 of the drawings, until it is released and transferred to the cylinder O by the operation of the transferring-gripers o, when it is carried by the cylinder O in the direction shown by the arrow in Fig. 10 until the creaser o' is brought opposite to the gripers n^2, when a second fold, parallel to the first, is made by creasing the sheet into the gripers n^2 on the second cylinder N, by which it is carried to the strippers Q, and by them guided to the tapes P P′.

It will be understood, of course, that suitable cams are provided for opening the spring-gripers for the purpose of receiving and releasing the sheets at the proper points. The sheets twice folded are then conveyed by the tapes to the second folding mechanism, being divided by the cutter on the roller p^4, where another fold is made at right angles to the two first, as already described above. But one set of folding devices is shown at the rear of the machine. It will be understood, however, that a duplicate set on the other side of the machine will be necessary for a double press like the one here shown.

It will be seen from this description that two parallel folds are made in the sheets by the operation of the three cylinders M, N, and O, but in an entirely novel manner, as far as known to me. The sheet is creased by the first cylinder into the second, from which it is taken by the third, and then creased back again by the latter into the second cylinder to make the second fold.

If it is desired to cut and fold half-sheets, the creaser m' is replaced by a cutter corresponding to the cutter m, and the two creasers m^2 are thrown up into working position, as shown in dotted lines of Fig. 10 of the drawings.

The spring-gripers n' are fastened open by placing the pin behind the crank-arm on their rock-shaft, thereby converting the folding-groove into a cutting-groove. The transferring-gripers o are fastened open in a similar manner as the gripers n', and the creaser o' is turned down into its grooves, as shown in dotted lines in Fig. 10.

It is evident that with these changes half-sheets will be cut and creased into the cylinder N, the gripers n^3 being now brought into operation, and that the devices on the cylinder O will be inoperative, so that the once-folded half-sheets will be carried directly to the tapes P, and thence to the second folding mechanism. The second or rear folding mechanism must be changed in speed, by changing gears, so as to act twice as rapidly as before.

In order to provide for the vibration of the creasers m^2, the rock-shafts m^3 are provided at one end with a crank-arm, m^4, through which a pin, m^5, is inserted to enter either one of two holes in the end of the cylinder, so that the rock-shafts are oscillated by turning the crank-arm and fastened in the desired position by means of the pins. The rock-shaft o^2 is provided with similar devices for securing a light adjustment of the creaser o'.

It will thus be seen that these cylinders may be changed from full-sized sheets to half-sheets without removing any device except the single creaser m'.

It is also evident that, under the arrangement of devices as described above, a very compact printing and folding machine is obtained, the addition of the folding mechanism requiring but very little increase in the size of the supporting-frame. This is effected by my arrangement of the first set of folding devices underneath the second inking apparatus; but with certain obvious changes these two devices might be reversed, and the inking devices arranged below the folding apparatus; and therefore I do not limit myself to the arrangement of the folders below the inkers, provided these sets of devices are arranged either one substantially above or over the other.

In case but two folds are required in the sheets, the printing-machine and folder are complete with the three cylinders M, N, and O only, a suitable mechanism being provided to deliver the folded sheets upon a receiver directly from the cylinder N.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The paper-roll shaft, in combination with the swiveled lever C, provided with the pins $c\ c'$, and the grooved adjusting-nut C′, substantially as and for the purpose set forth.

2. The fountain-roller shaft, in combination with the cams j' and k^4 mounted thereon, the vibrating lever J′, distributing-roller J, and ductor-roller K on vibrating arms k, one of which is provided with a pin connected therewith, against which the cam k^4 acts, substantially as and for the purpose set forth.

3. The ductor-roller K, mounted in arms on the rock-shaft K′, in combination with the spring k', loose arm k^2, having a pin at its upper end, and the cam k^4, substantially as described.

4. The ink-fountain roller L′, in combination with the cam k^4 on its shaft, the rock-shaft K′, spring k', and ductor-roller K, mount-

ed in adjustable bearings on arms *k*, attached to the rock-shaft, substantially as described.

5. The form-inking rollers I′, constructed with extension-journals at one end, in combination with the bearing-boxes *i*, through which the said journals project and are free to slide, and the closed boxes for the short journals cut away to permit the latter to be lifted therefrom, whereby the rollers may be readily removed and replaced, substantially as described.

6. The impression-cylinder G, in combination with the blanket, provided with a loop at one end, and the fastening-rods *g*, provided with a removable pointed end, *g′*, substantially as and for the purpose set forth.

7. The combination of three parallel cylinders, the first provided with a creaser, the second with two sets of folding-gripers, and the third with transferring-gripers and a creaser, whereby the sheet is first creased by the first cylinder into the second, then taken therefrom by the third, and again creased back into the second by the third to make two parallel folds, substantially as described.

8. The cylinder M, provided with a creaser and a cutter, in combination with the cylinder N, provided with folding-gripers and a cutting-groove, and the cylinder O, provided with transferring-gripers and a creaser, arranged and operating to cut the sheets and make two parallel folds therein, substantially as described.

9. A creaser mounted on a rock-shaft arranged within the groove in its carrying-cylinder, in combination with adjusting devices, by means of which the creaser may be turned down into the groove or thrown up into operative position and screwed in either adjustment, substantially as and for the purpose set forth.

10. The cylinder M, in combination with creaser m^2, rock-shaft m^3, provided with crank-arms m^4, and fastening-pin m^5, substantially as and for the purpose set forth.

11. The cylinder M, provided with a cutter, removable creaser, and adjustable creaser m^2, in combination with the cylinder N, provided with a cutting-groove and folding-gripers n' n^2 n^3, and devices for fastening the first griper, n', open to make a cutting-groove, and the cylinder O, provided with an adjustable creaser, o', transferring-gripers *o*, and devices for fastening the latter in an open position, whereby the cylinders may be changed from full-sized sheets to half-sheets, substantially as described.

12. A sheet-folding mechanism to which the sheets are delivered in a path parallel to the axis of the folding-rollers, in combination with the rotating rollers s^2 and the drop-rollers T, substantially as and for the purpose set forth.

13. The revolving cam U, in combination with the rock-shaft t', drop-rollers T, attached thereto, and arms t^2, jointed together at their inner ends, substantially as and for the purpose set forth.

14. The revolving creaser R, in combination with the griper-cylinder S, the carrying rollers s^2, the drop-rollers T, and the delivery-tapes P P′, all arranged and operating substantially as described.

WALTER SCOTT.

Witnesses:
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W. C. CORLIES.