Oct. 18, 1932. E. R. GASKIN 1,883,364

APPARATUS FOR TREATING PAPER WITH VAPOR PREPARATORY TO PRINTING THEREON

Filed Oct. 29, 1930 2 Sheets-Sheet 1

Fig. 2.

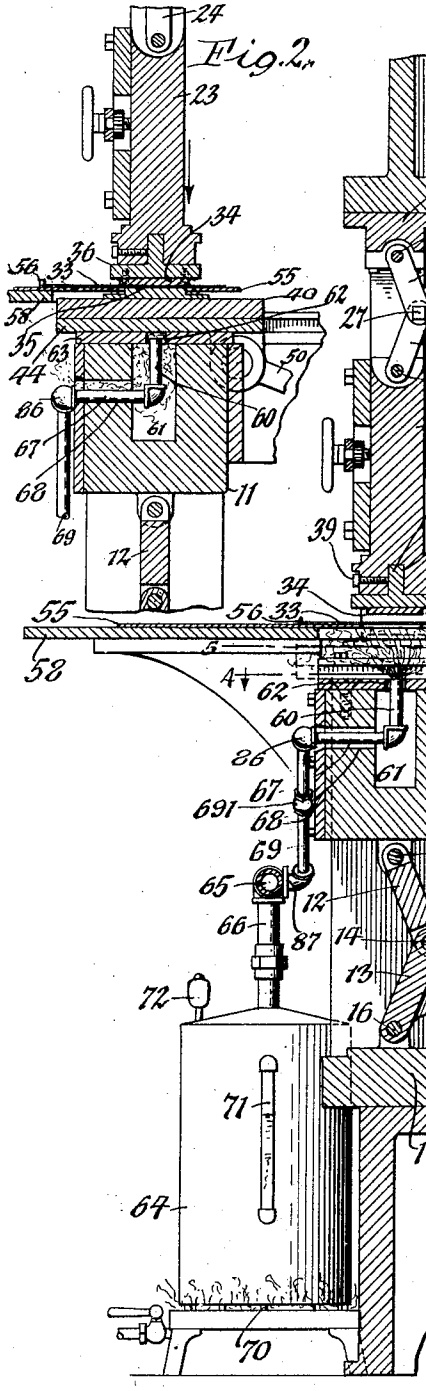


Fig. 1.

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Filed Oct. 29, 1930 2 Sheets-Sheet 2

Fig. 8.

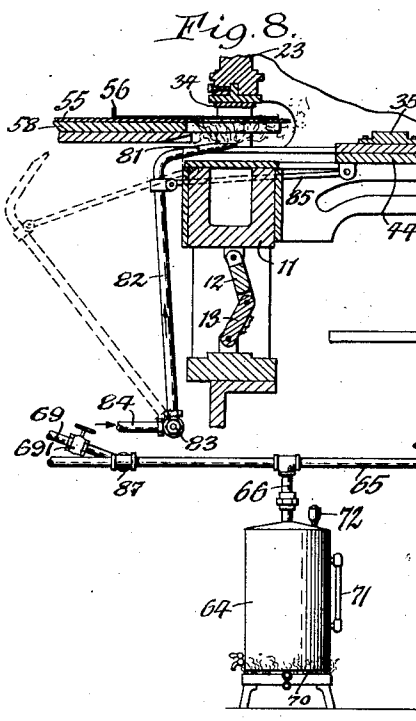


Fig. 3.

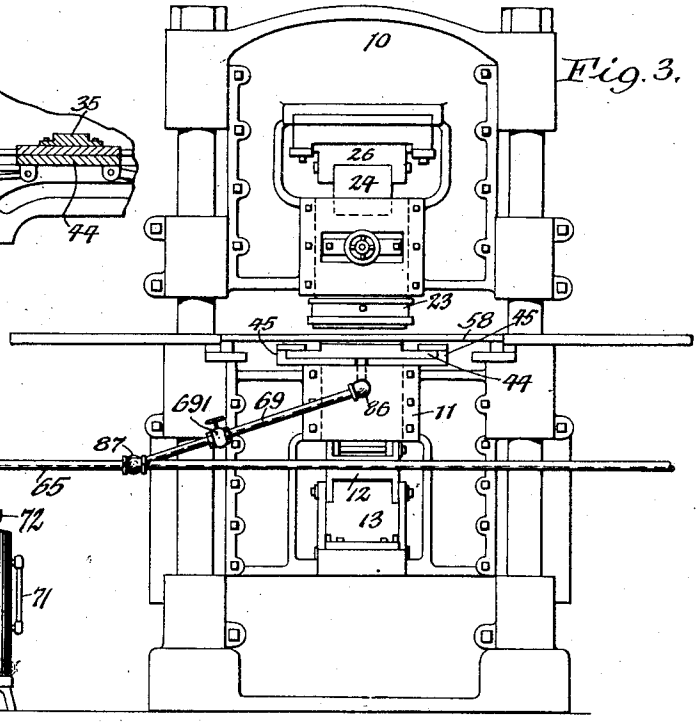


Fig. 4.

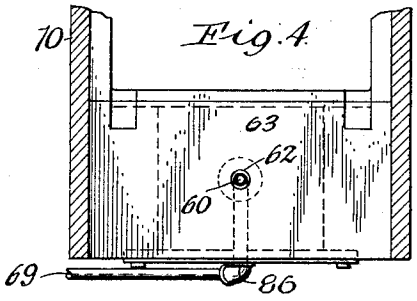
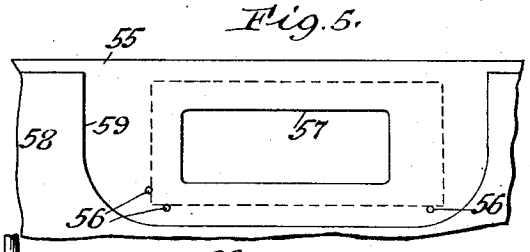


Fig. 5.



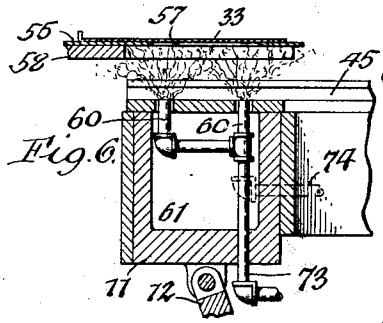


Fig. 6.

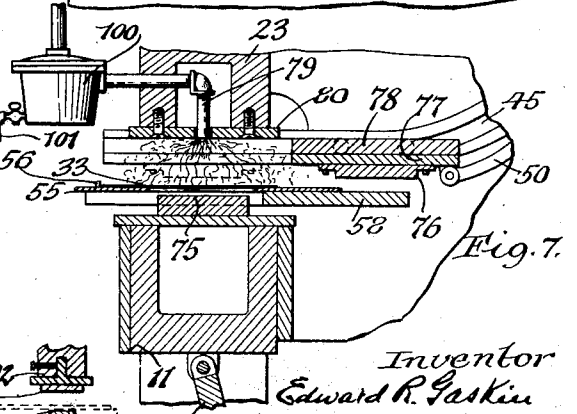


Fig. 7.

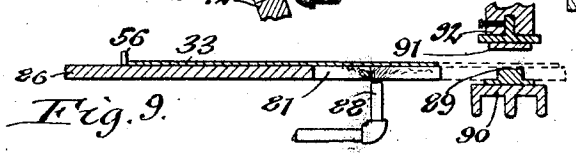


Fig. 9.

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Patented Oct. 18, 1932 1,883,364

UNITED STATES PATENT OFFICE

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APPARATUS FOR TREATING PAPER WITH VAPOR PREPARATORY TO PRINTING THEREON

Application filed October 29, 1930. Serial No. 491,890.

This invention relates to an apparatus for treating paper with vapor preparatory to printing thereon or embossing the same.

It has been found in actual practice that when sheet paper is comparatively dry, hard or rough that it requires unusually heavy pressure of the engraved steel die or engraved copper plate, or similar printing member of the press against the sheet of paper in order to enable the latter to pick up the ink properly and make a clear impression. This is particularly necessary when printing from engraved dies or plates which have been worn considerably and therefore renders it difficult if not impossible to obtain a clear impression of the face of an engraved die.

It is the object of this invention to provide simple, efficient and economical means for treating the sheets of paper with a vapor such as steam before producing the impression of the press thereon whereby the fibers of the paper are softened and any stiffness and hardness in the same is taken out so that the paper is pliable and can be readily deflected by light pressure into a full engagement with the engraved or printing surface and caused to take up the ink fully over the entire engraved surface, thereby bringing out all the details of the engraving without requiring undue pressure.

In the accompanying drawings:

Figure 1 is a fragmentary vertical longitudinal section of a printing press adapted to produce printing from an engraved steel die or engraved copper plate and equipped with one form of my invention and showing the parts in the position in which the die or plate is removed from between the upper and lower plungers of the press, and a sheet of paper has been introduced in its operative position ready for being printed thereon.

Figure 2 is a similar view showing the position of the parts when the sheet of paper is being impressed or printed between the die and counter of the press.

Figure 3 is a front elevation of the press.

Figure 4 is a fragmentary horizontal section taken on line 4—4 Fig. 1 looking downwardly.

Figure 5 is a fragmentary horizontal section taken on the correspondingly numbered line in Fig. 1 and looking upwardly.

Figure 6 is a fragmentary vertical longitudinal section similar to Figs. 1 and 2 but showing a modified form of my invention in which a plurality of vapor delivery nozzles are employed for tempering the sheet of paper preparatory to producing a printed impression thereon between the die and counter of a printing press.

Figure 7 is a similar view showing a further modification of my invention in which the position of the die and counter and the vapor applying means are reversed from that shown in Figs. 1, 2 and 6.

Figure 8 is a view similar to Figs. 1, 2, 6 and 7 and showing still another modified form of this invention.

Figure 9 is a fragmentary section of a further modification of my invention.

In the following description similar characters of reference indicate like parts in the several figures of the drawings.

Referring to Figs. 1, 2, 3, 4 and 5, the numeral 10 represents the main frame of the printing press which may be of any suitable construction to support the various working parts.

Although these working parts may be variously organized for co-operation with my improvements, the particular form of the press shown in Figs. 1–5 is constructed as follows:

The numeral 11 represents a vertically movable lower plunger which is guided on the front part of the main frame and actuated by means of a toggle having upper and lower links 12 and 13 which have their opposing ends connected by means of a pivot 14 while their extremities are connected respectively by pivot pins 15 and 16 to the underside of the lower plunger 11 and a supporting block 17 on the adjacent lower part of the main frame, a rotary shaft 9 journaled horizontally and transversely in suitable bearings on the main frame in rear of this toggle, a closing cam 18 arranged on the shaft 9 and adapted to engage with a roller 19 on the lower toggle bar 13 for causing the lower plunger to rise, and an opening cam 20 also arranged on the shaft 9 and adapted to en-

gage with a roller 21 which is connected by a link 22 with the lower toggle bar 13 for the purpose of opening the toggle and causing the lower plunger 11 to descend.

The numeral 23 represents an upper plunger which is arranged above the lower plunger and guided on the upper part of the main frame so as to be capable of moving vertically toward and from the lower plunger. This movement is imparted to the upper plunger by means which comprise a toggle having a lower toggle bar 24 pivotally connected at its lower end with the upper end of the plunger 23 by means of a pivot pin 25, an upper toggle bar 26 pivotally connected at its lower end by means of a pin 27 with the upper end of the lower toggle bar 24, and a pivot pin 28 connecting the upper end of the upper toggle bar 26 with a supporting block 29 on the upper part of the main frame.

The closing or straightening movement of the toggle bars 24 and 26 for causing the upper plunger to descend and the opening or unfolding action of these toggle bars for causing the upper plunger to rise, is effected in the present case by means of a rock shaft 30 having an upwardly projecting arm 31 connected by a link 32 with the pivot 27 which connects the opposing ends of these toggle bars 24 and 26.

The numeral 33 represents a sheet of paper which is adapted to be printed or embossed between the printing elements of the press, which elements in the present case consist of a counter 34 and a die 35 between which the sheet of paper is adapted to be pressed for producing an impression upon the latter. This counter in the present case is secured to the underside of an upper platen 36 which is detachably secured to the lower end of the upper plunger by means of a stem 37 formed on this platen and secured in a socket 38 in this plunger by means of a set screw 39. The die 35 is mounted on the lower platen 40 which is adapted to move backwardly and forwardly into and out of an operative position between the upper and lower plungers so that in the forward position of this platen the die thereon will be aligned with the counter for co-operation therewith, and in the rearward position of this lower platen the die thereon will be in a position for co-operation with the inking and wiping mechanism whereby ink is applied to the die and the surplus wiped therefrom before an impression is taken thereof.

This inking and wiping mechanism may be of any suitable and well-known construction and the same in the present instance is therefore represented diagrammatically by means of an ink delivery roller 41 with which the engraved surface of the die is adapted to engage in its rearmost position for receiving a coat of ink thereon, and an endless wiping sheet 42 which is supported between the inking roller 41 and the upper and lower plungers by means of guide rollers 411 and a pad 43 so that during the forward movement of the die from the inking roller 41 to the printing position any excess ink deposited on the die will be wiped therefrom and thereby permit a clean impression of the die to be produced on the sheet of paper.

The lower platen is reciprocated lengthwise of the machine by a slide 44 upon which the lower platen is mounted and which is guided at its opposite longitudinal edges in guide rails 45 which are connected with the lower plunger 11 and rise and fall therewith. The forward and backward movement of this slide 44 is effected by any suitable means but in the present case these means comprise a rock shaft 46 journaled on the lower part of the main frame and provided with an upwardly projecting rock arm 47, a rear link 48 pivotally connected at its rear end by means of a pin 49 with the upper end of the rock arm 47, a front link 50 connected at its rear end by means of a pin 51 with the front end of the rear link 48, a front pin 52 pivotally connecting the front end of the link 50 with the lower slide 44, and guideways 53 which are arranged on the underside of the guide rails 45 and move vertically therewith, and which receive rollers 54 at opposite ends of the pivot pin or rod 51 for controlling the movement of the links 48 and 50.

The sheet of paper 33 which is to be printed is supported in its operative position preparatory to being printed by placing the same on a registering mat 55 which is provided at its front end with gage pins 56 against which an edge portion of the sheet to be printed is placed for accurately gaging this sheet in its proper position between the upper and lower plungers preparatory to producing a printed impression thereon between the counter and die.

Below the counter the registering mat 55 is provided with an opening 57 so as to expose the underside of the sheet of paper to be printed and permit engagement therewith of the die, which co-operates with the counter for producing the printed impression on the sheet of paper.

The registering mat 55 is supported in its operative position by a feed table 58 arranged horizontally on the main frame and having its rear end provided with a recess 59 over which the rear part of the registering mat 55 projects, and thereby exposes the upper and lower surfaces of the sheet of paper 33 to be printed to the faces of the counter 34 and the die 35.

Preparatory to producing a printed impression between the die and counter on each sheet of paper, the latter, after being placed on the registering mat 55, is subjected to the

action of a cloud or jet of vapor which operates to puff up, soften and slightly moisten the sheet so that the fibers of the paper are loose instead of stiff and hard, and therefore capable of being readily pressed into engagement with all parts of the engraved surface of the die or plate and take up the ink readily from its entire area for producing a perfect impression.

Any suitable vapor may be employed for this purpose such as benzene, gasoline or benzol, but the safest and most economical vapor which may be used for this purpose consists of steam which may be directed against the area of the sheet to be printed in various ways, while the sheet is in the press.

In the particular organization shown in Figs. 1–5 this steam is delivered against the underside of the sheet of paper which is exposed through the opening 57 in the registering mat 55 and the recess 59 in the supporting table, by an upright nozzle 60 arranged in a cavity 61 in the lower plunger 11, and projecting upwardly through an opening 62 which is formed in a cover 63 at the upper end of the lower plunger, as shown in Figs. 1, 2 and 4.

Steam for this purpose may be generated in various ways, for example, in a steam boiler 64 arranged adjacent to the printing or embossing press and having the outlet at its upper end connected with the nozzle 60 by means of piping which includes a horizontal manifold pipe 65 connected with the main supply pipe 66 at the upper end of the boiler, a horizontal pipe 67 projecting from the lower end of the nozzle 60 forwardly through an opening 68 in the front wall of the lower plunger 11, and a vertically swinging delivery pipe 69 connected at one end with the manifold pipe 65 and at its opposite end with the front end of the horizontal pipe 67. The water in the boiler 64 may be heated by a gas burner 70 arranged below the boiler, and the height of the water in the boiler may be determined by means of a gage 71 arranged at the side thereof.

When the die-carrying slide 44 is in its rearward position the upper end of the nozzle 60 is uncovered by this slide thereby permitting the steam or vapor issuing from the nozzle to be directed against the underside of the sheet of paper 33 where the same is intended to receive a printed impression whereby the exposed area of the sheet is softened in the manner described.

At this time the lower plunger is in its depressed position and the upper plunger is in its elevated position so as to permit the attendant to freely place the sheet to be printed on the registering mat over the opening 57 preparatory to steaming and printing the same.

After the sheet has been thus placed in the printing position and received this steam treatment the slide 44 moves forwardly and carries the die 35 into its foremost position immediately below the opening 57 in the registering mat and the undersurface of the sheet to be printed. During the last part of this forward movement of the slide 44 the same engages with the upper surface of the cover or plate 63 and closes the opening or port 62 into which the upper end of the steam nozzle projects, as shown in Fig. 2, so that the same in effect forms a valve for cutting off the delivery of steam from the nozzle to the paper. Whatever steam escapes from the nozzle at this time will be conducted to the exterior of the press through the openings 62, pocket 61 and passage 68 through which the branch pipe 67 projects so that no dangerous steam pressure can develop within the press itself which might do harm.

As an additional safeguard the top of the boiler may be provided with a safety valve 72 which will permit the boiler to blow off when the pressure in the same exceeds a predetermined limit.

After the slide reaches the forward end of its stroke the counter is lowered into engagement with the upper surface of the sheet of paper by the descent of the upper plunger 23 and then the lower plunger is raised by its operating mechanism so that the die is carried upwardly through the opening 57 in the registering mat 55 and into engagement with the underside of the sheet to be printed and produces an impression of the die or plate thereon. Thereafter the lower plunger descends and carries the die away from the underside of the sheet which has been printed, the upper plunger is raised for disengaging the counter from the upper side of the printed sheet and then the slide 44 is moved rearwardly for receiving another coat of ink, and a wiping action removes the excess of ink preparatory to producing a printed impression on the next following sheet. As soon as the die and counter have been disengaged from the sheet which has been printed the operator removes this sheet from the registering mat and replaces the same with a fresh or unprinted sheet, and as soon as a new sheet is placed upon the registering mat over the opening 57 therein this sheet is also acted upon by the cloud or jet of steam issuing from the nozzle 60 which has been uncovered by the rearward movement of the slide 44 so as to put this sheet in condition for subsequent printing.

All the sheets of paper which are to be printed are successively operated upon by the steaming device and the printing mechanism in the manner described, which operations are performed without requiring any special attention from the operator but are effected automatically and therefore permit of producing the advantageous results of steaming

the paper without reducing the output of the press or in any way interfering with the usual work of the attendant.

When a plurality of presses are to be equipped with this steaming apparatus the manifold pipe 65 is made sufficiently long so as to lead to the several presses which are to be supplied with steam. For example, as shown in Fig. 3, the manifold pipe 65 is provided with two inclined branch pipes 69, each of which is adapted to supply steam to a press in accordance with this invention, and if a larger number of presses is to be served in this manner the number of outlets of this manifold pipe 65 are increased accordingly. Each of the branch pipes 69 has a valve 691 for controlling the same.

Each of these branch pipes may be made sufficiently long so that it will have the required spring and permit the lower plunger to rise and fall with the respective steam nozzle 60, or the upper end of each pipe 69 may be connected with the branch pipe 67 leading to the nozzle 60 by means of a rotary joint 86, while the lower end thereof may be connected with a steam manifold pipe 65 by another rotary joint 87, both of which rotary joints may be of any suitable and well-known construction. If desired, the piping connection between the boiler and the nozzle 60 may be relatively rigid so as to hold the nozzle practically immovable in a vertical direction, and when this form of construction is employed then the opening 68 in the lower plunger through which the branch pipe 67 passes is made sufficiently high so that the plunger is free to move into its upper and lowermost positions without disturbing the position of the nozzle, as shown in Figs. 1 and 2.

When comparatively large areas of a sheet of paper are to be printed, more than one steam delivery nozzle may be required, for example as shown in Fig. 6 two nozzles 60, 60 are arranged one behind the other so that the steam issuing therefrom in the form of a cloud will cover a proportionately greater area on the sheet of paper which is to be printed.

This particular Figure 6 of the drawings also shows the steam connection with the nozzles extending through the bottom of the lower plunger 11, as shown at 73. In some instances the steam connection may be carried through the rear wall of the plunger, as shown by dotted lines at 74 in Fig. 6. Obviously, however, this steam connection for supplying the delivery nozzles may be carried through any other suitable part of the lower plunger as circumstances require.

If desired, the counter may be arranged underneath the sheet to be printed, as shown at 75 in Fig. 7, and the die above the sheet, as shown at 76 in the same figure, which also necessitates reversal in the position of the die platen 77 and the longitudinally reciprocating slide 78 which carries the die platen. In this case, the steam supply nozzle 79 receives dry steam from a steam trap 100 (provided with a water drain pipe 101) and projects downwardly from the upper plunger 23 through an opening in an upper cover plate 80 which is adapted to be traversed by the slide 78 so as to cover and uncover the outlet of the upper nozzle 79. The operation of the apparatus in all other respects is substantially like that described and shown in the construction illustrated in Figs. 1–5.

Instead of utilizing the slide which carries the die, and the cover on one of the plungers through which the nozzle projects as a valve device for shutting off or permitting the escape of steam from the nozzle, an organization may be employed such as that shown in Fig. 8 which is constructed as follows:

The numeral 81 represents a vapor discharge nozzle which is movable forwardly and backwardly into and out of a position between the upper and lower plungers for the purpose of delivering a cloud or jet of steam against the surface of the sheet to be printed. This nozzle is mounted on the upper end of a longitudinally swinging branch pipe 82 which is connected at its upper end with the nozzle 81, while its lower end is connected by means of a rotary valve 83 with a steam or vapor supply pipe 84. The upper part of this swinging pipe 82 is connected by means of a link 85 with the die-carrying slide 44. When the plungers are separated and the slide 44 is in its rearward position the nozzle 81 is moved rearwardly into a position between the upper and lower plungers and below the point where the sheet is supported preparatory to being printed, and while the nozzle is in this position the rotary valve 83 is open to permit steam to pass therethrough and to the delivery nozzle 81. As the slide 44 moves forwardly for bringing the die 35 into operative relation with the counter 34 the swinging die 82 is moved forwardly and thereby shifts the discharge nozzle 81 forwardly away from its vapor delivery position below the sheet of paper, and at the same time turns the rotary valve 83 so as to close the same and prevent further discharge of steam or vapor therefrom.

A still further modification of my invention is shown in Fig. 9 in which the sheet 33 to be printed is placed on a table 86 and over an opening 87 in the latter, and means are provided for reciprocating the table so that in its foremost position the sheet stands over the upper end of a steam delivery nozzle 88, as shown by full lines in Fig. 9, and when the table is in its rearmost position, as shown by dotted lines in the same figure, the sheet is placed between a lower stationary die or plate 89 mounted on a bed 90 and the counter 91 adapted to co-operate with the die or plate

and mounted on a vertically movable plunger 92.

Each of these several devices for supplying steam or vapor to the sheet of paper which is to be printed is comparatively simple and inexpensive in construction and capable of being easily and readily applied to the standard types of printing and embossing presses now on the market, without requiring any change in the same and without interfering with the normal operation thereof.

It further permits of conveniently and expeditiously steaming, moistening or vaporizing the sheets over the areas which are to receive the printed or embossed impressions so as to cause the fibers of the paper to be moistened or loosened and put in a condition in which the same can be engaged fully with the design of the die or plate and receive a clear impression thereof under light pressure, such as would occur if the same were subjected to extra heavy pressure as is customary when printing from dies or engraved surfaces which have been worn considerably.

Moreover, by steaming the sheets preparatory to engaging the same by the engraved die or plate the impression on the sheet is made with ease, and every tone and line is obtained, no matter how delicate, so that the finished printed product is equal to that of a moistened hand printed impression on a hand operated press.

I claim as my invention:

1. An apparatus of the character described, comprising two relatively movable platens adapted respectively to carry a die and counter between which a sheet of paper is to be printed, means for supporting the sheet at the printing position and means for applying vapor to the sheet at the printing position before printing an impression thereon between the die and counter.

2. An apparatus of the character described, comprising two relatively movable platens adapted respectively to carry a die and counter between which a sheet of paper is to be printed, means for supporting the sheet at the printing position and means for applying steam to said sheet at the printing position before producing the printing impression thereon.

3. An apparatus of the character described, comprising a die and counter between which a sheet of paper is adapted to be printed, two relatively movable plungers upon one of which said counter is mounted, a slide movable into and out of an operative position between said plungers and carrying said die, and means for directing vapor against said sheet preparatory to printing an impression thereon between said die and counter.

4. An apparatus of the character described, comprising a die and counter between which a sheet of paper is adapted to be printed, two relatively movable plungers upon one of which said counter is mounted, a slide movable into and out of an operative position between said plungers and carrying said die, and means for directing vapor against said sheet preparatory to printing an impression thereon between said die and counter including a vapor nozzle mounted on one of said plungers and adapted to be covered and uncovered by said slide as it moves into and out of its operative position.

5. An apparatus of the character described, comprising a lower plunger, an upper plunger, means for moving said plungers toward and from each other, a counter mounted on the upper plunger, a slide movable into and out of an operative position between said plungers, a die mounted on said slide and adapted to cooperate with said counter for producing a printed impression on a sheet of paper placed between the same, and means for applying a vapor to the underside of said sheet while the slide and die are removed from between the plungers.

6. An apparatus of the character described, comprising a lower plunger, an upper plunger, means for moving said plungers toward and from each other, a counter mounted on the upper plunger, a slide movable into and out of an operative position between said plungers, a die mounted on said slide and adapted to cooperate with said counter for producing a printed impression on a sheet of paper placed between the same, means for applying a vapor to the underside of said sheet while the slide and die are removed from between the plungers, and a table which supports said sheet between said plungers.

7. An apparatus of the character described, comprising a lower plunger, an upper plunger, means for moving said plungers toward and from each other, a counter mounted on the upper plunger, a slide movable into and out of an operative position between said plungers, a die mounted on said slide and adapted to cooperate with said counter for producing a printed impression on a sheet of paper placed between the same, means for applying a vapor to the underside of said sheet while the slide and die are removed from between the plungers, including a vapor delivery nozzle which is arranged in the upper part of said lower plunger and is adapted to deliver vapor against the underside of said sheet when the slide is moved out of its operative position from between the plungers, and to be covered by said slide for cutting off the delivery of vapor against said sheet while the slide is in its operative position between said plungers.

8. An apparatus of the character described, comprising a lower plunger, an upper plunger, means for moving said plungers toward and from each other, a counter mounted

on the upper plunger, a slide movable into and out of an operative position between said plungers, a die mounted on said slide and adapted to cooperate with said counter for producing a printed impression on a sheet of paper placed between the same, means for applying a vapor to the underside of said sheet, while the slide and die are removed from between the plungers, including a vapor delivery nozzle which is arranged in the upper part of said lower plunger and is adapted to deliver vapor against the underside of said sheet when the slide is moved out of its operative position from between the plungers and to be covered by said slide for cutting off the delivery of vapor against said sheet while the slide is in its operative position between said plungers, and a vapor generator connected with said delivery nozzle.

9. An apparatus of the character described, comprising a die and counter between which a sheet of paper is adapted to be printed, two relatively movable plungers upon one of which said counter is mounted, a slide movable into and out of an operative position between said plungers and carrying said die, and means for directing vapor against said sheet preparatory to printing an impression thereon between said die and counter, including a vapor delivery nozzle mounted on said upper plunger and adapted to direct vapor downwardly against the upper side of the sheet of paper to be printed.

10. An apparatus of the character described, comprising a lower plunger, an upper plunger, means for moving said plungers toward and from each other, a counter mounted on the upper plunger, a slide movable into and out of an operative position between said plungers, a die mounted on said slide and adapted to co-operate with said counter for producing a printed impression on a sheet of paper placed between the same, means for applying a vapor to the underside of said sheet, while the slide and die are removed from between the plungers, including a vapor delivery nozzle movable toward and from a position between said plungers, and a rocking support which carries said nozzle.

11. An apparatus of the character described, comprising a lower plunger, an upper plunger, means for moving said plungers toward and from each other, a counter mounted on the upper plunger, a slide movable into and out of an operative position between said plungers, a die mounted on said slide and adapted to co-operate with said counter for producing a printed impression on a sheet of paper placed between the same, means for applying a vapor to the underside of said sheet while the slide and die are removed from between the plungers, including a vapor delivery nozzle movable toward and from a position between said plungers, a rocking support which carries said nozzle, and a link connecting said rocking support and slide.

In testimony whereof I hereby affix my signature.

EDWARD R. GASKIN.