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Patented Nov. 21, 1899.

P. G. FRAUENFELDER & W. H. MCENTEE.

COLOR PRINTING APPARATUS.

(Application filed Feb. 26, 1898. Renewed Oct. 24, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

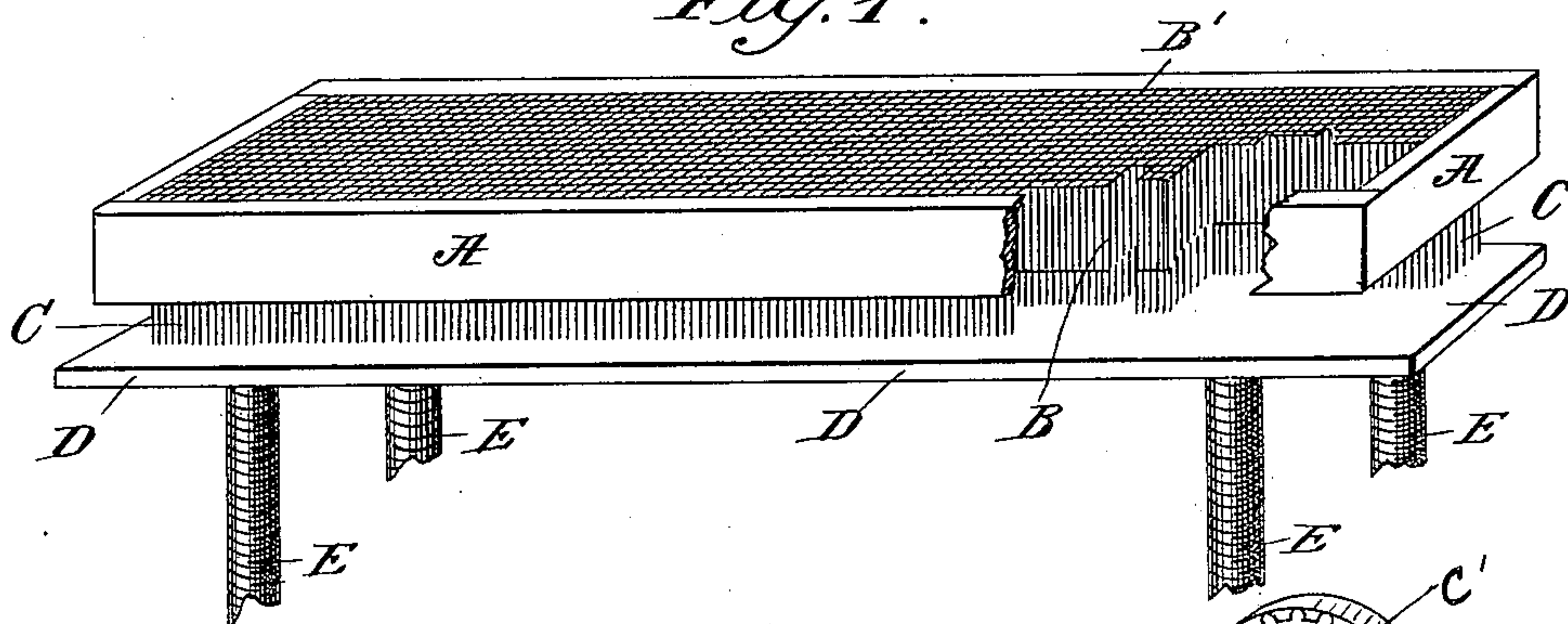


Fig. 2.

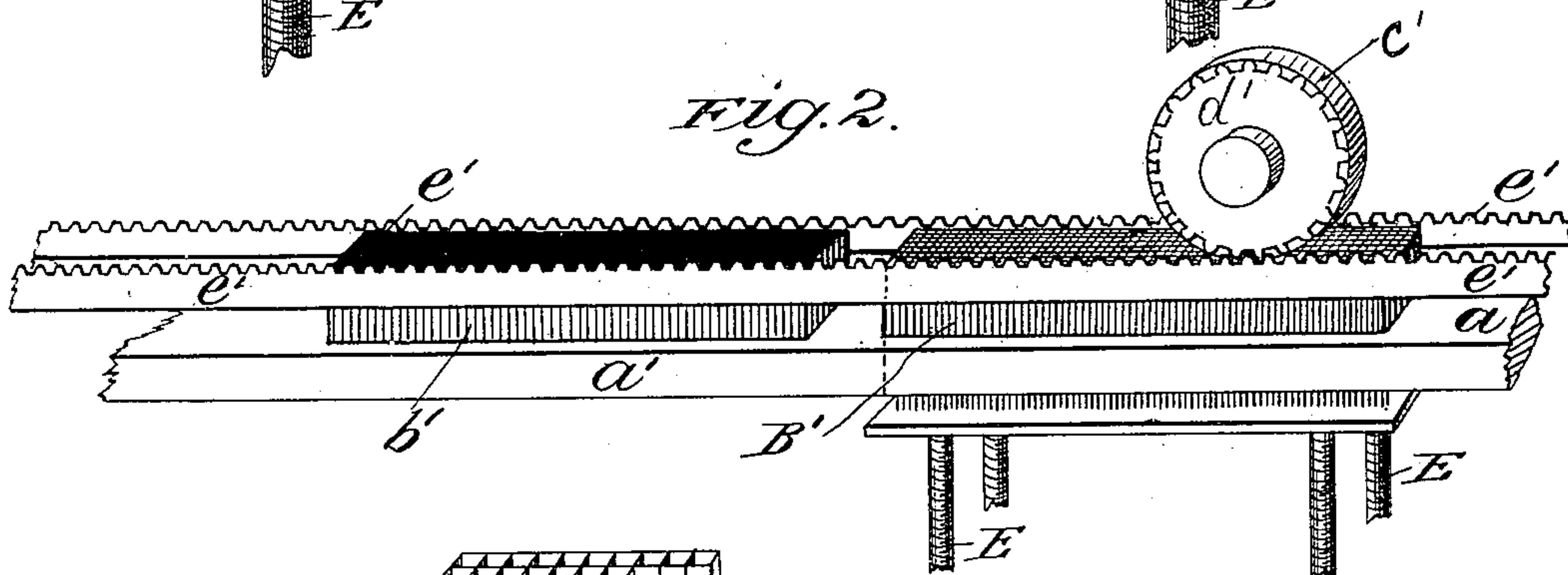


Fig. 3.

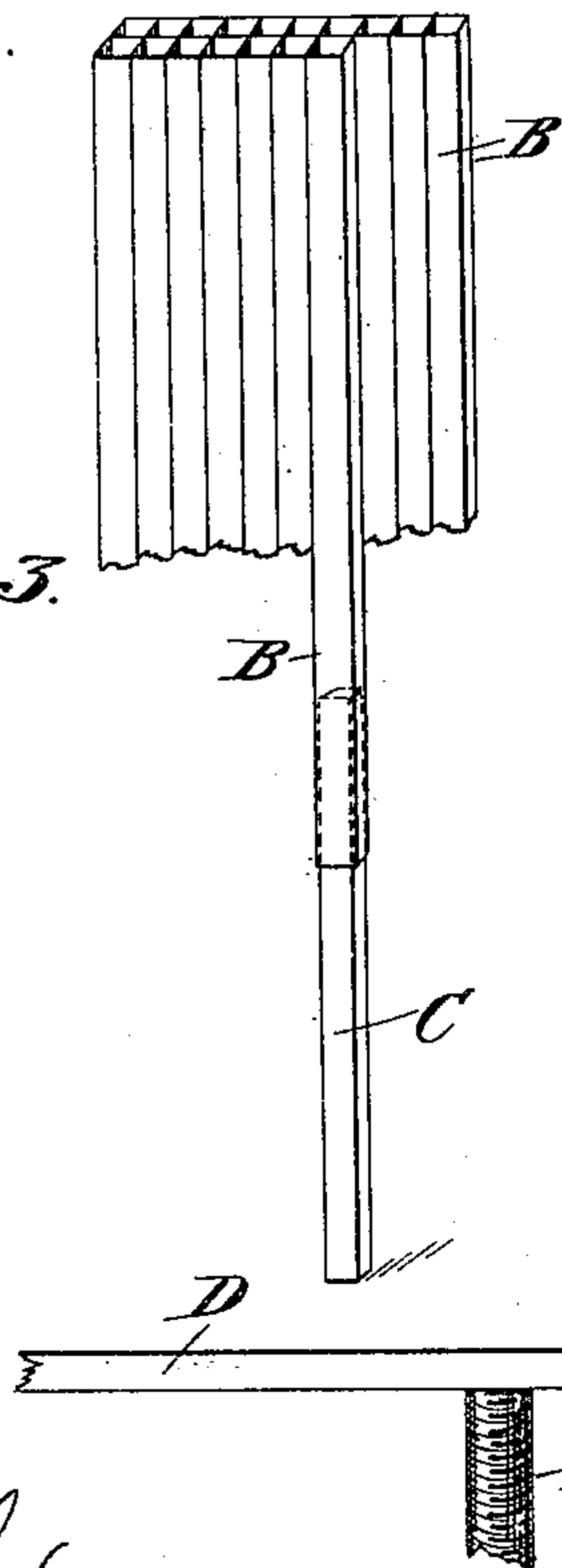
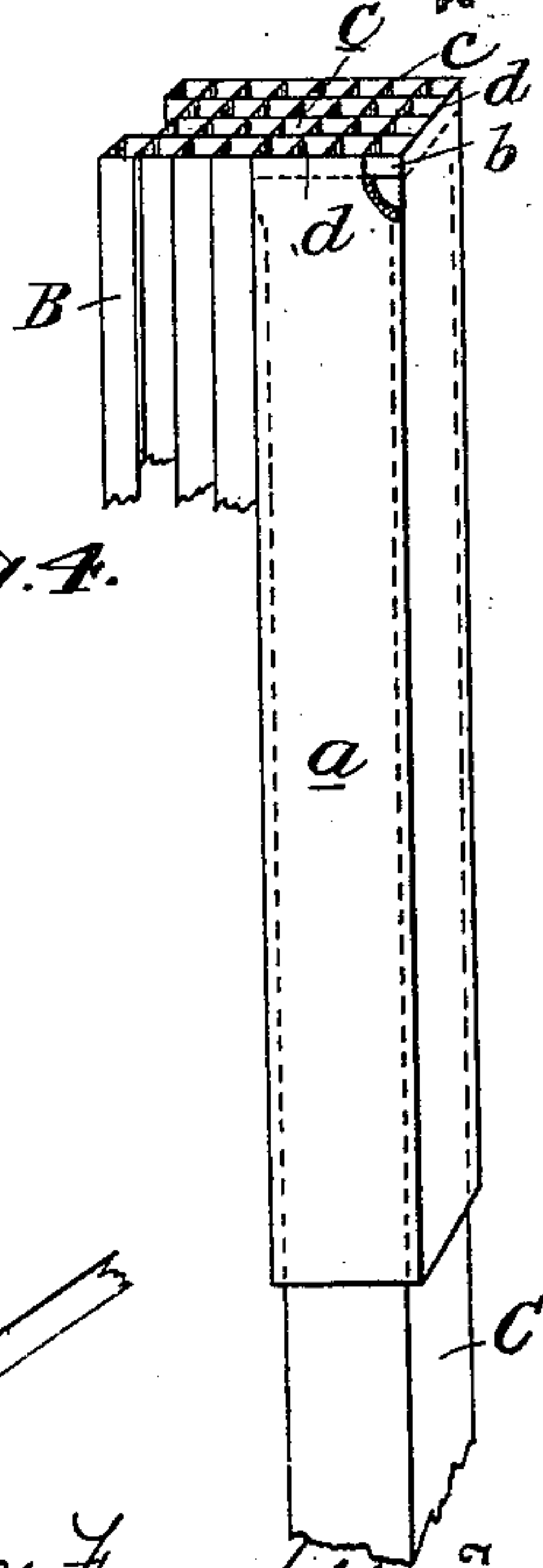


Fig. 4.



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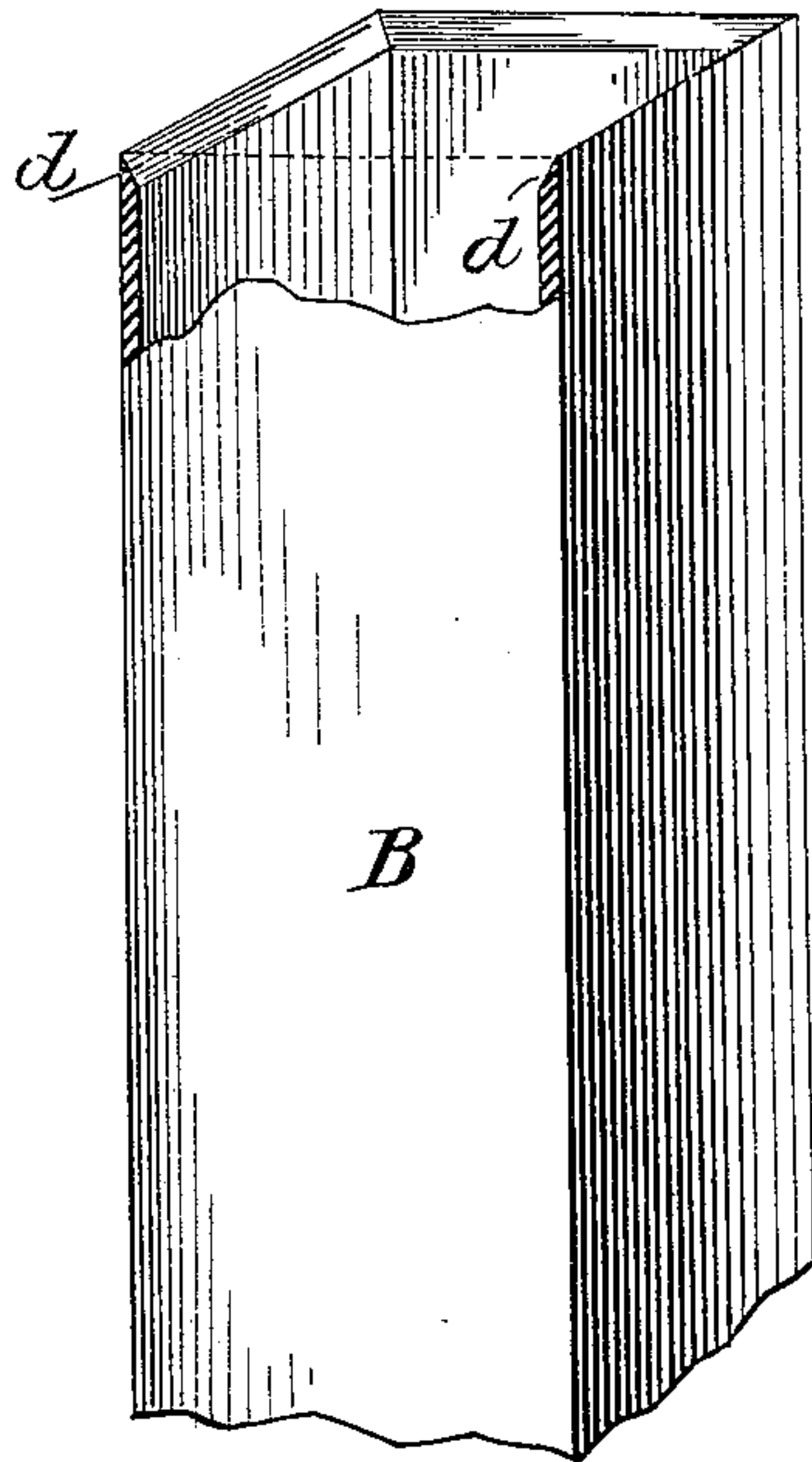
COLOR PRINTING APPARATUS.

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(No Model.)

2 Sheets—Sheet 2.

Fig. 5.



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UNITED STATES PATENT OFFICE.

PAUL GEORGE FRAUENFELDER AND WILLIAM H. MCENTEE, OF
NEW YORK, N. Y.

COLOR-PRINTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 637,379, dated November 21, 1899.

Application filed February 26, 1898. Renewed October 24, 1899. Serial No. 734,681. (No model.)

To all whom it may concern:

Be it known that we, PAUL GEORGE FRAUENFELDER, a citizen of the Republic of Switzerland, and WILLIAM H. MCENTEE, a citizen of the United States, both residents of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Color-Printing Apparatus, of which the following is a specification.

Our invention relates to improvements in printing apparatus. The controlling idea consists in employing a peculiarly-constructed printing-surface composed of a plurality of independent tubes, which act in the apparatus as type, each of the tubes containing ink or equivalent material of different colors, these tubes containing the differently-colored inks being employed in some respects as ordinary type are in ordinary printing. The separate tubes, having been "set up" or arranged, are blocked in a suitable frame, the upper ends of the tubes being arranged all upon the same plane from which the impression is taken in the first instance. The color or ink is expelled from the tubes by a series of plungers or pistons which enter the tubes from below and which are elevated as the printing advances and the ink is consumed.

The apparatus as above briefly described forms the subject-matter of an application for Letters Patent filed by us in the United States Patent Office on the 23d day of February, 1898, Serial No. 671,256, to which we refer for a more complete description.

In the apparatus above referred to as constituting a prior application for patent filed by us the impressions were taken by placing the paper or other substance to be printed upon directly over the upper ends of the ink-containing tubes which constitute the printing-surface and then pressing the paper upon the said surface. Under our present invention, however, we extend the operation somewhat, by which we obtain results different from those just referred to.

The invention is substantially as follows: Our multicolor-printing plate of the former invention becomes in this invention an ink-ing surface or fountain, from which color is taken and applied to any kind of printing-

plate, such as intaglio or half-tone plate, woodcut, lithographic stone, zinc plate, or aluminium plate.

Referring to the drawings hereof, Figure 1 illustrates a perspective view of the parts of the apparatus involved in our said prior application and which constitute what may be termed the "primary element" in our present apparatus. Fig. 2 is a perspective view of said primary element arranged with the secondary devices which we employ in this present invention. Fig. 3 illustrates a perspective of the separate tube and means of ejecting the colored ink therefrom, which we insert in this application for the sake of greater clearness and ease in understanding the same. Fig. 4 illustrates a perspective view of a large tube with perforated end in combination with small tubes. Fig. 5 illustrates the upper end of one of the printing-tubes enlarged.

In the description hereof we will embody a somewhat-detailed description of the entire apparatus, including that of our former application, so that the apparatus here under contemplation may be more clearly understood. It is as follows:

A illustrates a frame, which may be of any preferred construction. In practice it will be supported against the pressure of the platen of the press in any suitable manner. (Not shown.)

B are the tubes, (best shown in Fig. 3,) preferably square in outline. They are made of metal or other suitable material and may be of such size as the requirements of the work necessitate. For coarse work, such as bill-posters and the like, they may be as large as one-eighth of an inch in diameter and from that down to such size as desired—say one thirty-second of an inch or less.

C is one of the plungers. It is or may be a square piece of metal and has one end inserted in the tube, with its lower or opposite end resting on platen D, which we prefer to be made of metal. The platen is supported upon threaded rods E E, &c., the threads on which are preferably made of exceedingly low pitch, so that by proper turning of the rods the table or plate D, carrying the plungers C, may be elevated by exceedingly small de-

grees. The devices for turning the rods E are not shown. Any suitable mechanism may be employed, such as will turn them all simultaneously as occasion requires. These tubes
 5 are provided in large numbers, so that for each color there will be a large number of tubes, the same as for each letter of the alphabet there are a large number of individual type. We sometimes make the tubes ob-
 10 long in shape instead of square, so that the setting of the type or tubes may be more rapid where a large space of the same color is to be printed. For example, suppose we are to re-
 15 produce a design in which the detail or intricate parts require the use of tubes one-sixteenth of an inch in diameter, but in the design there are also large expanses of even or un-
 broken color. For these masses of color we use larger tubes *a*, (see Fig. 4,) which may be
 20 oblong or square or of any preferred shape. In the upper or printing end of such tubes a plug *b* is fitted, this plug being perforated, as at *c*, so as to form partitions corresponding with the one-sixteenth-of-an-inch openings of
 25 the other tubes, so that, although we use large and small tubes in combination, the printing-surface presents an unbroken plane of one-sixteenth-of-an-inch holes. The reason for inserting the plug, with its plurality of small
 30 holes, is so that the ink cannot be lifted bodily or in large quantities from the large tube, which might otherwise take place. This larger tube, in combination with small ones, is illustrated in Fig. 4.
 35 The tubes may be of any length convenient for handling, so long as they contain sufficient color for the edition or number of impressions. At their upper or printing ends, which constitute the printing-surface, the metal may be
 40 beveled off from the inside of the tubes outwardly and upon all its sides, so as to present as thin an edge as possible. This is best shown at *d d*, Fig. 5. The color, however, will ordinarily practically, if not completely,
 45 join at the adjacent edges, so that the print, as viewed from a distance of a few feet, will present unbroken color surfaces, such faint lines of demarcation as may be present being imperceptible.
 50 The operation of the devices as thus far described is as follows: The printer has before him his pattern for the production of the desired print, which may be a bill-poster, a wall-paper pattern, illustrated-catalogue work,
 55 illuminated print, or whatever it may be, and after becoming skilled, using that as a pattern, taking measurements, if necessary, he quickly sets up his tubes of such colors as are necessary to produce the pattern before him. We some-
 60 times cover the design to be reproduced with lines running at right angles, thus forming squares to correspond with the ends of tubes in our printing-plate. By the aid of this chart the operator is enabled to place the tubes with
 65 reference to the pattern of the design, just as in needle-work the stitches are taken according to the warp and woof of the fabric. These

tubes are set up in a frame, such as the frame A shown in the drawings, and after having been duly squared on their ends to pre-
 70 sent a continuous smooth surface they are clamped within the frame in any suitable manner. This continuous surface constitutes our inking-surface or "color-fountain," herein-
 after referred to, and we use it in practicing
 75 our invention, as will presently be stated.

For the purpose of describing the working of our invention we have illustrated in our drawing Fig. 2 only the most simple form of mechanism, as it is not dependent for its
 80 successful working upon any particular form of machine. In fact, we can adapt it to any of the lithographic presses and many of the typographic presses now in use.

In transferring the ink from the inking-sur-
 85 face or color-fountain B' (called "printing-surface" in former application) we support the frame A, which contains the printing-tubes, upon a table *a'*, which is suitably supported in any manner, (not shown,) and ad-
 90 jacent to the inking-surface B' a half-tone relief-plate *b'* is placed and is likewise supported upon the table *a'* in such relation to the inking-surface B' that when a roller *c'*, (one or
 95 more rollers may be employed,) which is made to rotate by means of a gear *d'*, which engages with racks *e' e'*, (the latter being suitably supported over the table *a'*,) is moved lengthwise of the racks it takes the ink from the inking-surface B' and transfers it to the relief-plate
 100 *b'*. In cases where a finer distribution of color is desirable the color is taken by the roller or rollers from the inking-surface and rolled onto an inking-slab, where it is taken by another roller or rollers and finally deposited on
 105 the final printing-plate. It is to be understood that the picture or design on the relief-plate *b'* is a complete detail of the design formed by the color-tubes in the inking-surface B' and of exactly the same size, and the
 110 roller *c'* is of suitable circumference so that in passing over the inking-surface B' an impression of the design or picture may be taken on the roller in one revolution without covering the entire circumference of the roller.
 115 The roller having taken the impression from the inking-plate, it is now passed or rolled in perfect register over the half-tone plate and transfers the colors to it in their proper relation. The half-tone plate is thus "inked
 120 up," and an impression may be taken by any of the usual methods. If more than one roller *c'* be used, they will all bear the same relation to the other parts as above stated. In a similar manner we can transfer the colors
 125 from our inking-surface B' to any lithographic surface which has been previously prepared with the detailed drawing corresponding to the color-design in our inking-surface; but in this case we should, of course,
 130 alternate the movement of the roller with a suitable damping of the stone, according to the common practice in this work. By "lithographic surface" we mean lithographic stone,

zinc or aluminium plate, or other printing-surface used in lithography.

Our invention may be employed in conjunction with the well-known rubber or elastic reducing devices to effect a reduction in the size and fineness of the print. This, however, forms no part of our present claim.

By means of our invention and its various uses we are able to effect multicolor printing of various kinds in a much more expeditious, effective, and inexpensive manner than possible by any other apparatus or process known to us.

It will be obvious to those who are familiar with such matters that modifications may be made in the details of the construction of the parts, not only such as suggested in our said previous application, but also in the apparatus shown in this present case, and particularly that, although we have illustrated the several devices in a horizontal position, they may be and frequently are used in different planes and at different angles relative to each other. Indeed, we use the invention on rotary presses and oscillating presses as occasion requires. It will be understood that the inks are of such consistency as not to escape from the tubes in any position they may be placed.

We wish it distinctly understood that the apparatus shown by us is illustrative merely of one form in which it may be made. Those skilled in this art will at once understand that modifications to a very considerable extent may be made therein without departing from the essentials of the invention.

We claim—

1. The combination in a printing apparatus of a series of tubes set in a frame, their upper ends all on the same plane; a series of plungers adapted to enter the lower ends of the tubes to eject their contents; a roller and a stone or equivalent printing-surface, for the purposes set forth.

2. The combination in a printing apparatus of a series of tubes, adapted to contain colored inks, set in a frame, their upper ends all on the same plane; a roller adapted to roll over the upper ends of said tubes; means to secure the smooth and uniform revolution of the roller; and a stone, or equivalent printing-surface adjacent to the said tubes and

roller, so arranged as to properly receive the impression from the latter; for the purposes set forth.

3. The combination in a printing apparatus of a series of tubes adapted to contain differently-colored inks; means to eject the ink from the tubes from below; a roller of the necessary width and diameter to receive upon its surface, without overlapping, the design presented by the tubes; and a stone, or equivalent printing-surface upon which the roller may transfer the ink, for the purposes set forth.

4. The combination in a printing apparatus of a series of tubes adapted to contain differently-colored inks, supported upon a table or suitable support; a roller of sufficient width and diameter to receive upon its surface, without overlapping, the design presented by said tubes; means to direct and control the rotation of the roller; and a stone or equivalent printing-surface, likewise supported upon the said table in such manner as that the roller may properly transfer the ink upon its surface thereto; for the purposes set forth.

5. In a printing apparatus a series of tubes adapted to contain differently-colored inks, set in a frame; a roller of sufficient width and diameter to receive upon its surface, without overlapping, the design presented by said tubes; and a plate having engraved upon it in relief the design substantially such as presented by said tubes, and of the same size, whereby the roller may transfer the different-colored inks thereto, substantially as they appear upon the surface of said tubes; for the purposes set forth.

6. A printing apparatus embodying an inking-surface composed of a series of separate receptacles for containing differently-colored inks; a roller of such size as to receive upon its surface, without overlapping, the entire design presented upon the said inking-surface; and a printing-surface of substantially the same size as the inking-surface, upon which the roller may transfer the ink; for the purposes set forth.

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