

(No Model.)

W. SCOTT.  
PRINTING MACHINE.

No. 557,152.

Patented Mar. 31, 1896.

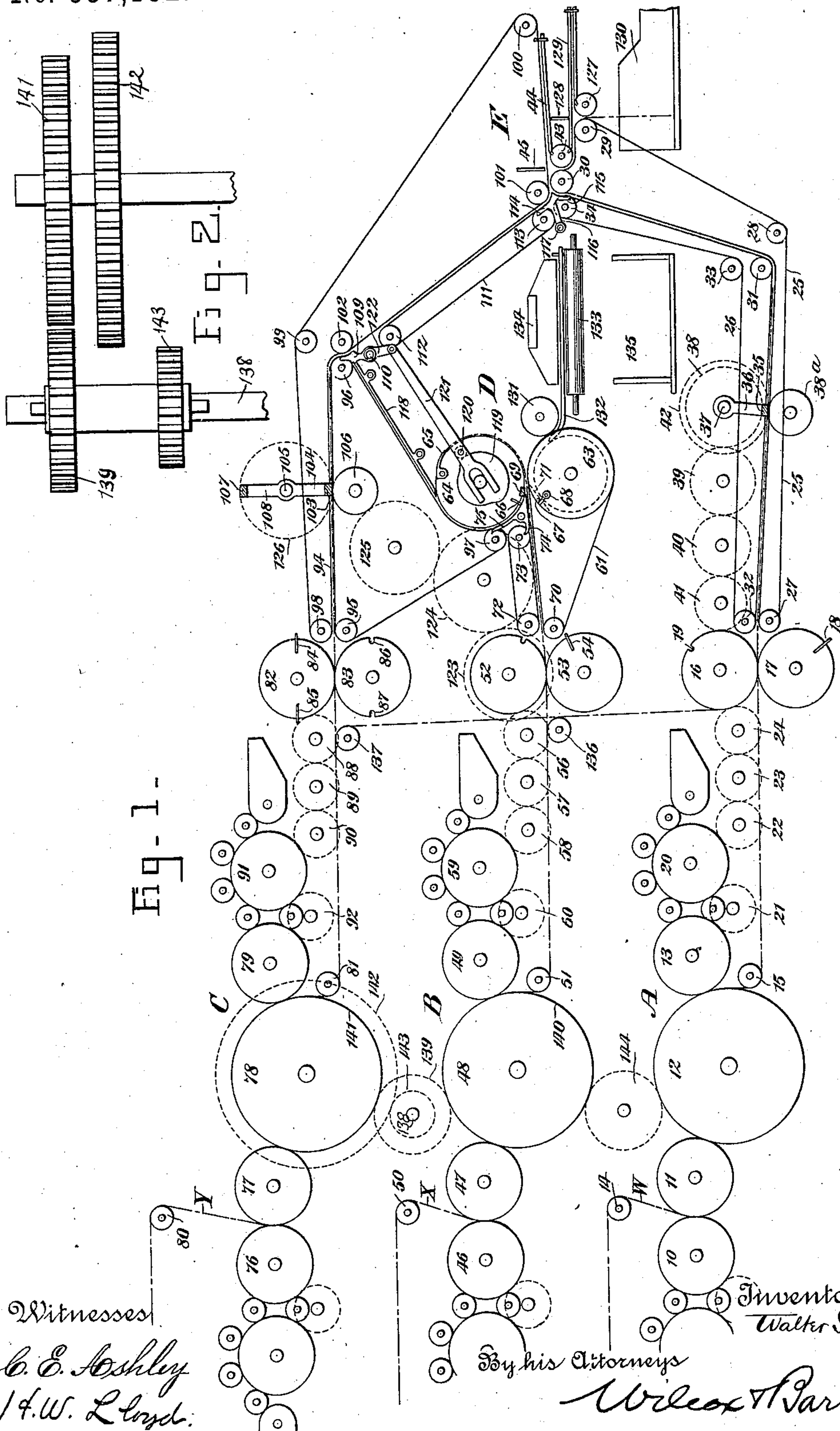


Fig. 1 -

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# UNITED STATES PATENT OFFICE.

WALTER SCOTT, OF PLAINFIELD, NEW JERSEY.

## PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 557,152, dated March 31, 1896.

Application filed December 2, 1891. Serial No. 413,775. (No model.)

*To all whom it may concern:*

Be it known that I, WALTER SCOTT, a citizen of the United States, and a resident of Plainfield, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Printing-Machines, of which the following is a specification.

One form of my invention is shown in the accompanying drawings, forming part of this specification.

The objects of my invention are to simplify the construction of web-perfecting printing-machines, to increase their capacity, to reduce the space occupied by them, and other objects, as will hereinafter appear.

In carrying my invention into effect I employ two main printing-machines each perfecting webs of desirable width from which full or given length sheets are subsequently severed, and an auxiliary printing-machine perfecting a web from which half-length or supplemental sheets are subsequently severed, a folding mechanism for each main machine, and means for alternately diverting the supplemental sheets to said folding-machines. The printing-machines are arranged one above another in parallel planes and the folding mechanisms are placed one ahead of the other in relation thereto.

The printing-machines shown are of the well-known rotary type, the plate-cylinders of which may be inked by any suitable apparatus, such apparatus not being shown, as it may be of any usual form.

Figure 1 is a side elevation of the invention, the framework and other accessories being omitted; and Fig. 2 is a detail view of gearing for driving the machines at the same or at different speeds.

In the accompanying drawings the two lower machines are the main machines and the upper machine is the supplemental machine. It is obvious, however, that this arrangement need not be adhered to in practice. The lower machine (marked A) consists of the first plate-cylinder 10, first impression-cylinder 11, the second impression-cylinder 12, the second plate-cylinder 13, and appropriate inking apparatus for the plate-cylinders. The web W is led into said machine A from a roll (not shown) suitably supported in the framework. Said web is shown as being

led over a roller 14, thence between the first plate and impression cylinders around the latter and the second impression-cylinder, between the last and the second plate-cylinder, the perfected web being led under roller 15 and to the perforating-cylinders 16 17. These cylinders perforate the web by any suitable or usual devices into full-length sheets. The cylinder 17 has the perforating-blade 18, and the cylinder 16 has the coacting groove 19. The perforating-cylinders are driven at the speed of the machine A by any suitable means. The means shown for driving these cylinders consists of gearing connecting them with the distributing-cylinder 20 of the inking apparatus for cylinder 13, said cylinder 20 being connected to cylinder 13 by gear 21 and to the cylinder 16 by gearing, as 22 23 24. Cylinders 16 17 are geared together in the usual way.

The web after leaving the perforating-cylinders is taken between the accelerating-tapes 25 26, which run at a speed slightly greater than that of machine A. The said tapes 25 are on rollers or pulleys 27, 28, 29, 30, and 31. Tapes 26 are on rollers 32, 33, 34, and 31. The web after leaving the perforating-cylinders continues in the same general direction it was previously moving until it reaches the roller 31, at which point the tapes make a sharp turn upward. The distance of the roller 31 from the perforating-cylinders is rather more than the length of the sheets which they detach from the web W. After the cylinders have perforated the web the sheet is not detached therefrom until the leading end thereof is nipped at the roller 31 by the accelerating-tapes. It sometimes happens that the forms cut through the webs at the sides of the forms along the central or other margin. In such case it might be that the nip of the tapes would detach the sheet along such central margin rather than at the line of perforations. To prevent this mishap, I provide suitable clamping mechanism for clamping the sheets along the central margin at the moment the sheets are nipped by the tapes, said mechanism having the same surface speed as the tapes at the moment of clamping. The mechanism that I prefer to use in this instance consists of a revolving bar on one side of the web and a coacting



roller or revolving bar on the other side thereof. The bar 35 is borne by arms 36 from the shaft 37. The coacting roller 38<sup>a</sup> is journaled below the web, which rests on the top thereof as it passes along. The shaft 37 is driven at the speed of the accelerating-tapes by any suitable means. The means shown for so driving it consists of the gear 38 on said shaft 37 and intermediate gears 39 40 41, connecting gear 38 with the gear of cylinder 16. The shaft 37 has a gear 42 of larger diameter than gear 38 connecting it with the gear on cylinder 38<sup>a</sup>. The distance of the exterior surface of the bar 35 from the center of shaft 37 is equal to the radius of the pitch circle of the gear 42. This construction gives the said bar 35 a speed greater than that of the web W.

The full-length sheets are run by the tapes 26 26, over rollers 30 43, onto the guides 44, and are folded by the creaser 45 in the manner hereinafter described.

The second main printing-machine B consists of a first plate-cylinder 46, first impression-cylinder 47, second impression-cylinder 48, second plate-cylinder 49, the usual inking apparatus, and other adjuncts. The web X is led from a roll (not shown) into the printing-machine B in any suitable way, as over a roller 50, is perfected or printed on both sides, led under roller 51, and to the perforating-cylinders 52 53. The cylinder 53 carries the perforating-knife 54, and cylinder 52 has the coacting groove 55. The cylinders 52 53 are driven at the speed of the machine by any suitable means, as by gears 56 57 58, connecting cylinder 52 with the distributing-cylinder 59 of the inking apparatus for plate-cylinder 49, the said cylinder 59 being geared to cylinder 49 by the intermediate gear 60.

From the cylinders 52 53 the web is led between the tapes 61 62 to a suitable folding mechanism, as D. The folding mechanism shown consists of cylinders 63 64, the cylinder 64 having sheet-retainers, as grippers 65, opposite which is a creaser 66, and cylinder 63 having a groove 67 for coaction with said creaser, and grippers 68 for coaction with the groove to retain creased edges of sheets. Since the folding mechanism moves at a greater speed than the web, the same difficulty with sheets cut by the plates might be experienced here. For the purpose of clamping the sheets along the central margins at the moment they are detached from the web I employ a bar 69 on the cylinder 64, at the periphery thereof, the said bar coacting with the surface of cylinder 63 at that moment to clamp the sheets. Cylinders 63 64 do not clamp the web between them except when the bar 69 is in action. The pressure of the grippers 65 must be so regulated that the end of the web may slip thereunder—that is to say, the web must slip rather than to tear, even when partly cut by the plates or perforated by the knife 54. The action of the bar 69 and cylinder 63 clamping the sheets along

the central margins detaches them from the web at the line of perforations. The tapes 61 run on roller 70 and cylinder 63, there being grooves 71 in cylinder 63, transverse of the groove 67, to allow the said tapes to come below the creaser 66. Tapes 62 run on rollers 72 73. Guides 74, extending from between the pulleys 73 to near the cylinders 63 64, retain the sheets or web on the tapes 61 to that point. A curved guide 75, preferably integral with guide 74, extends from near the cylinders 63 64 back around the latter, for the purpose hereinafter described. The folding of the sheets taken by cylinders 63 64 will be hereinafter described.

The auxiliary printing-machine C consists of a first plate-cylinder 76, a first impression-cylinder 77, a second impression-cylinder 78, a second plate-cylinder 79, the usual inking apparatus, and other adjuncts. The web Y is led from a roll (not shown) in any suitable way, as over roller 80, to and between the cylinders 76 77, around the latter, and over cylinder 78 to and between the last and cylinder 79, and is thence led under roller 81 to the perforating mechanism. Supplemental or half-length sheets are severed from the web Y and are alternately directed to the folding mechanism D of machine B and folding mechanism E of machine A, and are there folded with the full-length sheets, as hereinafter described.

The perforating mechanism shown for the web of the supplemental machine C consists of cylinders 82 83, the cylinder 82 carrying two perforating-blades 84 85 at opposite sides thereof, and cylinder 83, having two grooves 86 87 at opposite sides thereof, for coaction with blades 84 85, respectively, to perforate half-length sheets. Cylinders 82 83 may be driven in any suitable way, as by gears 88 89 90, connecting cylinder 82 with the distributing-cylinder 91 for plate-cylinder 79. Said cylinder 91 is geared to cylinder 79 by the intermediate gear 92.

The web Y after leaving the cylinders 82 83 is carried between accelerating-tapes 93 94. Tapes 93 run about on pulleys 95 96 97 and cylinder 64, hereinbefore described. Tapes 94 run on pulleys 98, 99, 100, 101, and 102. Pulleys 96 102 are adjacent each other, and the tapes make a sharp turn at this point for the purpose of nipping the leading edges of the web. The pulleys 96 102 may be so located that there will be but one line of transverse perforations between them and the perforating-cylinders 82 83, but I prefer to locate them, as shown, at rather more than twice the length of a half-sheet, for purposes hereinafter referred to. In the last case, if only the nip of the tapes as they pass the roller 96 be depended upon to detach the half-sheets from the web, the break might not be at the line of perforations nearest the roller 96. To insure the proper breaking of the sheets from the web, I may employ a clamping or breaking mechanism similar to that hereinbefore



described in connection with the web W. The breaking-bar 103 is carried by arms 104 from a shaft 105 above the web Y. Below the said web is a cylinder or roller 106 for coaction with the said bar 103. The length of the arms 104 may be such that the bar 103 will make one revolution for each half-sheet and detach the same from the web. I prefer, however, to have the arms 104 of twice the length necessary for the above mode of operation, so that the bar 103 will make one revolution for each two half-sheets and to place a bar 107 on the opposite side of shaft 105 from bar 103, the said bar 107 being supported by arms 108. Bars 103 107 will thus alternately detach the half-sheets from the web. The half-sheets, after being detached from the web, are carried by the accelerating-tapes 93 94 to the nipping-rollers 96 102, at which point they are alternately directed to the folding mechanisms D and E by any suitable means. I show a spear-headed switch 109 on shaft 110, journaled in the framework, for the purpose of diverting the half-sheets, as described. The sides of the spear-head are curved, as shown, to coact with the rollers in guiding the sheets. The half-sheets directed to the folder E are carried thereto by tapes 94 111, the said tapes 111 running on rollers 112 113. The rollers 30, 34, 101, and 113 are adjacent each other, the rollers 30 101 feeding the sheets and half-sheets under the creaser 45 onto the guides 44. Guides 114 115, curved around rollers 101 and 30, respectively, direct the half-sheets and sheets between said rollers. The said guides are carried by arms 116 from a shaft 117 mounted in the framework. With the switch 109 in the position shown the half-sheet is diverted to folder E, and when it is moved over to the right the half-sheet is directed to folder D. I have shown a set of guides 118 for supporting the half-sheets from the switch 109 to the cylinder 64, the said guides coacting with the tapes 93 to feed the half-sheets.

The switch 109 may be moved by any suitable means. I show it as being operated from the shaft of cylinder 64 by means of a cam 119 thereon, the cam acting on a roller 120 on rod 121 pivotally connected to an arm 122 of shaft 110, and being forked at its other end to straddle the shaft of cylinder 64. The cam 119 may be an open one, as shown, and a spring (not shown) be used to hold the roller 120 thereagainst; or the cam may be a closed one and govern the rod 121.

The folding mechanism D and the breaking-bar for the supplemental web may be driven at a greater speed than that of the webs by any suitable means. The mechanism shown for driving these parts consists of a gear 123 on the shaft of cylinder 52, the said gear being of larger diameter than said cylinder and having a greater linear speed. A gear 124 connects gear 123 with gear on cylinder 64. Gear 124 is connected with a gear on cylinder 106 by a gear 125. A gear

126 on shaft 105 meshes with the gear of cylinder 106.

With the mechanisms in the position shown the half-sheets that go to the folder E have their leading edges brought in register with the leading edges of the full-length sheets and are run on the guides 44 therewith. The creaser 45 descending on the central margin folds the sheet between rollers 30 43. The copies may be further folded, if desired, in which case such folding is done by rollers 29 127, a creaser 128 forcing the sheets between the same. Guides 129 retain the sheets against the said rollers. After the last folding the copies may be delivered in any suitable way, as into a trough 130.

The operation of the folding mechanism D is as follows: The ends of the web are taken by the grippers 65 and carried around therewith; but as the web has not yet been perforated and as the grippers move slightly faster than the web, the same slips under the grippers until such time as the knife 54 has perforated the web, or rather until such time as the pad or bar 69 shall have gripped the sheet near the central margin, when the sheet is separated from the web; or the action of the creaser 66 and groove 67 may certainly be depended upon to separate the sheets from the web. After the creasing the grippers 68 take the creased margins and carry them around until they approach the roller 131 and the stripping-fingers 132, when the grippers open and the sheets are fed out on the fingers or rod 132. The half-sheets are preferably associated with the full-length sheets, so that their leading ends will be folded with or in register with the central margins of said full-length sheets. The copies run on the rod 132 may be further folded, as by folding-rolls 133 and creaser 134, and be suitably delivered, as into a receiving-trough 135.

The constructions thus far described will produce one or two six-page copies, as may be desired. To produce one six-page copy, either of the machines A or B may be used, and the supplemental machine C be run at half-speed, producing half-length sheets which are separated from the web, as above described, and are all directed to the folder E or D, as the case may be. The switch 109 may be set to direct them to the proper folder, or it may vibrate, as in the case where both machines A and B are used, and direct the sheets to the proper folder, since the half-sheets will only arrive at half the frequency that they do when the supplemental machine is run at full speed, as will be readily understood.

The webs of all the machines may be associated prior to the perforating thereof and all be led into one folding mechanism to produce copies of eight or twelve pages. In such case the web X may be led around roller 136 and downward around cylinder 16 and be associated with the web W and perforated therewith by the cylinders 16 17. The subsequent



operation of detaching the full-length sheets and folding them will be readily understood from the foregoing description of the detaching and folding mechanisms. In like manner  
 5 the web Y may be led around roller 137 and down to the cylinder 16 and be associated with the webs W X, whereby twelve-page copies may be produced.

Ten-page copies may be produced by associating the web X with the web W in the manner above described and by running the supplemental machine C at half-speed and directing the half-sheets produced thereby to the folder E, where they will be associated  
 15 with and folded into the full-length sheets severed from the webs W X. Ten-page copies may also be produced as follows: The webs perfected by the machines A and B may be in sections or be split into sections, the sections having unlike matter printed thereon,  
 20 and the two sections of each web be superimposed by suitable turners prior to their entry between the perforating-cylinders to form eight pages. The supplemental machine C  
 25 running at full speed and perfecting a single-width web, the half-length sheets severed from it would be directed to the folding mechanisms D and E in the manner above described and associated with the eight-page sheets  
 30 there to form ten-page copies, which will be folded as above described.

In case it were desired to produce an eight-page copy and also a four-page copy it can be done with the machines shown in several  
 35 ways, of which I will describe one. One of the perforating-blades 84 85 may be removed or otherwise rendered inoperative, and that one of bars 103 107, which would coact with the middle portion of the full-length sheets  
 40 thus formed to detach the same from the web, would be left on and the other removed from its operative position. The switch 109 would be disconnected from its operative mechanism and set to direct the full-length sheets  
 45 either of the folding mechanisms D and E, as might be desired. The parts would be so timed that the leading edges of the full-length sheets from machine C would register with the leading edges of the full-length sheets  
 50 from machines A or B as they entered the folding mechanism with the same.

Assuming that machines A and C were employed to produce eight-page copies, the folder E would fold the products thereof, while the  
 55 folder D would fold the four-page copies from machine B. By using suitable turners and by having the webs of machines A and B, which are superimposed by the turners, and by using the machines in the manner just described copies of twelve, sixteen, twenty, and  
 60 so on, pages may be produced and folded at the machine E, while eight, twelve, and sixteen, and so on, paged copies may be folded at the folding mechanism D.

65 The machines A, B, and C may be driven at the required speed by any suitable mechanism, as by that shown and now to be described.

The power to drive the machines may be derived from shaft 138 between machines B and C, the said shaft having a gear 139 at each  
 70 end to mesh with gears 140 and 141 on cylinders 48 and 78, respectively, and having the same pitch as said cylinders, said gears 140 and 141 being at opposite ends of their cylinders. The gear 139 that meshes with gear  
 75 140 is fast on the shaft, while the gear 139 that meshes with gear 141 is splined to move longitudinally of said shaft 138, so as to be disconnectible from gear 141. Adjacent the  
 80 gear 141 and inside the same is a large gear 142, also on cylinder 78, while adjoining the gear 139, that meshes with gear 141, is a smaller gear 143 rigid with said gear 139 and  
 85 splined to shaft 138 to slide thereon. The said gears 142 and 143 are of such sizes that when they are in mesh and gears 139 141 out of mesh the machine C will be driven at half-speed. Cylinders 12 and 48 are geared together by an intermediate gear 144, which  
 90 may be mounted so as to be disconnected from said cylinders, if desired.

The surfaces of the folding-cylinders 63 64 are separated by a space, so that they will not  
 95 act to feed the sheets or web. The tapes 61 62 are likewise separated for the same purpose. After the leading edge of the web has been taken by the grippers 65 the same slips thereunder, as the grippers are moving faster than the web, until such time as the pad or  
 100 bar 69 and its coacting parts shall grip the paper or until the creaser and groove shall have creased the same. At this time the sheets are detached from the web, the end of the web resting on the tapes and being fed forward  
 105 thereby.

In the drawings the supplemental machine is shown as being above the main machines, and the web of the lower main machine is shown as being led under or around the folding mechanism of the upper main machine  
 110 to its own folding mechanism, said folding mechanism being shown one ahead of the other—i. e., nearer the presses than the other. Of course the web of the upper main machine may be led to its folding mechanism over or  
 115 around the folding mechanism of the lower main machine, and if the supplemental machine be used also in the latter case it would be under the lower main machine.

It will be noted that the full-length sheets  
 120 severed from the webs W X are four-page sheets at least and that the perforating devices act only at alternate margins between pages, while the bars 35 69 and the parts coacting therewith clamp the other alternate  
 125 margins along their entire length, overlapping on the printed matter, thus preventing tears, as above stated.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—  
 130

1. The combination with a printing mechanism for perfecting a web or webs, of perforating mechanism arranged to act on alternate



margins to divide the web or webs into sheets, accelerating devices, and margin-clamping mechanism arranged for clamping the sheets the length of the other alternate central margins as the sheets are seized by the said accelerating devices, whereby strain on the said central margins is avoided as the sheets are torn from the web or webs, substantially as and for the purpose set forth.

2. The combination of printing mechanism for perfecting a web or webs, perforating-cylinders for dividing the web or webs into sheets along alternate margins, accelerating-tapes, and a revolving clamping or breaking bar and coacting roller or bar arranged to clamp the sheets the length of the other alternate central margins as the sheets are nipped by said tapes, whereby strain on such central margins is avoided as the sheets are torn from the web or webs, substantially as described.

3. The combination with printing mechanism for perfecting three webs, two perforating mechanisms for dividing two of said webs along alternate margins into full sheets, a folding mechanism for each of said two full sheets so formed, accelerating devices between said perforating mechanisms and said folding mechanisms, margin-clamping mechanism for each of said two full sheets for clamping the same the length of the central or other alternate margins as the sheets are nipped by the said accelerating mechanisms, whereby strain on said central margins is avoided, and means severing half-sheets from the third web and associating them alternately with said full sheets, substantially as described.

4. The combination with printing mechanism for perfecting three webs, two perforating mechanisms for dividing two of said webs along alternate margins into full sheets, a folding mechanism for each of said two full sheets so formed, accelerating devices between said perforating mechanisms and said folding mechanisms, margin-clamping bars and coacting bars or rollers for each of said two full sheets for clamping the same the length of the central or other alternate margins as the sheets are nipped by the said accelerating

mechanisms, whereby strain on said central margins is avoided, and means severing half-sheets from the third web and associating them alternately with said full sheets, substantially as described.

5. The combination of a printing mechanism for perfecting a web, a perforating mechanism for dividing said web along alternate margins into full sheets, a folding mechanism, accelerating mechanism between said perforating and folding mechanisms containing margin-clamping members which clamp the other alternate margins along their length as the accelerating mechanism nips the full sheets, whereby strain on such central or other alternate margins is avoided, a second printing mechanism for perfecting a web running at a fraction of the speed of the first-named printing mechanism or web, and mechanism for severing short sheets from said second web and associating them with the full sheets, substantially as described.

6. The combination of a printing mechanism for perfecting a web, a perforating mechanism for dividing said web along alternate margins into full sheets, a folding mechanism, accelerating mechanism between said perforating and folding mechanisms, a revolving margin-clamping breaking-bar and coacting bar or roller for clamping the other alternate margins along their length as the accelerating mechanism nips the full sheets, whereby strain on such central or other alternate margins is avoided, a second printing mechanism for perfecting a web running at a fraction of the speed of the first-named printing mechanism or web, and mechanism for severing short sheets from said second web and associating them with the full sheets, substantially as described.

Signed at New York, in the county of New York and State of New York, this 25th day of November, A. D. 1891.

WALTER SCOTT.

Witnesses:

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