(No Model.) 2 Sheets—Sheet 1.

W. SCOTT.

WEB PRINTING, FOLDING, AND CUTTING MACHINE.

No. 458,350. Patented Aug. 25, 1891.

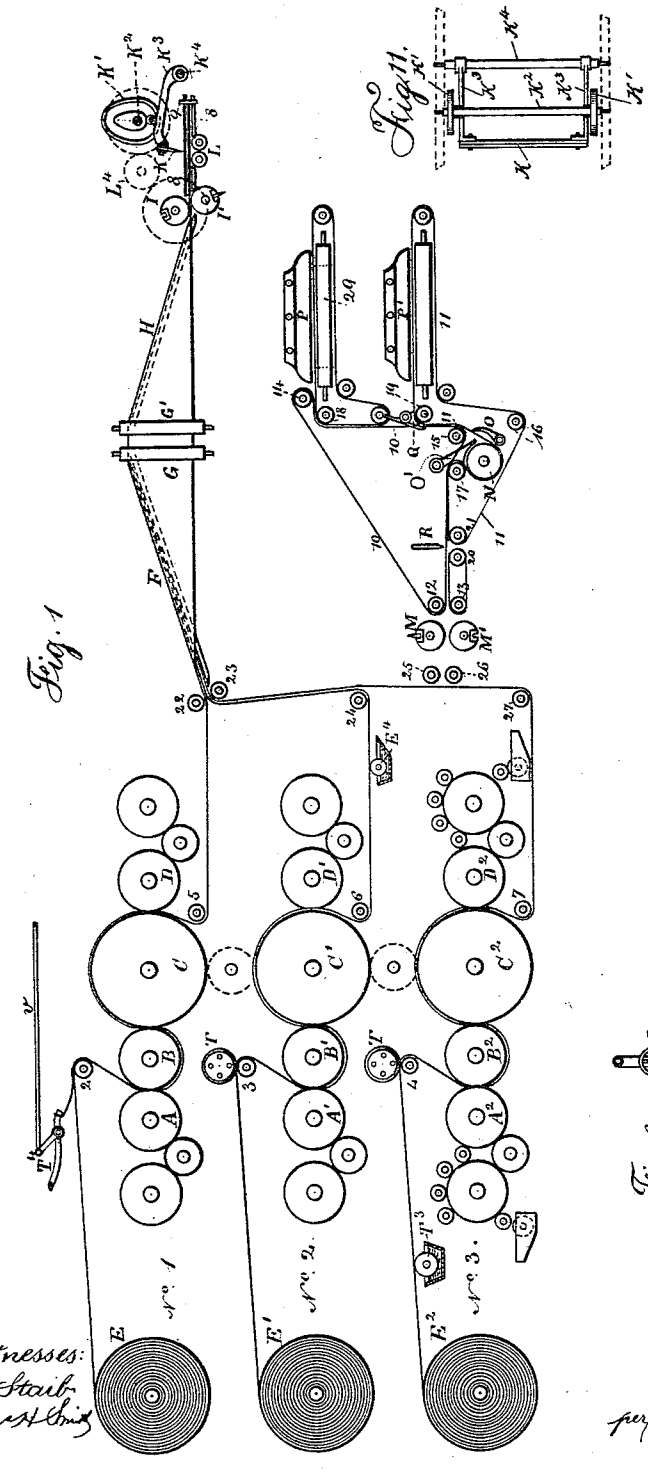


Fig. 1.

Fig. 11.

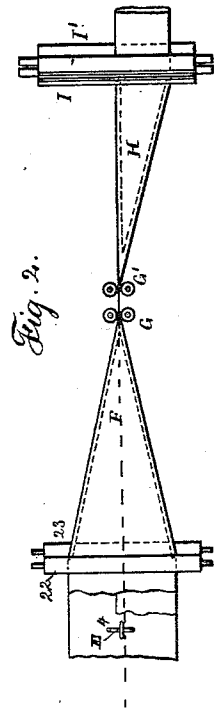


Fig. 2.

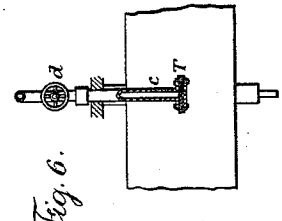


Fig. 6.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

W. SCOTT.

WEB PRINTING, FOLDING, AND CUTTING MACHINE.

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Fig. 9.

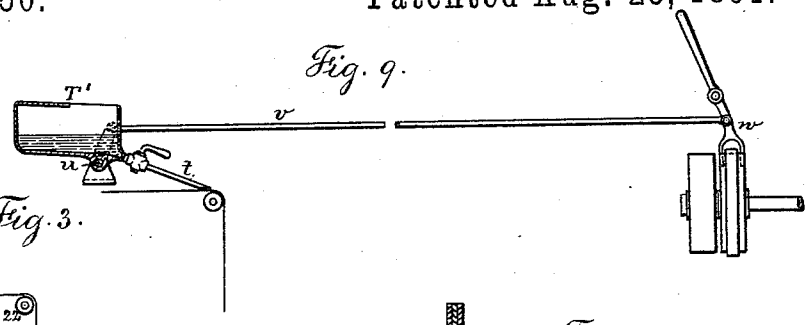


Fig. 3.

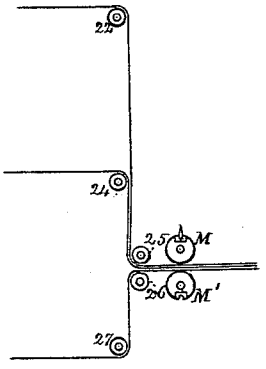


Fig. 4.

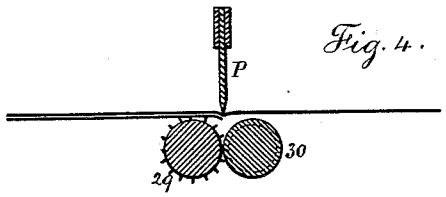


Fig. 5.

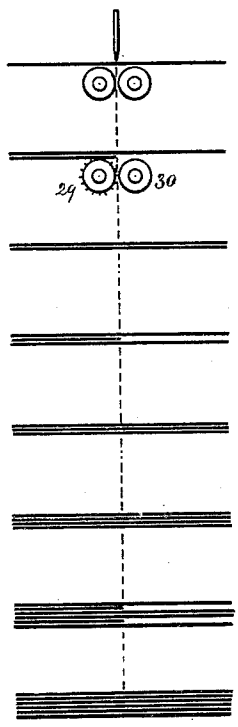


Fig. 7.

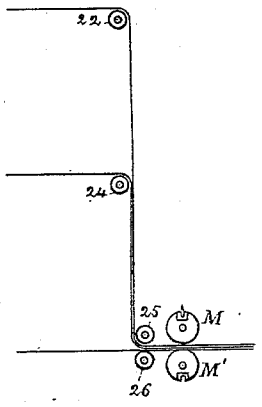


Fig. 8.

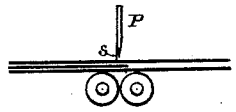
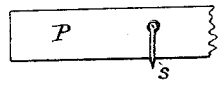


Fig. 10.



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UNITED STATES PATENT OFFICE.

WALTER SCOTT, OF PLAINFIELD, NEW JERSEY.

WEB PRINTING, FOLDING, AND CUTTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 458,350, dated August 25, 1891.

Application filed November 3, 1890. Serial No. 370,124. (No model.)

To all whom it may concern:

Be it known that I, WALTER SCOTT, a citizen of the United States, residing at Plainfield, in the county of Union and State of New Jersey, have invented an Improvement in Web Printing, Folding, and Cutting Machines, of which the following is a specification.

In my application, Serial No. 315,886, filed June 28, 1889, I have represented three web-printing presses, one above the other, and the webs are conveyed away associated, folded longitudinally, and then cut.

In my application, Serial No. 317,719, filed July 16, 1889, I have represented three web-printing presses, in which the webs are associated together, folded longitudinally, and cut.

The present invention is to supply a demand that has arisen for a press in which the printed webs can be delivered and folded in different ways, according to the article or product to be delivered—that is to say, in the present invention one, two, or three of the webs can be folded longitudinally and cut off and then folded transversely, or one, two, or three webs can be delivered, cut off, and folded, or two or more sheets after being cut off can be collected and delivered to the folding mechanism for folding the product longitudinally or transversely, thus adapting the press to newspaper-work or job-work and to the printing and folding of products containing four, six, eight, ten, twelve, fourteen, sixteen, twenty, and twenty-four page products. In connection with the folding of the printed web or webs longitudinally I have found a difficulty, especially in the better qualities of work, where the paper is heavy, and especially with paper that is highly glazed upon the surface. This difficulty arises from the paper folding unequally in its longitudinal fold, in consequence of the paper being stiff and cracking more or less as it is folded longitudinally by running over an incline. To overcome this difficulty, I apply to the web a line of moisture at the place where the longitudinal fold is made, so that the paper becomes sufficiently softened to prevent the cracking operation before mentioned; and I remark that in order to maintain the proper glaze upon the paper in the better qualities of press-work it is usual not to moisten the paper, thereby maintaining the gloss that is given to the paper in its manufacture, and the narrow line of moisture applied at the fold of said paper accomplishes the object mentioned of preventing the paper cracking without the gloss on the surface of the paper adjacent to the fold being injured by moisture, and in folding paper, especially where the paper is dry and moderately stiff, a difficulty has heretofore been experienced in folding one sheet in the middle adjacent to a half-sheet that intervenes between the folded sheet and one of the folding-rolls, and in order to insure the proper action of the folding device the folding-roll, against which the half-sheet is brought into contact by the folding-blade acting upon the whole sheet, is provided with pins which act upon the margin of the paper or upon a line of the subsequent fold, so as to insure the proper movement of the half-sheet adjacent to the whole sheet that is being folded.

In the drawings, Figure 1 is a diagrammatic vertical section of the apparatus made use of by me. Fig. 2 is a partial plan view of the longitudinal folding device. Fig. 3 is a diagram showing the direction in which the webs are passed when they are to be cut before folding. Fig. 4 is a section of the folding-rolls and blade in larger size. Fig. 5 illustrates the manner in which the sheets may be brought together or folded to form the products containing the various numbers of pages heretofore indicated, and Fig. 6 is a separate sectional plan view of the moisteners. Fig. 7 is a modification in the arrangement of the rolls around which the webs pass. Fig. 8 shows the folding-rolls and sheets, and Fig. 9 is a modification of the moistener. Fig. 10 shows part of the folding-blade and one of the needles, and Fig. 11 is a diagrammatic plan view illustrating the relative positions of the folding-blade, arms, rock-shaft, and actuating-cams, the position of the frame being indicated by dotted lines.

I have numbered the presses as 1, 2, and 3, and the printing-cylinders A A′ A^2 are inked in any convenient manner and given the first impression against the impression-cylinders B B′ B^2, and the webs of paper pass over the second impression-cylinders C C′ C^2 and receive the second impression from the printing-cylinders D D′ D^2, and these are inked

in any suitable manner, and in Fig. 1 I have illustrated inking devices such as are usually made use of. The rolls of paper E E′ E² are mounted in any usual way, and from such rolls the webs pass into the respective presses and they are led over the rollers 2 3 4 to the respective printing-cylinders, and they pass away after receiving the impression below the respective rolls 5 6 7.

I provide a longitudinal folding-incline F, with pairs of vertical folding-rollers G G′ between the folding-incline F and the turning-incline H, and at the end of the turning-incline H are the horizontal cutters I I′, which serve to separate the web or associated webs into sheets, and these sheets pass along between the bars 8, (or their equivalents, tapes,) and the advancing edges of the sheets are arrested by the gage 9, and there is a folder K above the folding-rolls L, which folding-blade is actuated by suitable means—such, for instance, as a cam acting at the ends of the folding-blade to carry the sheet down between the rolls L at the proper time, and the folded product may be received into any suitable holder or it may be delivered to a second folding device acting at right angles to the first. I also provide rotary cutting-cylinders M M′ beneath the folding-incline F, and these cutter-cylinders are adjacent to the ranges of belts 10 and 11, that pass around the rolls 12 13 14 15 16 17 and convey the sheets, as cut, away from the cylinders M M′, and I provide a collecting-cylinder N, in contact with which the belts 11 also pass, and there is a stationary guide O′ and moving switch O for directing the sheets around the collecting-cylinder N, when so desired, or when the sheets are not to be collected the switch O is set so that the sheets are carried by the belts 10 and 11 over the roll 17 and beneath cylinder N and against the roll 15 and up over the roll 18 to the folding apparatus P, and there is a second switch Q adjacent to the roller 19, by which the sheets can be diverted to the folding mechanism P′. This allows one sheet to be carried to the folder P and the next sheet to the folder P′, so as to give time for the folding mechanism to operate, and these folders, the switches, and the collecting-cylinder correspond generally to those represented in my patent, No. 398,544.

In addition to the device before described, I make use of a folder R adjacent to the rolls 20 21, which may be brought to fold the sheets transversely as they are cut off and form one product. This folder R is to be notched for the passage of the belts 10.

The rolls 22, 23, 24, 25, 26, and 27 are provided in the positions represented in order that the webs of paper may be conveyed away, as hereinafter described, so as to be delivered in products with a greater or less number of pages associated together.

It will now be understood that a web from either press No. 1, 2, or 3 can be run over the folding-incline F and folded longitudinally and separated transversely by the cutters I I′ and delivered as a four-page product, or which usually will be folded by the blade K and into a smaller compass before being delivered. If two webs are run over the folder F, they will be folded together longitudinally and can be cut off as an eight-page product and delivered flat or folded. If all three webs are brought together and run over the folding-incline F, they will be cut off together and delivered as a twelve-page product either flat or folded. It is to be understood that the folder K can be thrown out of action, as usual in presses. If a six-page product is required, one whole web and a half-width web may be printed on two of the presses and they may pass over the longitudinal folding-incline F, the whole-width web being folded and the half-width web being above or below one-half of the whole-width web, and the product is cut by the rotary cutters I I′ into sheets and folded by the blade K, or, if desired, the whole-width web and the half-width web can be passed between the rollers 25 and 26 and separated by the cutters M M′, and conveyed by the belts 10 and 11 to the folders P P′, and by the switch Q the products are directed first to the folder P and then to the folder P′, and this part of the apparatus may also be used for folding a four-page product or an eight-page product. In cases where a ten-page product is desired two full-width webs are to be printed on the presses 1 and 3 and a half-width web upon the press No. 2, the half-width web coinciding with half of the whole-width web, as indicated in Fig. 5, and the product may be folded longitudinally upon the incline F before being cut off, or the same may be carried between the rollers 25 26 and delivered to the folders P P′ successively. Where a sixteen-page product is required, two webs can be employed, and the pairs of sheets, as separated, will be collected upon the cylinder N, and each four sheets so collected will be delivered and conveyed first to the folder P and then to the folder P′, and this operation is the same when a twenty-page product is required; but in that case two full-width webs from the presses 1 and 3 will be used, with a half-width web from the press No. 2 introduced between them, and when a twenty-four page product is desired three pairs of sheets from two of the printing-presses will be accumulated upon the collecting-cylinder N, the six sheets forming the product being discharged at once from the collecting-cylinder and carried to the folder P or P′. In all cases care is to be exercised to bring the printed matter on the different webs properly into register.

In order to facilitate the longitudinal folding of either one or more of the webs, I make use of a moistener T, that applies to the web of paper a line of moisture where the fold is subsequently to take place. This moistener T is preferably in the form of a disk, the periphery of which is of a proper width for ap-

plying the line of moisture. This moistener may be a disk of fibrous material between two metallic disks, the periphery of the porous or fibrous material extending slightly beyond the edges of the metallic disks and receiving the moisture from a water-holder direct or from a porous roller in such water-holder.

The axis *c* of the moistener may be tubular, with openings communicating with the porous disk T, so that water may be supplied through this tubular axis *c* to the desired extent, such supply being regulated by a valve *d*.

In Fig. 4 I have represented the folder P as adjacent to the folding-rolls 29 30, and upon the surface of the roll 29 there are projecting pins, such pins being located so as to act upon the paper, by preference in the line of a fold to be afterward made in the sheets or upon the margins of the paper, and these pins are especially available when a whole-width web and a half-width web are being made use of, as in producing a six-page paper, because the sheet of half-width is preferably between the sheet of full-width and the roller 29, and as these rollers 29 and 30 are revolved as usual the half-width sheet is carried in between the rolls 29 and 30 with reliability, because the pressure upon a whole-width sheet causes the half-width sheet to press upon the pins that project from the roll 29. Hence such pins and roll carry the half-sheet in between the rolls at the same speed as the whole-width web is carried between such rolls by the action of the blade P, whereas if such pins were not made use of on the roll 29 the half-width sheet might not be started with the same rapidity nor move as reliably as the whole-width sheet.

It will be apparent that if a very small stream of water is allowed to run along an inclined wire or a piece of cord or other flexible material resting upon the paper at the place where the fold is subsequently to be applied, as seen at T^4, Fig. 1, a line of moisture can be placed upon the paper instead of using the wheel or disk before described. In this instance the water can be supplied by a pipe and regulated by a cock. It is also important to be able to stop the flow of water or to raise the moisture out of contact with the paper whenever the press is stopped; otherwise the moisture would spread in the paper and injure the appearance of the same. In order to effect this operation, any suitable connection can be made to a moving part of the press to bring the moisture into contact with the paper when the press is in motion, and to automatically throw the moistener out of action when the press is stopped.

In Fig. 9 I have illustrated a moistener that is connected with the stopping-lever or belt-shifter of the press. This moistener I have represented in the form of a water-holder T′, from which a regulated supply of water passes along a gutter, wire, or piece of flexible material *t*, and there is a pivot *u* for the water-holder and a link *v* to the belt-shifter *w*, so that the water-holder is thrown out of action as the belt is shifted to the loose pulley and the reverse. The cock that regulates the supply may be shut off automatically by the link *v*, as shown in Fig. 1, or in the apparatus shown in Fig. 9 the end of the gutter or tube *t* may be raised above the level of the water to stop the supply.

In Fig. 8 I have represented the half-width web as between two full-width webs. The margin or edge of the half-width web passes sufficiently beyond the line of the fold to make a narrow fold in the edge of the half-width web. In this case the narrower web may be slightly more than the half-width of the whole-width web, so that the printed matter will come properly to register and the fold near the edge of the narrower web will hold such narrower web properly in position between the full-width webs, and in this case it is preferable to use along with the folding-blade. P one or more needle-points *s*, Fig. 8, projecting beyond the edge of the folder to pass through the layers of paper and hold the narrower-width web in its proper position for being folded and prevent the same slipping during the folding operation, and these pins may be used in connection with the folding-blade when one full-width web or two full-width webs are used with the narrower web. In cases where one web is slightly wider than the half-width, as seen in Fig. 8, a line of paste may be applied near the edge to unite the same to the adjacent web in the folding operation. A paste-trough is shown at E^4 to apply the paste to the middle web, and the paste being applied on a line at one side of the fold does not become spread by the folding-blade. In the diagrammatic plan, Fig. 2, the dotted line indicates the position of the central fold, and a sheet is indicated between the two full-width webs, which intermediate sheet is rather wider than the half-width, and the position of the paste-wheel is indicated at E^4.

It will be apparent upon reference to Fig. 7 that in cases where the rolls 25 and 26, that are adjacent to the cutters M M′, occupy the positions represented the roll 27 may be dispensed with. Usually it is preferable to provide a moistening apparatus T with each of the presses, so that all three webs may be moistened in the middle before being passed over the folding-incline, according to the condition of the paper. In some instances it is preferable to apply the water to the under side of the paper, and this may be effected by a wheel running in a trough of water, as seen at T^3, Fig. 1. In all cases it is advantageous to apply the water to the web as it passes from the roll into the press, as the water should have sufficient time to soften the paper before folding.

The cams K′, that serve to actuate the folder K, are upon a cross-shaft K^2 above the folder and the folder is upon arms K^3, piv-

oted upon the cross-shaft K^4. Hence the cams give to the folding-blade a very positive and reliable movement, and where the shaft of the cams is driven by direct gearing from the cutter-cylinder, as indicated by the dotted lines L^4, the folding operation is brought into reliable harmony with the cutting operation, so that the fold takes place the moment the product is cut off and the folding-blade rises in time for the next sheet to pass beneath it. The folding-rolls should be accelerated in their movement.

In my patent, No. 436,155, granted September 9, 1890, the web from the third press is presented with the side that receives the last impression next to the longitudinal folders and the ink is liable to smear. In my present arrangement the side of the web that comes next to the longitudinal folding-inclines has received the first impression and been in contact with the second impression-cylinder, and hence is not liable to be smeared in running over such folding-inclines.

I claim as my invention—

1. The combination, in a printing-machine, of means for supplying a web of paper and printing the same, a moistener for applying a line of moisture longitudinally of the web, and a longitudinal folding mechanism acting on the line of moisture, substantially as specified.

2. The combination, in a folding mechanism adapted to fold a whole-width sheet and a half-width sheet or web, of the folding-blade, rollers between which the fold of the whole-width web is carried by the blade, and pins upon the roller with which the half-width web comes into contact for insuring the proper movement of the half-width web or sheet during the folding operation, substantially as set forth.

3. The combination, with two presses, one for printing a whole-width web and the other for printing a web rather more than half-width, of a cutter for cutting the associated webs off into separate products and a folding-blade and rollers for folding in the center of the whole-width web and near the edge of the other web, substantially as specified.

4. The combination, with two presses, one for printing a whole-width web and the other for printing a web rather more than half-width, of means for applying a line of paste between the inner edge of the narrow width and the whole-width web and where the fold does not come, and a cutter for separating the combined webs into sheets and a folder for folding the sheets on the center line of the whole width, substantially as specified.

5. Three printing-presses for printing on two full-width webs and one web slightly more than half the width of the other webs, in combination with rollers for bringing such webs together and in register, cutters for separating the printed webs to form one product, and a folder for folding such product with the line of fold adjacent to the one edge of the narrower web and central with the other web or webs, substantially as set forth.

6. The combination, in a printing mechanism, of three presses adapted to print upon both sides of three separate webs, an incline for folding one or more of the webs longitudinally, and cutters for cutting off the folded web or webs, cutters for cutting off one or more of the printed webs before being folded, and rollers around which the respective webs are passed between the printing, folding, and cutting devices, whereby the printed webs can be associated, folded, and cut, or cut and folded, as required, substantially as set forth.

7. The combination, with a press for printing upon a web of paper and a longitudinally-folding mechanism, of a moistener adapted to apply a line of moisture longitudinally of the web and where the fold is to be made and automatic moving mechanism for separating the moistener from the paper when the press is stopped, substantially as set forth.

8. The combination, with a press for printing upon a web, of a cutter to cut up the web transversely, a folding-blade to fold the paper transversely, pivoted arms for carrying such blade, a cross-shaft and cams thereon, and rollers directly upon the pivoted arms and acted on by the cams to give motion to the blade, substantially as specified.

9. The combination, with the press for printing on a web and the belt-shifting mechanism, of a water-supply for the paper in line of the fold and a connection from the belt-shifter for stopping the moistening of the paper when the press is stopped, and the reverse, substantially as specified.

Signed by me this 27th day of October, 1890.

WALTER SCOTT.

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