

Aug. 25, 1931.

W. C. HUEBNER

1,820,194

PROCESS OF AND APPARATUS FOR PRINTING

Filed Dec. 30, 1927

2 Sheets-Sheet 1

Fig. 1

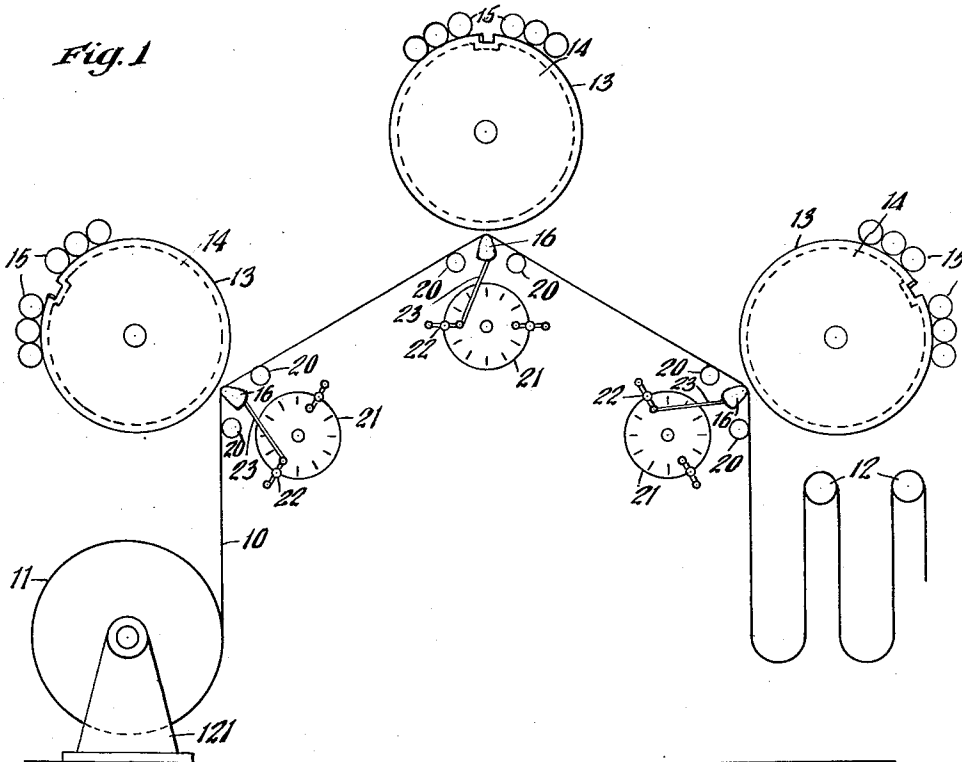
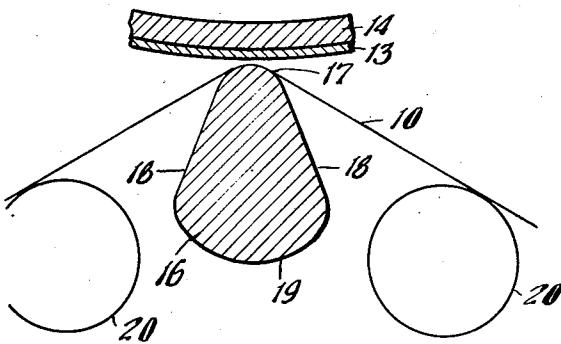


Fig. 3



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2 Sheets-Sheet 2

Fig. 2

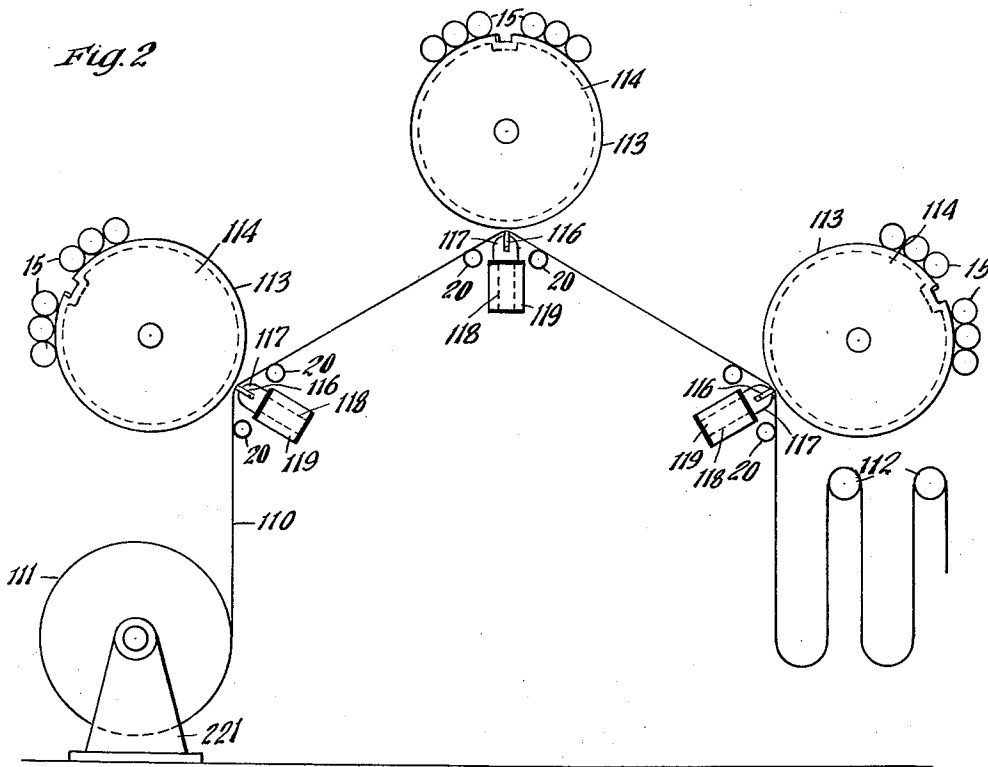
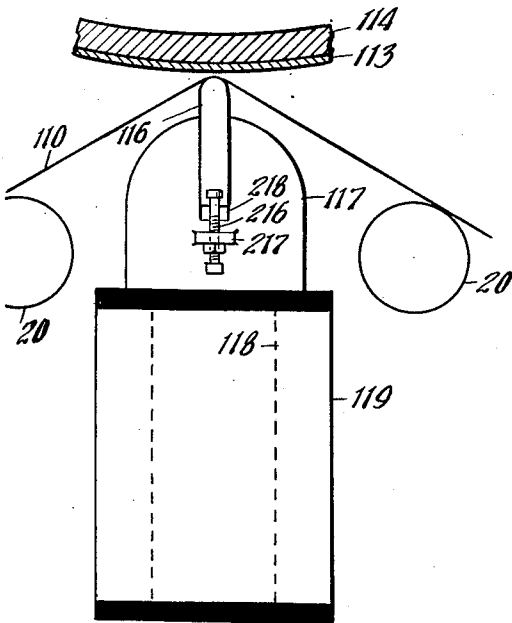


Fig. 4



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UNITED STATES PATENT OFFICE

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PROCESS OF AND APPARATUS FOR PRINTING

Application filed December 30, 1927. Serial No. 243,642.

This invention relates to improvements in process of and apparatus for printing.

As well known to those skilled in the art, there have been, heretofore, only three known kinds of printing employed commercially. These are relief, intaglio and planographic or lithographic. In relief printing, the representation or image to be reproduced is disposed on the printing form above the surface level of the remainder of the printing surface and the ink is applied to the raised portions. In intaglio, the representation or image to be reproduced is cut below the remaining portion of the printing surface and the ink is applied in the under-cut portions. In the plano- or lithographic type of printing, the entire printing surface is substantially plane, but the different portions thereof are so prepared that ink is retained only on those portions corresponding to the representation or image to be reproduced.

Many forms of printing presses such as cylinder, flat form, sheet and web fed and others have been used in carrying out the different kinds of printing above referred to. So far as I am aware, in every heretofore known method of printing and in every heretofore known type of printing press or machine, it has been absolutely essential to have the printing form or surface in contact with the print-receiving surface and pressure applied during the period of contact in order to effect a transference of the ink from the representation or image on the printing surface to the print-receiving surface.

Many practical difficulties and disadvantages are inherent in every heretofore known method of printing and printing press resulting from the necessity of physical contact and pressure between the printing and the print-receiving surfaces. Particularly are these difficulties and disadvantages present in multiple, mass and color production of prints. To enumerate all of these difficulties and disadvantages is unnecessary but a few of the more prominent ones may be referred to. In all the heretofore known methods of printing from cylindrical forms in printing presses, or from flat forms onto cylindrical print-receiving surfaces, one essential has

been to co-ordinate the surface speeds of the printing and print-receiving surfaces so as to prevent mis-register, streaking, slurring and smearing, and also other defects caused by high and low local areas, resulting in uneven impressions in the printed product. This factor alone involves much labor and expense in the "make ready" of the printing presses, that is, much time and labor are required in what is commonly known as under-laying or over-laying in order to obtain the synchronism in speed of the printing and print-receiving surfaces, and the desired uniformity in the quality of the impressions.

Further, the contact pressure characteristics of heretofore known methods of printing causes much trouble due to the great difficulty in obtaining uniformity of pressure between all printing portions of the printing surface and print-receiving surface, an over-pressure or under-pressure at different areas producing a marked defect in the printed product, due to the uneven "lift" of ink from the printing plate to the print-receiving surface.

In practical production where the change from one job to another requires different thicknesses of stock, varying from tissue to cardboard upon which the work is to be printed, those skilled in the art are aware of the time, labor and cost of making ready for such various thicknesses of stock, and also the impression lifting difficulties caused by varieties in the quality of the stock, viz., coated, calendered or offset stock, comparatively smooth and rough surface stock, all factors needing skill and attention to secure successful results in printing because of lint from uncoated stock, plucking of surfaces in coated stock, all of which also applies to cloth printing and other materials.

The disadvantages and difficulties above enumerated are greatly augmented in the case of color-printing where the print-receiving surface receives a plurality of different color impressions in order to obtain the final desired colored printing. Also, in color printing, register of the color impressions becomes exceedingly difficult to maintain where contact and pressure between the printing and

print-receiving surfaces is necessary as in all heretofore known printing methods.

A still further important disadvantage of the prior known methods of printing involving contact and pressure between the printing and print-receiving surfaces, necessarily results from the mere fact that mechanical pressure is essential in transferring the inks from the print to the print-receiving surfaces. Among these disadvantages may be enumerated the necessity for employing very heavy and rigid parts in the printing presses to enable the parts to withstand successfully the necessary pressure involved. Also, the continued repeated pressure on the same printing surface or surfaces causes the latter to wear down, disintegrate, or otherwise become spoiled so that in cases of large editions or long runs, a number of similar or duplicate printing surfaces or forms are required to to print the entire edition. In renewing a printing surface or form, all of the difficulties first mentioned with respect to time of make ready, register, over-pressure and under-pressure and the like are repeated and the difficulties of register, particularly in color-printing, are multiplied many fold.

Another serious limitation inherent in all prior known methods and machines for printing involving contact and pressure between the printing and print-receiving surfaces has been found in the case of multi-color printing. In multi-color printing, as is well known, the successive color impressions are super-imposed on each other on the printing surface and, where pressure is involved, the one color ink is applied to a previously applied color ink while the latter is wet, since this destroys color values and the register arising from the spreading of the two color ink impressions under such conditions. Where two or more areas of heavy colors are superimposed, there is a lack of "lift" due to previous wet color on the print-receiving surface. I am aware that many attempts have been made to provide color printing presses in which two or more color impressions are applied to the same printing surface in one pass of the printing surface or sheet through the press, but such presses are quite complicated, very expensive and have attained only a very limited use commercially, because of the high cost of equipment, and make ready time and the need of highly skilled labor, of which there is a shortage, and also because the final results are not as good, as is obtained from single color presses where each color is allowed to set or dry in order to permit successive colors to "lift" properly. By far the greatest percentage of color printing has heretofore been and now is being done on those types of presses where the print-receiving surfaces are fed through the printing press in sheets, one at a time, the entire edi-

tion receiving the one color impression and thereafter the entire edition is run through the same press with a different color printing surface thereon or through a different press to receive the second color impression and so on for as many different color impressions as may be required. Obviously, the expense and extra time involved in color printing under these conditions, is much greater than would be the case if the print-receiving surface could be passed through the printing press continuously in the form of a continuous web or a succession of sheets, carried by a holding web, and all the color impressions received while making the one pass through the press.

One object of my invention is to provide a new method or process of printing which entirely does away with the necessity of contact or pressure between the printing and the print-receiving surface during the transference of the ink from the former to the latter.

A second object of my invention is to provide a printing press or apparatus whereby the printing may be effected by a transference of the ink from the printing surface to the print-receiving surface without involving contact or pressure between the said two surfaces.

A third object of my invention is to provide a process or method of printing wherein any desired image or representation on any type or class of printing surface or form may be transferred in exact correspondence to a print-receiving surface without contact or pressure between the printing and print-receiving surfaces.

A fourth object of my invention is to provide a press or apparatus capable of carrying out the improved process set forth in the preceding object of invention.

A fifth object of my invention is to provide a method or process of printing wherein the ink on the printing surface, whatever its character, and the print-receiving surface, have successive areas of both surfaces brought into relatively close but nevertheless spaced relationship while subjected to a field of force such as an electrostatic or magnetic field and the ink subjected to the lines of force of said field, in such manner that transference of the ink from the printing to the print-receiving surface is effected without contact or pressure between said surfaces.

A sixth object of my invention is to provide a press or apparatus so constructed and organized as to effectively carry out the process set forth in the preceding object of the invention.

A seventh object of my invention is to provide a method or process of printing wherein the print-receiving surface and a plurality of separate printing surfaces are successively brought into operative relationship but

without contact or pressure between them and the inked images or representations on the several printing surfaces are successively transferred therefrom to the print-receiving surface.

An eighth object of my invention is to provide a press or apparatus for carrying out the process set forth in the preceding object of the invention.

Other objects of the invention are to provide a method or process of printing wherein: successive different color impressions may be applied to the same printing surface while the several different color impressions are wet without destroying the color values or register and without the necessity of interposing any drying step between the successive impressions; a print-receiving surface in the form of a continuous web or a succession of sheets of like or different sizes carried by suitable means and held thereon by any desired means, may be passed successively into operative but spaced relationship to a plurality of printing surfaces and the inked impressions from the latter applied to the printing surface; a print-receiving surface is successively passed through a plurality of fields of force and, while in each field of force, has applied thereto, an inked impression of any desired image or representation from a printing surface in proximity to but spaced therefrom; and to pass a print-receiving surface in the form of a continuous web successively in juxtaposition to a plurality of printing surfaces but free from pressure therewith and while in juxtaposition with respect to each printing surface, subjecting the printing and print-receiving surfaces to the lines of a field of force for effecting transference of the ink in accordance with the inked images or representations on the printing surface to the print-receiving surface.

Still further objects of my invention are to provide apparatus suitable for and capable of carrying out the several objects of invention set forth in the preceding paragraph.

Other objects of my invention will more clearly appear from the description and claims hereinafter following.

In the drawings forming a part of this specification, there have been indicated conventionally, suitable apparatus for carrying out my invention both with respect to the process and apparatus aspects thereof. In said drawings, the apparatus shown is by way of illustration only and not by way of limitation inasmuch as my invention may be carried out in many other ways.

Due to the radical difference in my invention over any heretofore known method or apparatus for printing, I have been unable to find any words in the English language which will accurately define my improved process or apparatus and it is for this reason

that I have found it necessary to employ the term "printing" and related terms in describing my improved process and apparatus, notwithstanding the fact that the term "printing" is defined in all dictionaries as involving the use of pressure between the printing and print-receiving surfaces and I wish it to be understood that in referring to my process and apparatus as a "printing process" or "printing apparatus", these terms are used as being the nearest appropriate terms but with the understanding that no pressure is contemplated with reference to my process or apparatus.

In said drawings, Figure 1 is a side elevational view of one form of machine embodying my invention and suitable for carrying out the process, the apparatus illustrated in this figure being of the electrostatic induction type. Figure 2 is a view similar to Figure 1 but illustrating another embodiment of my invention, the apparatus in this figure being of the magnetic type. Figure 3 is a detail sectional view illustrating more particularly the portions of the apparatus where the transference of the ink from the printing surface to the print-receiving surface takes place, this detail view being of the apparatus shown in Figure 1. And Figure 4 is another detail view similar to Figure 3 but showing the parts of the apparatus illustrated in Figure 2. Figures 2 and 4 are on a relatively large scale with the air gap exaggerated to better illustrate the invention.

In said drawings, the illustrations are more or less conventional, I deeming it not necessary to illustrate in detail many of the common parts of a printing machine such as the paper-feeding devices and the details of inking rollers, and the like.

Referring first to the construction illustrated in Figures 1 and 3, the apparatus there shown is of the multiple type with three printing surfaces or forms being used and the print-receiving surfaces being in the form of a continuously fed web. As there shown, the print-receiving surface may be a continuous web of paper 10, which unwinds from a roll 11, supported by suitable standards 121. The web 10 passes successively by the three printing units hereinafter described and after the final impression is received, the web is looped over suitable rollers 12—12 until it is properly dried and then passes onto a winding reel, or to suitable cutting, folding or finishing apparatus.

The three printing couples, or units, as shown, are arranged uniformly with the middle unit or couple elevated above the two outside couples. Inasmuch as each of the printing couples is of the same character, it is only necessary to describe one of them with any particularity.

The printing surface or form which I have

chosen to illustrate in the drawing, is in the form of a press plate 13 wrapped around and secured to a printing cylinder 14 in any well known manner. The press plate 13 may, of course, have the matter to be printed produced thereon by any of the well known methods and of either relief, intaglio or planographic character. In the simplest arrangement which I have chosen for illustration, the plate 13 will be of the relief type and directly inked by any suitable roller inking arrangement as indicated by the rollers 15—15.

Disposed closely adjacent the periphery of the printing form, but spaced therefrom, preferably a few thousandths of an inch, is a guiding and supporting bar 16 for the web-print receiving surface 10. The latter, which corresponds in length to the length of the roller 14, has a rounded relatively narrow engaging edge 17, tangent divergent sides 18 and a rounded bottom 19. Said bar 16 may be made of any suitable material and preferably of metal, the particular cross-section shown being designed to permit the concentration of the electrostatic charges along the narrower edge adjacent the printing surface. Preferably also, suitable idler rolls 20—20 will be used one on each side of the bar 16 to properly maintain the web 10 constituting the print-receiving surface.

Associated with each bar 16 is a source of electrostatic electricity and in the drawing I have illustrated conventionally an electrostatic machine of the well known disc type. As will be understood, the electrostatic machine of the disc type will have a series of discs on a common axle, the series preferably extending the full length of the bar 16. The charges of electricity generated from the electrostatic machine designed at 21, will be collected by the brushes on the holders 22 and conducted by preferably a plurality of metallic rods 23 to the bar 16. An electrical connection may also be made, if desired, to the roller. The bar 16, as an entirety or the portion embodying the active edge 17 thereof may be provided with a very fine adjusting means which I have not deemed necessary to illustrate, in order to vary within predetermined limits the space or gap between the bar 16 and the printing surface represented by the plate 13, for the purpose hereinafter described.

As will be understood by those skilled in the art, all three of the cylinders with their printing surfaces 13 thereon will be suitably geared so as to rotate in synchronism and suitable power drives will be provided for each of the electrostatic machines, it not being deemed necessary to illustrate details of this character. In the apparatus chosen for illustration, three color printing may be carried out in which case each of the printing plates 13 will have different color separation images or

representations thereon of the subject matter to be printed. And these plates on their respective cylinders will be co-ordinated in register as will be understood by those skilled in the art.

By operating the electro-static machines continuously, it will be seen that a constant electro-static potential is maintained on the bar 16 and, due to the narrow edge 17 thereof, the electrostatic charge will be concentrated or of greatest density on this narrow edge, in accordance with the well known action of electrostatic electricity. There is thus created and maintained a constant field of force in the zone between the bar 16 and the corresponding printing form or surface adjacent thereto, the lines of force having their greatest intensity where the bar 16 and printing surface are closest. These lines of force, as well understood, will act through the web constituting the print-receiving surface and I have found will attract or so effect the ink on a printing surface as to cause the latter to be projected or deposited on the print-receiving surface. The ink in this particular embodiment of my invention may be of any desired character inasmuch as the electro-static charges or lines of force will act on either so-called electrical or non-electrical conducting matter. In practice, I will so adjust the elements of the printing couple as to leave a gap between the printing and the print-receiving surfaces preferably varying from three to thirty-three thousandths of an inch although the surfaces might actually touch one another without deleterious results if the transfer of the ink is effected rather by the action of the lines of force than by mechanical pressure exerted in the usual way.

With the apparatus and process disclosed, by synchronizing the speed of the print-receiving surface with the speed of the printing surfaces, successive localized areas of both printing and print-receiving surfaces are brought within the field of force and the ink subjected to the lines of force and thus deposited on the print-receiving surface over successive areas corresponding to the successive areas of the inked image or representation on the printing surface, all of this being accomplished without contact or pressure between the printing and print-receiving surfaces. Further, the print-receiving surface is presented successively to the several printing surfaces or forms and consequently the inked impressions from the several printing forms or surfaces can be deposited on the print-receiving surface notwithstanding the fact that the ink received from the first or an earlier printing form may be wet when the print-receiving surface is brought into juxtaposition with the next or a later printing form. Where color printing is to be performed and the different color plates are on the successive printing surfaces or forms, the

several colors may be applied to the print-receiving surface while the inks are wet without any danger of squashing down or smearing or streaking of the prints or losing color values through lack of "lift" since there need be no contact or pressure between the printing and print-receiving surfaces at any time. With my improved method and apparatus, it will be observed that no mechanical wear or pressure occurs on the ink conveyors of the printing surface and hence the quality and size of the ink conveyors remain unimpaired regardless of the length of edition being printed.

As will be obvious to those skilled in the art, due to the manner in which the ink is caused to be transferred from the printing surface through the small air-gap by the lines of force, there is a natural tendency for the ink to spread or spray after leaving the printing surface. By maintaining the printing and print-receiving surfaces in very close proximity, say three, four or five thousandths of an inch or even in actual contact, no discernible spreading or spray effect of the ink occurs and consequently the reproduction on the print-receiving surface is maintained very sharply defined. In certain classes of printing, it is desirable to have a lesser degree of definition of the reproduced image or representation, that is, a so-called softening of the printed subject and this is readily accomplished with my invention by varying the gap or spacing between the printing and print-receiving surfaces. If the gap is increased slightly over that last mentioned, a very slight spreading or spraying of the ink takes place, producing a corresponding slight softening of the reproduction and, as this gap is increased, the spreading or spraying of the ink particles becomes still greater and the softening or toning down correspondingly increased although in any case it will be understood that the amount of spread or spraying is very minute. Further, a very noticeable improvement in the product is obtained with my invention, particularly in color work, is the "built up" effect of the inks on the print-receiving surface resulting from the ability to apply the inks wet, one on top of the other, that is, the inks have a definite "body" value on the print-receiving surface corresponding more or less to the effect produced on the eye by an oil painting where the said "body" effect is readily discernible.

Referring to the construction illustrated in Figures 2 and 4, the arrangement shown is much the same as that shown in Figures 1 and 3 except that in lieu of the electrostatically created field of force, I produce a magnetic field of force. The arrangement of continuous web of print-receiving material 110, roll 111, standard 221, printing rollers 114, printing surfaces or plates 113, idler rollers 20 and looping rollers 112 may

be the same as in the first form described. In lieu, however, of the bar 116, I provide a soft iron bar or armature 116 extending the full length of the printing surface and closely spaced relative thereto as in the former case of the bars 16. The armature bar 116 may be maintained in a magnetized condition by any suitable means as for instance by mounting the same on a plurality of cone-like armature heads 117 carried at the tops of the rod armatures 118, each of the latter being confined within a magnetic coil 119, all of the coils being energized from any suitable source of current, preferably a direct current. Provision for a very fine adjustment of the armature bar 116 may be made as by adjusting screws 216 rotatably mounted in brackets 217 located at each end of the bar 116 which slides with a close fit in slots 218 formed in the heads 117.

In carrying out my invention with the arrangement shown in Figures 2 and 4, it is only necessary to observe one difference as compared with the process and apparatus illustrated in Figures 1 and 3, namely, the use of inks which are susceptible to the action of magnetic lines of force, that is, an ink with magnetizable metallic substance incorporated therein.

The many advantages of my improvements over all prior known methods and machines of printing will readily occur to those skilled in the art and among them may be mentioned the ability to use very much lighter parts due to the absence of pressure during the printing act; the absence of wear and consequently longer life of the printing surfaces, forms or plates; the absence of streaking, smearing or squashing down of the ink particles on the print receiving surfaces; the elimination of the great amount of time and labor now required in "make ready"; the ability to apply successive ink impressions while wet ink is still on the print-receiving surface; the ability to carry out color printing as a continuous process without the necessity of drying between successive applications of the different color inks; the greater ease with which register may be maintained between the impressions from a plurality of printing surfaces; and the equal facility with which my invention may be used with any kind of a prepared printing surface or form and whether belonging to the relief, intaglio or planographic class.

I have illustrated in the drawings and described herein, only two forms of apparatus indicative of my invention but I am well aware that the broadest aspects of my invention may be embodied in any type of printing press and with any type of prepared printing surface, one of the important factors of my invention permitting of this wide range of utility being the absence of contact

or pressure between the printing and print-receiving surfaces and the use of lines of force as distinguished from mechanical means for effecting the deposits of the ink on the print-receiving surface in accordance with the previously prepared image or representation on the printing surface or surfaces.

Believing that I am the first to effect printing without the use of contact or mechanical pressure between the printing and print-receiving surfaces, I desire to claim my invention most broadly. As will be understood by those skilled in the art, any letters, words, delineations, numerals, drawings, pictures, illustrations, characters, designs, marks, symbols or images or any combination thereof, may be reproduced on the print-receiving surface of paper, cloth or other suitable material by my invention and I therefore use the term "representation" or "image" herein as embracing any one or any combination of the different items just enumerated. It will also be understood that the terms "printing surface" and "print-receiving surface" are used in a generic sense throughout the description and claims.

Throughout the specification and claims, the expression "field of force" has been used in the sense frequently employed in writings on electrical and magnetic phenomena, to indicate the field or sphere within which electro-static or magnetic forces are sufficiently active or powerful to effect a transference of the ink from one surface to another in the manner previously set forth, and I have employed the expression "lines of force" to indicate the forces themselves acting in a definite path or direction in effecting the transfer.

The physical effects resulting from the development and application of these forces are measurable in direction and amount, and these effects are indicative of the presence of what I have termed a field of force within which lines of force are active, whatever may be the theoretical explanation behind the observable effects of electro-static and magnetic action.

In the above sense, it will be understood that where I employ the expression "field of force" in the claims, unless otherwise qualified, it will be understood that this expression is intended to refer generically either to an electro-static field, or to a magnetic field, or to a combination of the two, howsoever and by whatsoever apparatus or means the field may be developed and maintained.

I claim:

1. The herein described improvement in the art of printing which includes: subjecting successive areas of a printing surface having an inked representation thereon while in proximity to a print-receiving surface, to a field of force and transferring the ink from

said successive areas by the lines of force of said field to the print-receiving surface on corresponding successive areas thereof to thereby reproduce the representation thereon in ink.

2. The herein described improvement in the art of printing which includes: bringing successive areas of an inked image printing surface and an image-receiving surface in close proximity to each other and subjecting the successive areas, while in proximity, to lines of force of a field of force and thereby propelling the ink from the successive areas of the printing surface to the corresponding successive areas of the print-receiving surface.

3. The herein described improvement in the art of printing which includes: subjecting successive localized areas of an image printing surface having an inked representation thereon to the lines of force of a field of force and correspondingly simultaneously disposing successive localized areas of a print-receiving surface closely adjacent to but free from contact with said printing surface and thereby transferring corresponding successive localized quantities of ink from the printing to the print-receiving surface.

4. The herein described improvement in the art of color printing which includes: providing a plurality of image printing surfaces with corresponding but different color separation representations of the same subject thereon; inking said representations with the corresponding color inks; bringing an image-receiving surface and each of said image printing surfaces successively into juxtaposition for printing with the printing surface close to but free from contact with the printing surface; and, during the successive said juxtaposed positions, transferring the inks to the printing surface by lines of force.

5. The herein described improvement in the art of color printing which includes: passing an image-receiving surface successively into juxtaposed, printing, slightly spaced relation with respect to a plurality of printing surfaces provided with corresponding color separated representations thereon; inking said printing surfaces with the corresponding color inks; and, during each said juxtaposition, attracting the ink across said intervening space onto the printing surface by lines of force.

6. The herein described improvement in the art of color printing which includes: passing an image-receiving surface by a continuous movement successively into juxtaposed, printing, slightly spaced relation with a plurality of printing surfaces provided with corresponding, relatively registered, color separated images thereon; inking said printing surfaces with the corresponding color inks; and, during each said juxtaposition

sition, depositing the ink onto the printing surface by created lines of force.

7. The herein described improvement in the art of color printing which includes: providing a plurality of image-printing surfaces with corresponding, different color separation images of the same subject thereon and in relative register; inking said images with the corresponding color inks; bringing an image-receiving surface and each of said printing surfaces successively into juxtaposition for printing with the printing surface slightly spaced from the print-receiving surface; and, during each of said juxtaposed printing positions, creating a field of force and, by the lines of force thereof, transferring the inks to the printing surface.

8. The herein described improvement in the art of printing which includes: providing an image printing surface having an inked representation thereon; creating a field of force; moving successive localized areas of the inked representation into the zones of greatest intensity of said field of force; and simultaneously moving successive corresponding areas of a print-receiving surface into said zone but in spaced relation to said image printing surface whereby the ink is discharged from the latter from successive areas onto corresponding successive areas of the image-receiving surface and a printing of said representation thereby obtained.

9. The herein described improvement in the art of printing which includes: providing a plurality of image printing surfaces each having an inked representation thereon; creating a corresponding plurality of fields of force; moving successive localized areas of each inked representation into the zone of greatest intensity of the corresponding field of force; and simultaneously moving successive corresponding areas of an image receiving surface into said zones, in sequence, but in spaced relation to the said image printing surfaces whereby the ink is transferred from the image printing surfaces, in sequence, to said print-receiving surface.

10. In a printing machine, an image printing surface having a representation thereon; means for inking said representation; means for moving said image printing surface so as to present successive areas of the representation into closely spaced relation to successive areas of an image-receiving surface; and means for creating a field of force in the zones of closely spaced relationship of said surfaces and thereby transferring the ink to the print-receiving surface by the lines of force thereof.

11. In a printing machine, the combination with a plurality of printing surfaces each having a printing representation there-

on; means for inking the representations of said printing surfaces; means for moving an image-receiving surface successively in juxtaposition to each image printing surface; means for moving each printing surface so as to present successive areas of the representation thereon into closely spaced relation to the image-receiving surface; and means for creating a field of force in each of the zones of closely spaced relationship of said surfaces and thereby transferring the ink to the print-receiving surface by the lines of force thereof.

12. In a printing machine, a rotatable cylinder having an image printing representation thereon; means for inking said cylinder; means for moving an image-receiving surface so as to pass the same in closely spaced relation to the cylinder as the latter is rotated; and means for creating a field of force in the region of closest proximity of an image-receiving surface and cylinder to thereby transfer ink from the latter to an image-receiving surface to correspond with said representation thereon.

13. In a printing machine, a plurality of rotatable cylinders each having a printing image thereon; means for inking the respective cylinders; means for moving an image-receiving surface successively into close proximity to each of the cylinders; and means for creating a field of force in each of the regions of proximity of the print receiving surface and respective rollers.

14. The herein described improvement in the art of printing, which comprises taking a printing surface having an inked image thereon, bringing said printing surface into close proximity to an image receiving surface within an induced field, to thus effect the transfer of the inked image from the printing to the receiving surface.

15. The herein described improvement in the art of printing, which comprises taking a printing surface having an image thereon, inking said image, bringing said inked image into close proximity to a receiving surface, subjecting said surfaces to an induced field, to thus effect the transfer of the inked image from the printing to the receiving surface.

16. The herein described improvement in the art of printing, which comprises taking a plurality of printing surfaces each having a constituent portion of an image thereon, inking said portions, bringing a receiving surface successively into close proximity to the printing surfaces, successively subjecting said printing surfaces and receiving surface to induced fields, to thus successively effect the transfer of the inked constituent portions of the image to the receiving surface, each constituent portion of the image being transferred before the immediately preceding transferred portion is dry.

17. The herein described improvement in

the art of printing, which comprises taking a printing surface having an inked image thereon, bringing said printing surface into close proximity to an image receiving surface within an induced field, to thus effect the
5 transfer of the inked image from the printing to the receiving surface, and controlling the character of the image transferred to the receiving surface by varying the degree of proximity of the printing and receiving surfaces.
10

18. The herein described improvement in the art of printing, which comprises taking a printing surface having an inked image
15 thereon, bringing said printing surface into close proximity to an image receiving surface within an induced field, to thus effect the transfer of the inked image from the printing to the receiving surface, and controlling the character of the image transferred to the receiving surface by varying
20 the effectiveness of the induced field between the printing and receiving surfaces.

19. The herein described improvement in the art of printing, which comprises taking a printing surface having an inked image thereon, bringing into and maintaining said printing surface in close proximity
25 to an image receiving surface within an induced field, to thus effect the transfer of the inked image from the printing to the receiving surface.
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In witness that I claim the foregoing I have hereunto subscribed my name this 28th
35 day of December 1927.

WILLIAM C. HUEBNER.

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