(No Model.) 3 Sheets—Sheet 1.

E. B. STOCKING.

METHOD OF AND MEANS FOR FOLDING PAPER.

No. 264,364. Patented Sept. 12, 1882.

Fig. 1

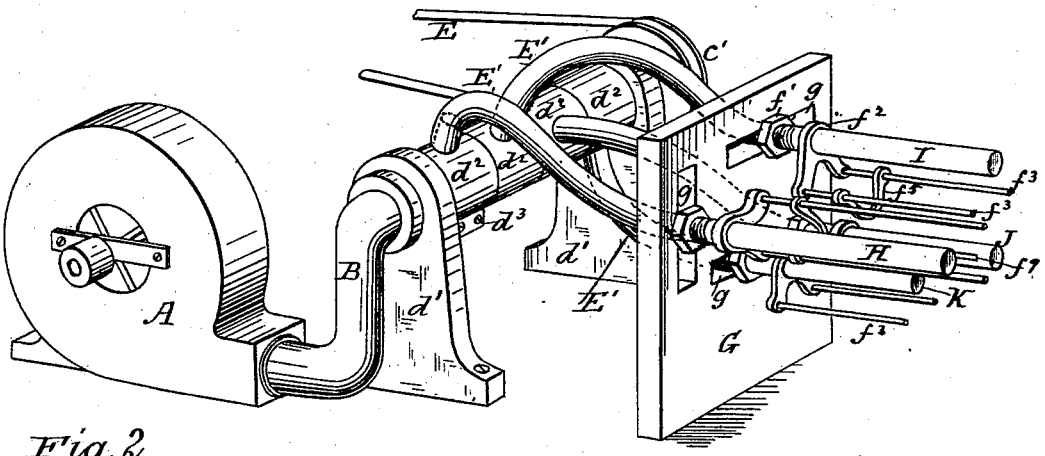


Fig. 2

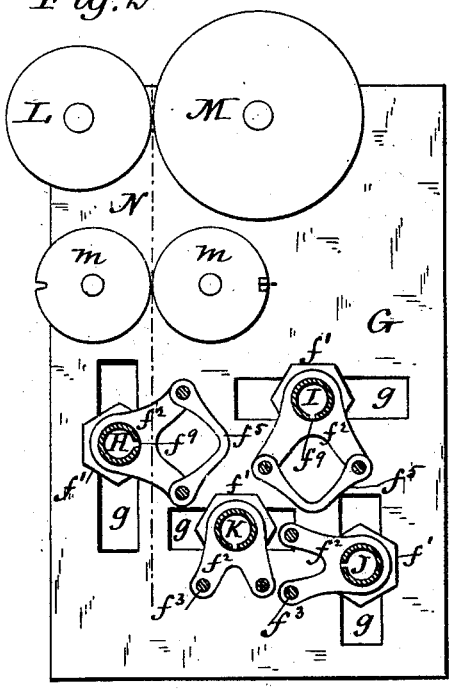


Fig. 3

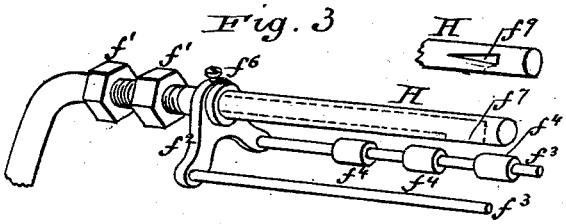


Fig. 4

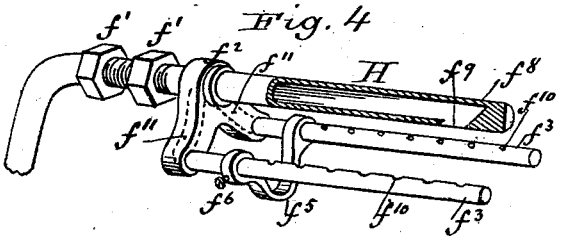


Fig. 5

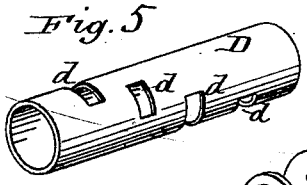


Fig. 6

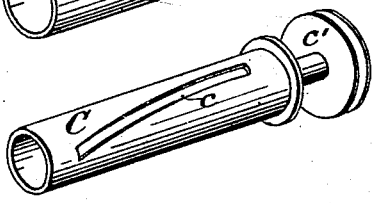
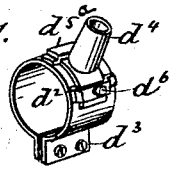


Fig. 7.



Witnesses:

E. E. Masson

W. B. Masson

Inventor

Edgar B. Stocking

(No Model.) 3 Sheets—Sheet 2.

E. B. STOCKING.

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Fig. 8.

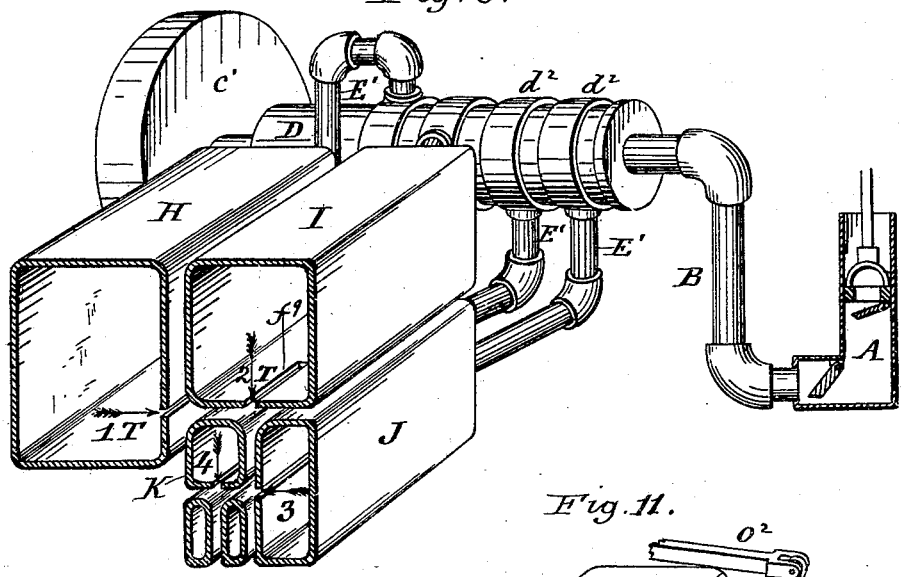


Fig. 11.

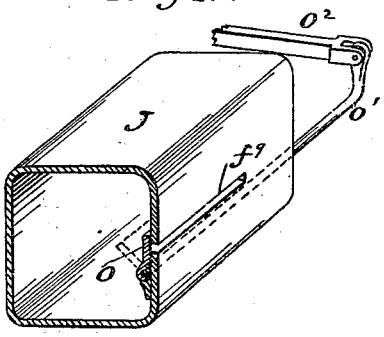


Fig. 9.

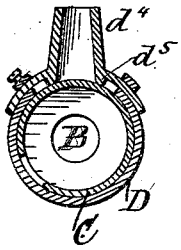


Fig. 10.

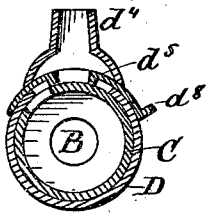
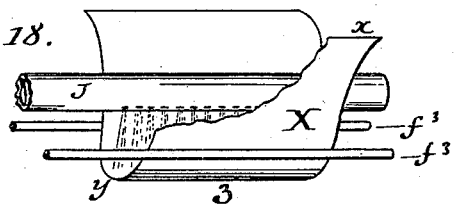


Fig. 18.



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METHOD OF AND MEANS FOR FOLDING PAPER.

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Fig. 12.

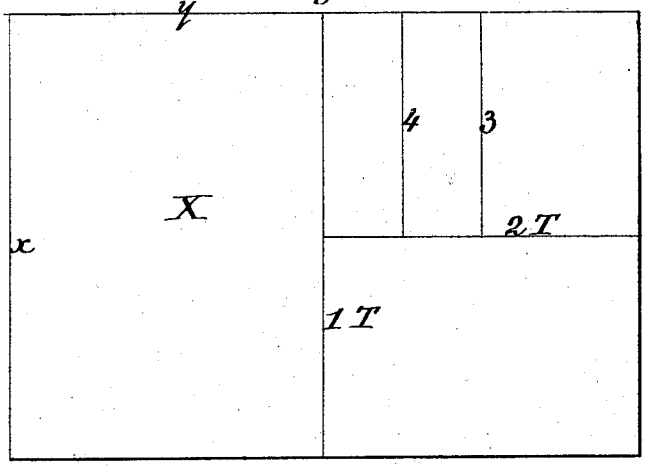


Fig. 13

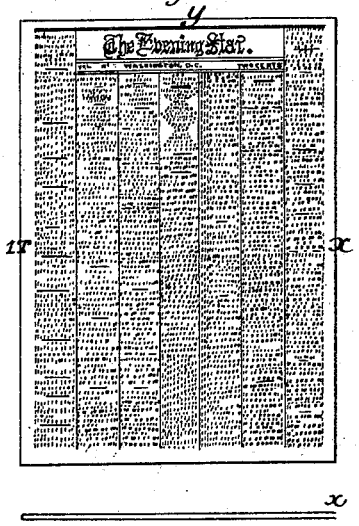


Fig. 14

Fig. 15.

Fig. 16.

Fig. 19.

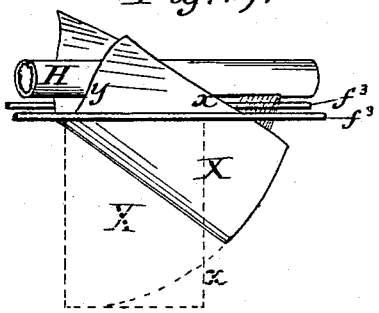
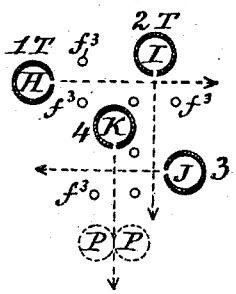


Fig. 17.



Witnesses:

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UNITED STATES PATENT OFFICE.

EDGAR B. STOCKING, OF WASHINGTON, DISTRICT OF COLUMBIA.

METHOD OF AND MEANS FOR FOLDING PAPER.

SPECIFICATION forming part of Letters Patent No. 264,364, dated September 12, 1882.

Application filed May 6, 1882. (No model.)

To all whom it may concern:

Be it known that I, EDGAR B. STOCKING, a citizen of the United States of America, residing at Washington, in the District of Columbia, have invented a certain new and useful Method of and Means for Folding Paper; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

The object of my invention is to provide a method of and means for folding paper without the employment of tapes, folding-blades, or folding-rolls, and, though applicable to fold paper in the entire field of paper manufactures, it is more particularly designed to fold printed sheets or newspapers, either when presented for folding automatically by a printing-press or by hand.

Heretofore a blast of air has been employed to force paper into the bite of pressing and feeding rolls, which rolls acted to complete the fold and feed the paper, and it has been suggested that a blast of air might be substituted for a folding-blade to direct the paper into the bite of pressing and feeding rolls, which are conical, and which act to complete the fold, to feed the paper, and to turn the paper while it is being fed. In all cases heretofore the blast of air has performed the function of the folding-blade only—that is, to direct the paper into the bite of rolls running in contact with each other, whereby the rotation of the rolls thus in contact completed the fold by pressing the portions of the paper located on each side of the fold-line together and feeding the paper therethrough.

I am not aware of any instance, before my invention thereof, of forcing paper by means of a blast of air through mechanism which acts to complete the fold without acting to compress and feed the paper; nor am I aware of any instance of directing the blast against the paper in such a manner as to not only fold it, but also to turn the paper, so that what were its side edges become its ends and what were its ends become its side edges.

My invention therefore consists, first, in supporting the paper at points a distance from and on each side of the fold-line and directing a blast of air along the fold-line, so that the folding and feeding of the paper so supported are accomplished solely by the blast of air. In this operation the paper is simultaneously folded and fed by a blast of air.

Secondly. My invention consists in supporting the paper at points a distance from and on each side of the fold-line and directing a blast of air against the paper along a portion only of the fold-line, so that the feeding, folding, and turning of the paper so supported are accomplished solely by a blast of air. In this operation the paper is simultaneously folded, fed, and turned by a blast of air.

Thirdly. It consists in turning a suitably-presented sheet by a blast of air directed against a part only of the fold-line.

My invention also consists in certain mechanism hereinafter described, and specifically set forth in the claims.

Referring to the drawings, Figure 1 is a perspective of mechanism adapted to practice my method of folding paper. Fig. 2 is a front elevation of a portion of Fig. 1, with parts thereof in section, and having associated therewith certain elements of a printing-press. Figs. 3 to 7, inclusive, are details of said mechanism. Fig. 8 is a modified form thereof. Figs. 9 and 10 are details of said modified form. Fig. 11 is a modification of the blast-controlling mechanism. Figs. 12 to 16, inclusive, are plans and edge views of a newspaper as it appears before and after each fold. Fig. 17 shows the relative position of certain elements of the mechanism employed, the direction in which the paper is moved at the making of each fold, and the location of final pressing-rolls which may be employed. Fig. 18 illustrates the operation of folding, and Fig. 19 that of folding and turning.

Like letters refer to like parts in all the figures.

A represents a blower, or it may be a force-pump, of usual construction, and the blast produced thereby is conducted by a pipe, B, into a cylinder, C, which is slotted longitudinally. It may be either in a straight line or a curved line, the latter as shown at *c*, and the cylinder

is closed at one end only, and provided at its closed end with a pulley, c'. The cylinder C is surrounded by a snugly-fitting cylinder, D, which is slotted circumferentially at d d, said slots being located parallel to and lapping by each other, as in this instance; but they may, if desired, be otherwise disposed, the only requirements of the case being that said slots shall not directly communicate one with another. No more than one at a time register with slot c of cylinder C. The cylinder D is supported rigidly in a frame-work or blocks, d' d', and is surrounded by collars d^2—in this instance four in number—and each of the collars is split and is drawn together by screws d^3, so that they snugly fit the cylinder D. Each collar is provided with a nozzle, d^4, which has two lugs, d^5, which fit the slots d transversely, but are of less extent circumferentially than the slots, as clearly shown in Figs. 9 and 10. A belt, E, is connected with the pulley c', and with any convenient motor or moving part of a printing-press with which the mechanism is associated, so that the cylinder C is rotated once during the delivery of each sheet from the press. Each of the nozzles d^4 is adjustably held upon the cylinder D by means of the manner of attachment thereto—viz., being split and bound thereon by screws d^3—in which case the nozzles are integral with the collars, as shown by dotted lines in Fig. 1; or they may be separate and adjustably held upon the collars by the loops a^{5a} and set-screw d^6, as shown in Fig. 7; or a slide-valve, d^8, provided with lugs d^5, may pass through slots in the base of the nozzle, as shown in Fig. 10. Curving slot c in cylinder C prevents registering with two of the slots d in cylinder D simultaneously. A flexible pipe, E', connects each of the nozzles with a rigid pipe supported in frame-work, which may be a portion of the frame-work of a printing-press.

At G, Figs. 1 and 2, I have illustrated a frame-work and one manner of supporting the rigid pipes so that they may be adjusted in different relative positions. The frame is slotted in this instance at four places, g, the slots being arranged at right angles to each other. Each of the rigid pipes H I J K is screw-threaded at its inner end—that is, the end which is supported in the frame-work—and is provided with two nuts, f' f', which, after the pipe is passed through the slot, are turned toward each other and firmly bind the pipe at any desired point therein. Each of the pipes is also provided with a bracket, f^2, which is adapted to support two or, if desired, more rods or pipes, f^3 f^3, and these may, if desired, be supplied with or constitute in themselves friction-rolls f^4 f^4, and may, if desired, be provided with dependent or extending loops f^5, adapted to slide along upon and to be adjustably fixed at desired points thereon, as may also the brackets f^2 by set-screws f^6. The outer end of each of the pipes H I J K is closed, so that the inner surface thereof is at right angles to its length, as shown at f^7 in Fig. 3 by dotted lines; or it may be slanted outwardly at that point, or inwardly, as shown at f^8 in section at Fig. 4, and these pipes are slotted from their closed ends toward their inner ends to a greater or less distance, as desired, as shown at f^9, and when pipes are used, as at f^3, Fig. 4, they may be perforated, as shown at f^{10}, in which case they communicate with the pipes to which they are connected by means of passages f^{11} in the brackets f^2.

In Fig. 2, L represents one of the type-cylinders, and M the impression-cylinder, of a rotary printing-press, and the rolls m m are the feed and cutting rolls thereof, which operate to deliver and sever the web N as separate printed sheets and automatically present the same for folding.

In the modified form of mechanism illustrated in Fig. 8 a force-pump is substituted for the blower and rigid pipes for the flexible pipes, and the pipes H I J K are made large and substantially square in cross-section, in order that they may perform the function of the rods in supporting the paper; and in Fig. 11 a valve, o, pivoted within a pipe, may be employed so as to cover the slot f^9, when closed, by oscillating the crank-rod o' through the means of the connecting-rod o^2, which may be operated in any suitable manner, by which modified construction compressed air may be confined within the pipes and automatically discharged so as to drive the paper through and between the pipes and fold or fold, feed, and turn the same, as hereinafter described.

The operation of folding paper by my method and by the employment of the mechanism described is as follows, reference being had, first, to Figs. 12 to 19, inclusive, in order to render the same more clear.

Fig. 12 represents the inner pages of a four-page paper, X, the title being supposed to be at the upper left corner and on the under side of the sheet; and as presented for folding, as in Fig. 2, the title is supposed to be at the lower inner corner, and, for convenience, from this point in the description Fig. 17 will be referred to. The end x of the sheet is in front, in line of feed from the press. When the middle fold-line, 1 T, (which indicates first fold and turn,) has arrived opposite the slot in pipe H a blast of air from the pipe is directed against the sheet and over a part only thereof that is near the outer end of the fold-line, whereby the sheet is forced between the rods f^3 f^3 in the direction indicated by the arrow, and is turned as indicated by dotted lines, Fig. 19. This brings the side y to the rear and the end x to the side in the line of feed, and the title is still on the under side. For convenience in following the result of each subsequent fold, I have reversed the paper, so as to show the titles in Figs. 13, 14, and 15. When the fold-line 2 T (second fold and turn) arrives opposite the slot near the outer end of the pipe I a

blast is directed therefrom and against the outer part only of said fold-line, and the sheet is folded between the rods located below that pipe and fed between the pipe J and its rods and simultaneously turned, as before described with reference to the first fold, and when the line 3 arrives opposite the slot of the pipe J, a blast extending along substantially the entire line of fold, (the slot of pipe J being sufficiently long to emit such a blast,) the paper is folded and fed between the rods f^3, connected with this pipe, (which simply folds without turning,) as clearly illustrated in Fig. 18; and the same operation is repeated when the line 4 arrives opposite the similar slot of pipe K.

P P, Fig. 17, represent a pair of feeding and pressing rolls, into the bite of which the blast from pipe K may deliver the folded paper if desired; or the usual receiving-trough may be employed. The paper being usually damp, but slight pressure is required to compress the plies of the folded papers, and, furthermore, a very sharply defined fold is not desirable. The edge views given are intentionally exaggerated; but the actual operation of the method and mechanism described produces folds of usual and desirable compactness and regularity.

In the operation of the modified form of mechanism shown in Fig. 8 it will readily be seen that the pipes H I J K form supporting-surfaces and reservoirs of compressed air, by which my method can as readily be practiced. Practically only one sized sheet is required to be folded—that is, this construction of mechanism is intended to be arranged within the frame-work of a printing-press and to constitute a part thereof, so that substantially one sized sheet only will be required to be folded thereby. In case a "double sheet" is desired an additional straight-folding round blast-pipe can be arranged above the pipes H I, and by suitable well known means the sheet can be conducted thereinbetween, and a first fold without turning would present the double sheet, to be subsequently folded, as hereinbefore described. The rapidity in the succession of the blasts in the successive pipes is governed by means of the adjustment of the nozzles circumferentially nearer to or farther from each other, as desired, or by determining by the location of the lugs d^5 the point during the rotation of the slotted cylinder C within the limits of a slot, *d*, in the cylinder D at which an exit of the blast shall occur. A double series of blasts through a single series of nozzles can be produced by duplicating the slot in cylinder C, and said duplicate slot may be located one-half circumference from that shown, so that about as the third fold in one sheet is being made a first fold may be made in a following sheet, and in this manner two or more sheets may be simultaneously and separately folded. Other varied uses of the method and means will readily suggest themselves to persons skilled in the art.

In the modification shown in Fig. 4 the perforated pipes f^3 f^3 tend to lift the sheet at either side of the fold-line and facilitate the operation of the main blast, and when used it would be practicable to construct the bracket so that several similar pipes could be supported to serve as a table or wide support for the sheet, a portion or all of them being perforated, to lift uniformly or with greater force at the side edges or the ends of the sheet to aid in a straight folding or a folding and turning thereof. The loops f^5 are not absolutely necessary to a successful turning of the sheet. They are added to facilitate the operation, and they may be used or omitted.

By widening the slots *g*, Fig. 2, each of the pipes H I J K may be adjusted in all directions from each other, and by turning each pipe axially its slot may be elevated or depressed so as to direct the blast to fold in slanted directions, and in this form of mechanism and that shown in Fig. 8 different-sized sheets may be folded by simply properly timing the blasts as to duration and succession—as, for example, in folding a long sheet, the second blast is delayed until the desired fold-line arrives at a point opposite the slot from which it is emitted, the delay being in exact relation to the increased length of the sheet to be folded. In case of a turning-blast, as from pipe H, said blast may not be suddenly cut off; but as the turn is completed a slight blast may be continued against the folded and turned sheet, between the plies, and against the fold-line thereof, to hold the same momentarily in or against the sides of a suitable (well-known) pocket until the succeeding blast shall be emitted.

It is evident that my method of turning sheets of paper may be employed without its instrumentality in folding the sheet, as where mechanism or the hands are employed to present said sheets in U form to the operation of a blast which is directed against said sheet at or near only one of its edges, (see Fig. 19,) whereby the sheet would be turned as hereinbefore described, any well-known guiding surfaces or pocket being employed; and I deem it proper to state that I consider such turning as of my invention. This feature of turning a sheet by a blast of air results in a great advantage, in that the entire folding mechanism can be arranged closely together and parallel to the printing, feeding, and cutting mechanisms in rotary web-presses, and requires much less space for its operation than with any other folding mechanism; but it is evident that two blast-pipes adapted to fold without turning and provided with their supporting-rods could be located at right angles to each other and operate to produce a sheet folded twice, each fold being at a right angle to the other. This, also, I should deem not a departure from my invention. Furthermore, the supporting-rods as well as the blast-pipes may be supported directly by the frame-work of the press, in which case the brackets herein shown would be dispensed with.

Having described my invention and its op-

eration, what I claim as new, and desire to secure by Letters Patent, is—

1. The method herein shown and described of folding paper, which consists solely in supporting the paper at points on each side of and a distance from the desired fold-line and directing a blast of air against the paper along said fold-line, substantially as and for the purpose set forth.

2. The method herein shown and described of folding paper, which consists solely in supporting the paper at points on each side of and a distance from the desired fold-line and directing a blast of air against the paper along a portion only of the fold-line, substantially as and for the purpose set forth.

3. The method herein shown and described of turning a sheet of paper, which consists in presenting it in U shape to a blast of air directed against the paper along a portion only of the desired fold-line, substantially as and for the purpose set forth.

4. The combination solely of means for directing a blast of air and means for supporting paper on each side of and a distance from a desired fold-line, all substantially as shown and described.

5. The combination of means for producing a blast of air, means for confining the blast, means for emitting the confined air in successive blasts, means for directing said successive blasts on a portion only of a desired fold-line, and means for solely supporting a sheet of paper on each side of and a distance from a desired fold-line, all substantially as shown and described.

6 The combination of means for emitting successive blasts of air, means for timing their succession, flexible means for conducting said blasts, adjustably-arranged means for directing the same, and means for supporting a sheet of paper on each side of and a distance from a desired fold-line, all substantially as shown and described.

7. The combination of means for supporting a sheet of paper on each side of and a distance from a desired fold-line, and a blast-pipe slotted near one of its ends, all substantially as shown and described.

8. The combination of means for supporting a sheet of paper, as described, and a blast-pipe adapted to direct a blast of air in a direction less than a right angle to its length, all substantially as shown and described.

9. The combination of a slotted inner cylinder, a slotted outer cylinder, and adjustably-attached nozzles provided with lugs which fit into the slots of the outer cylinder, all substantially as shown and described.

10. The combination of a blast-pipe, a bracket, and supporting-rods, substantially as shown and described.

11. The combination of a slotted frame-work and blast-pipes adjustably secured in the slots and provided with supporting-rods.

12. The combination, with the blast-producing mechanism A, conductor B, slotted cylinder C, the cylinder D, slotted at d d, the collars d^2, provided with the nozzles d^4, having the lugs d^5, the blocks d', and pulley c', substantially as shown and described.

13. The combination of the cylinders C and D, slotted as described, the flexible pipes E′, the frame G, slotted at g g g g, and the blast-pipes H I J K, adjustably secured in the slots, substantially as shown and described.

14. The combination of the frame G, slotted as described, with the blast-pipes H I J K, screw-threaded at their inner ends and provided with the nuts f' f', substantially as shown and described.

In testimony whereof I affix my signature in presence of two witnesses.

EDGAR B. STOCKING.

Witnesses:
E. E. MASSON,
W. B. MASSON.