No. 624,030. Patented May 2, 1899.

J. M. HEPPLER.

PROCESS OF AND APPARATUS FOR PRODUCING IRISATED PRINTS.

(Application filed Jan. 3, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

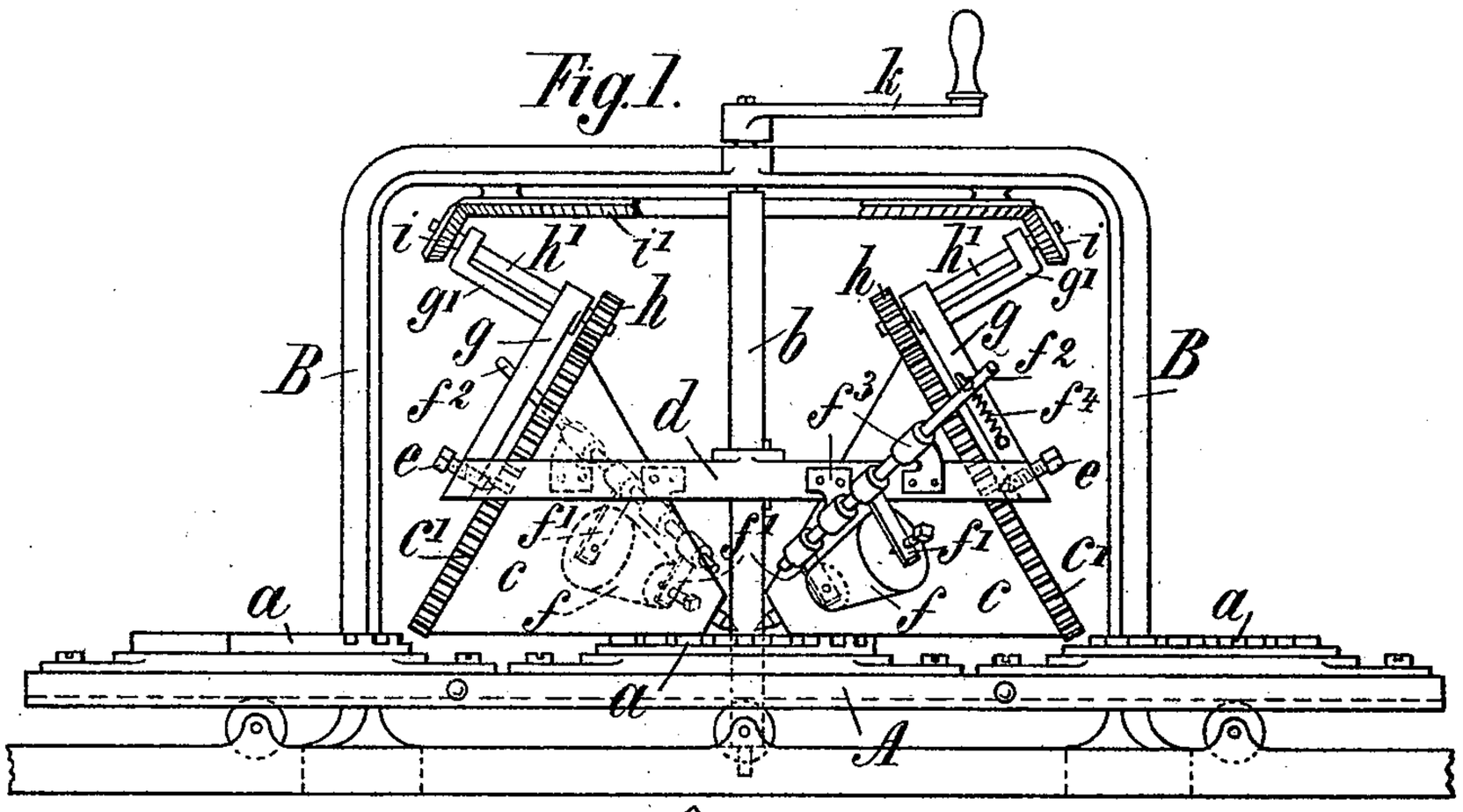


Fig. 2.

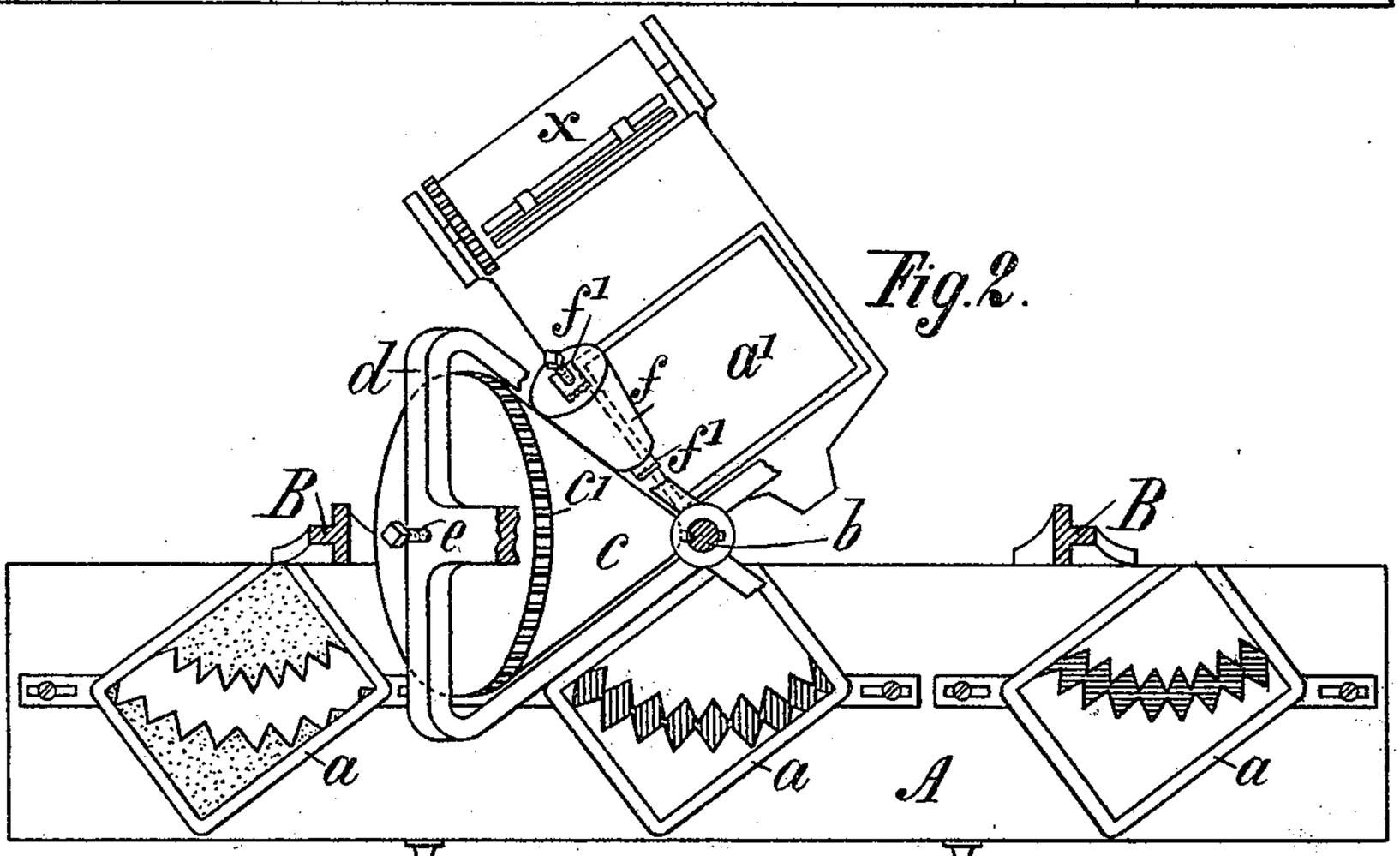
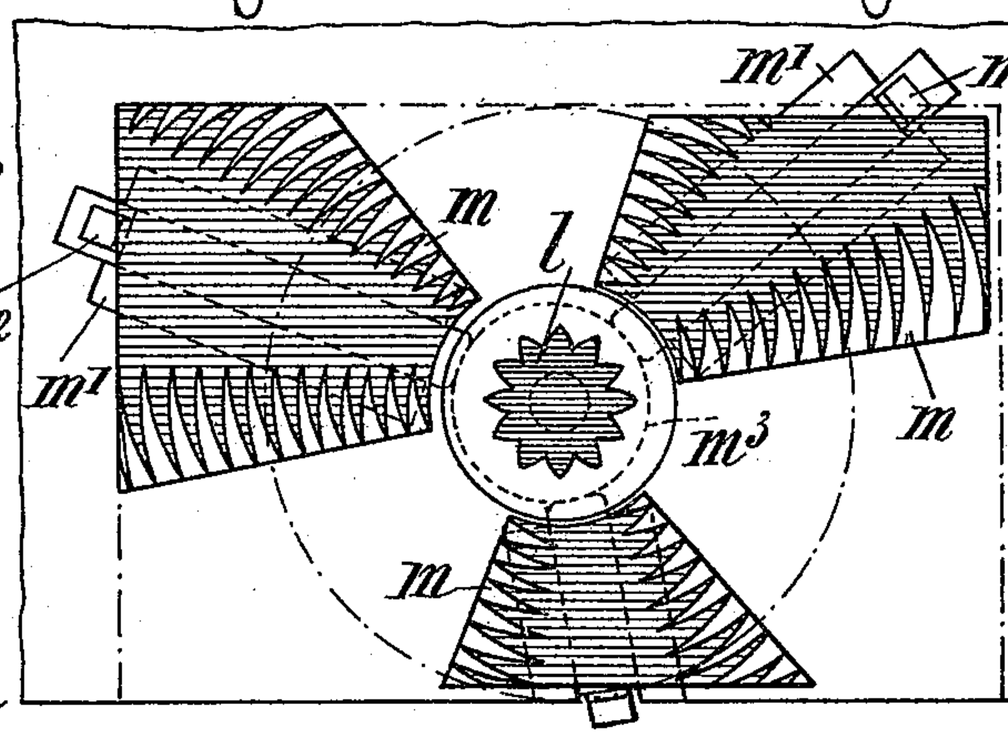


Fig. 6.



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No. 624,030. Patented May 2, 1899.

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(No Model.) 3 Sheets—Sheet 2.

Fig. 3.

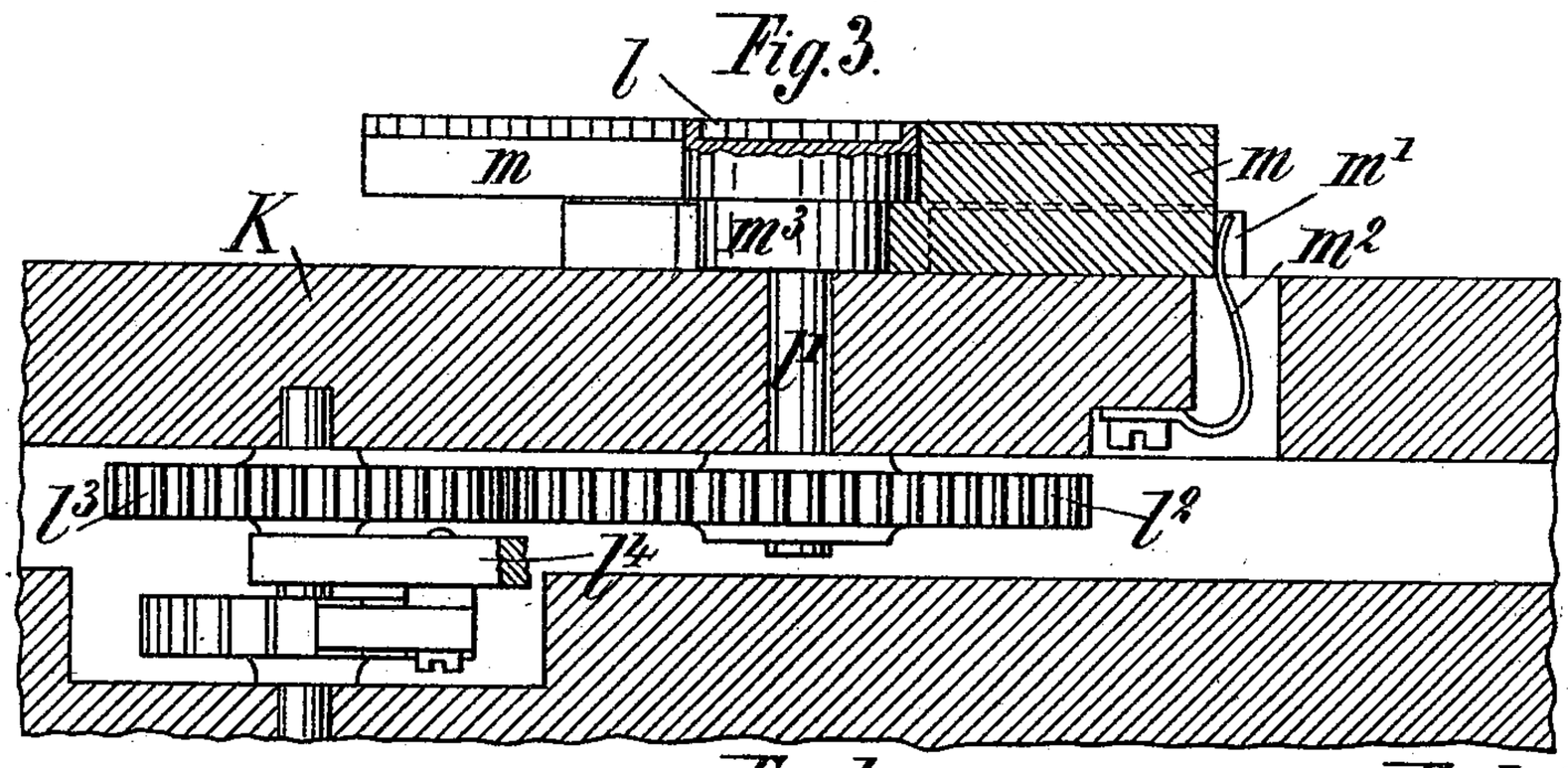


Fig. 4.

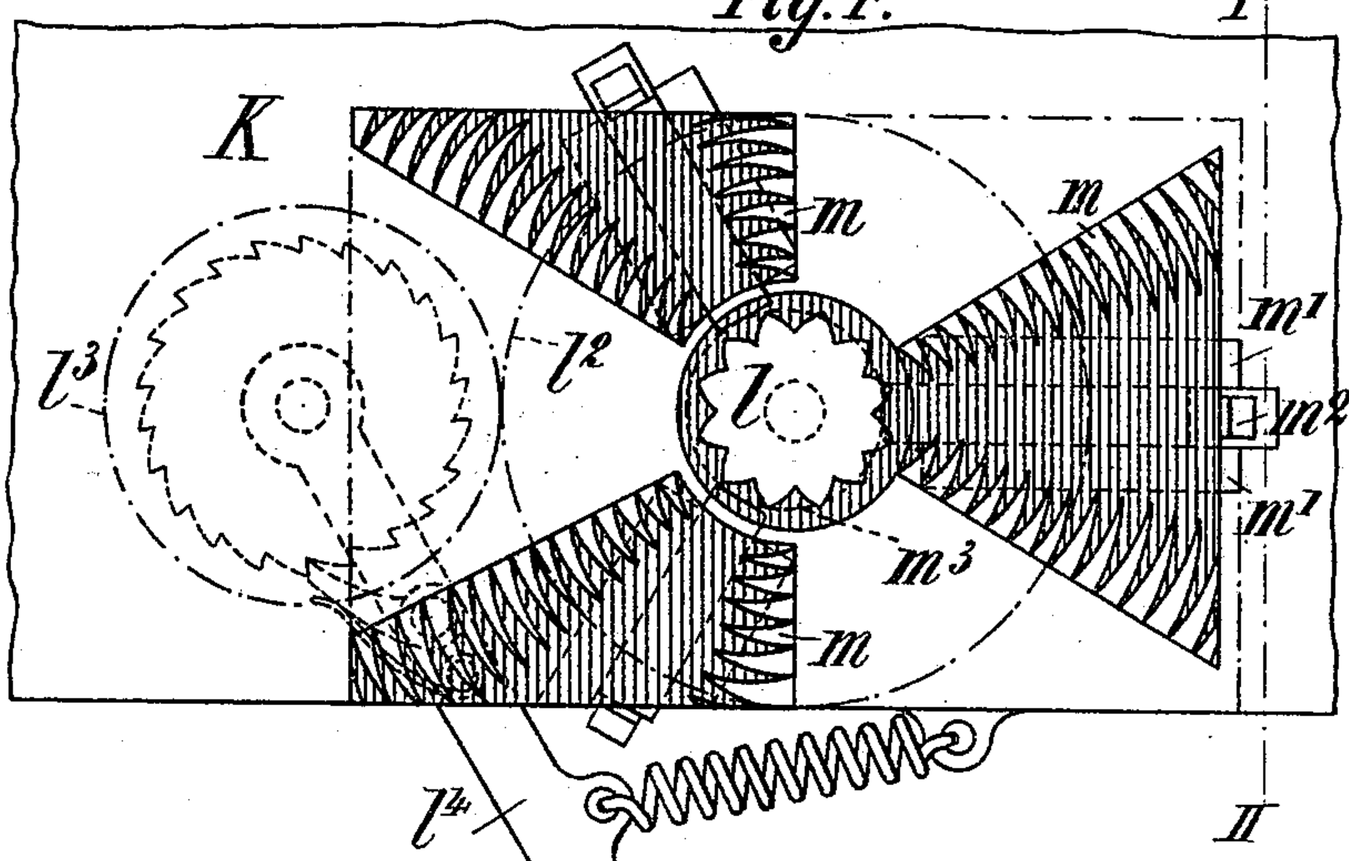


Fig. 4a.

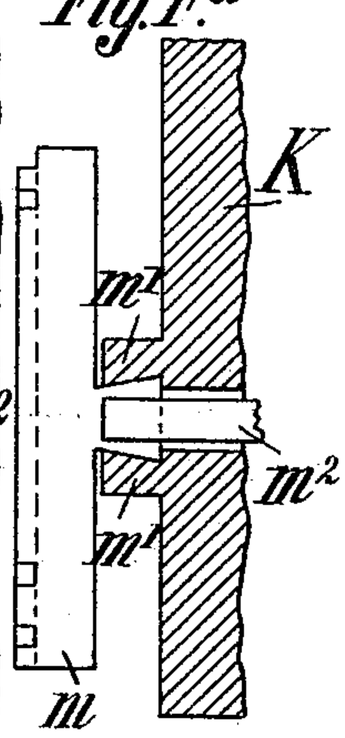
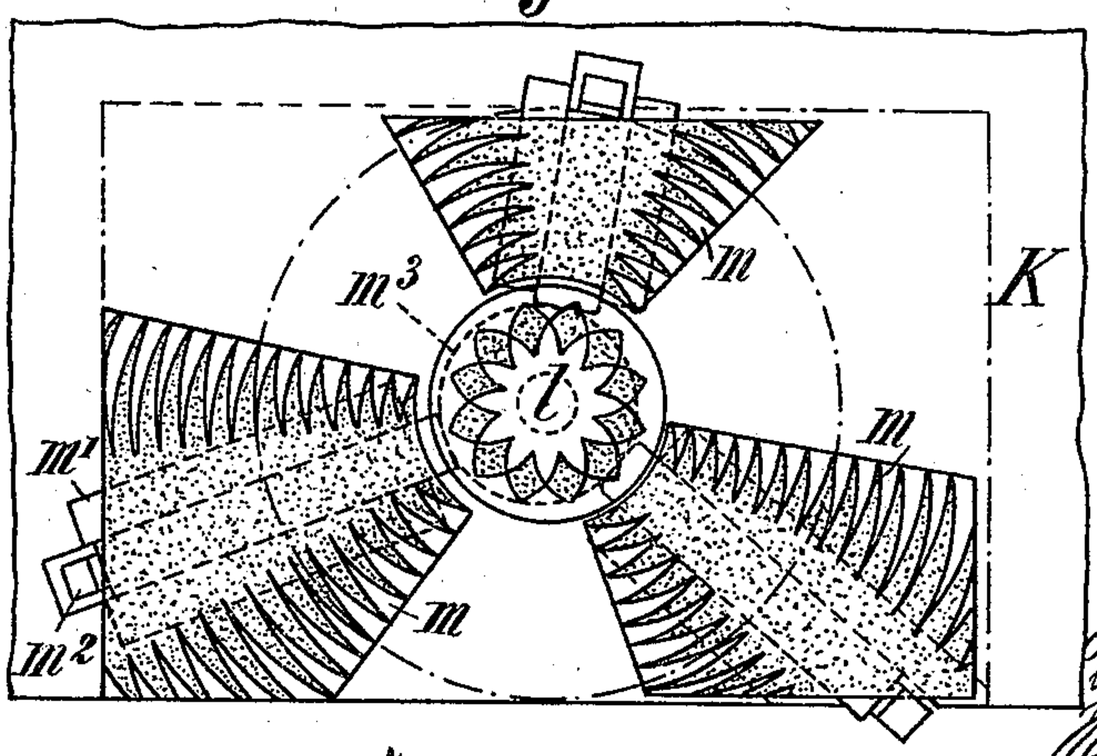


Fig. 5.



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No. 624,030. Patented May 2, 1899.

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(Application filed Jan. 3, 1898.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 7.

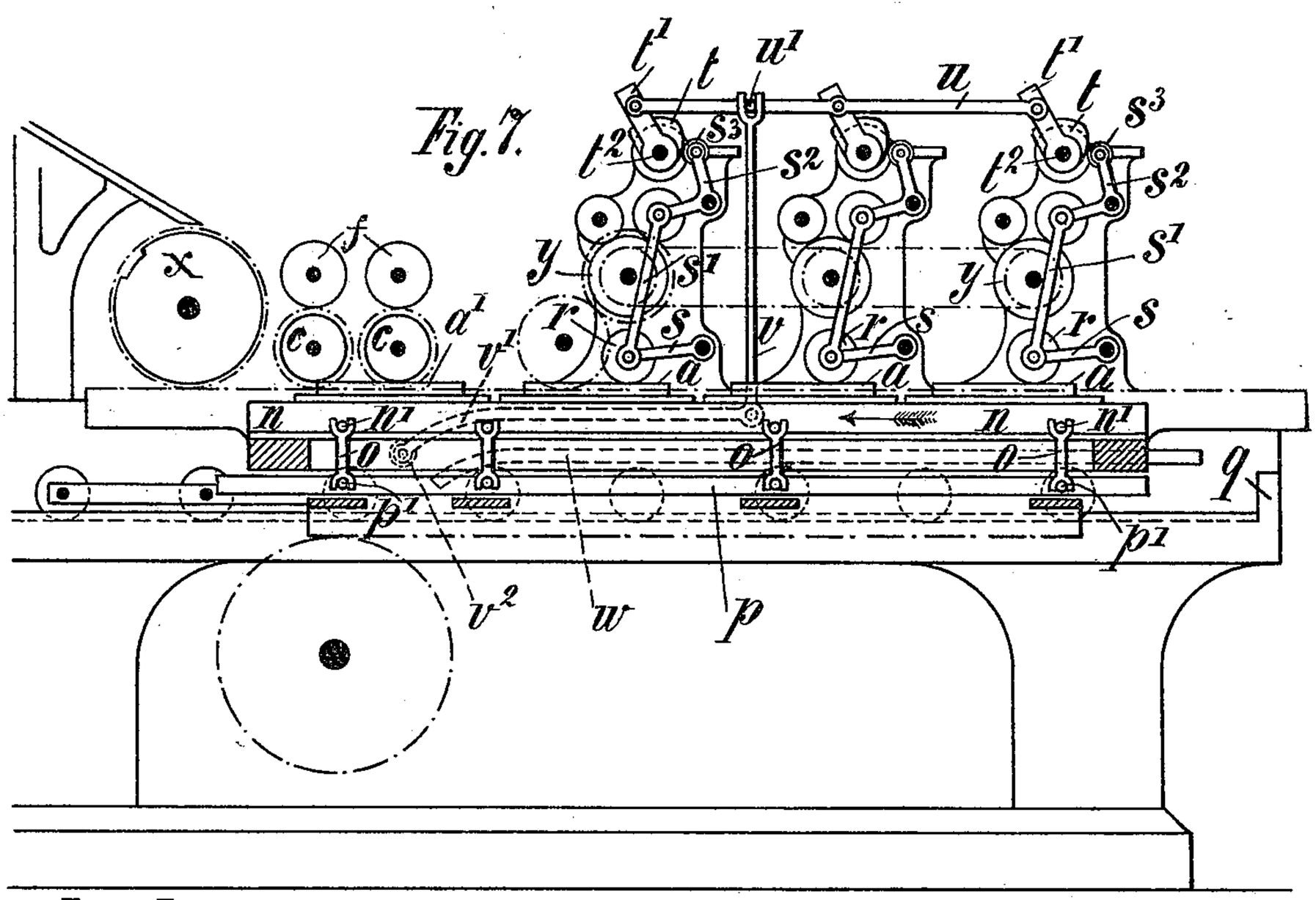


Fig. 8.

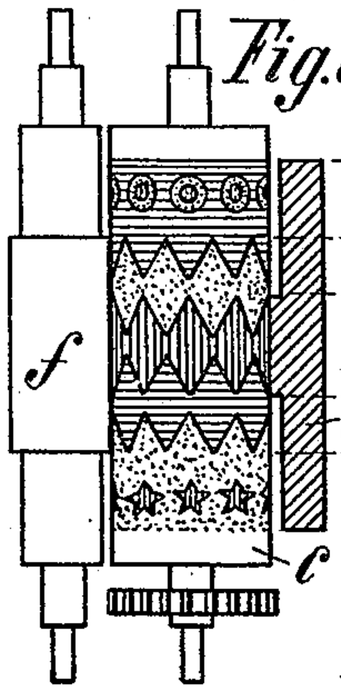


Fig. 9.

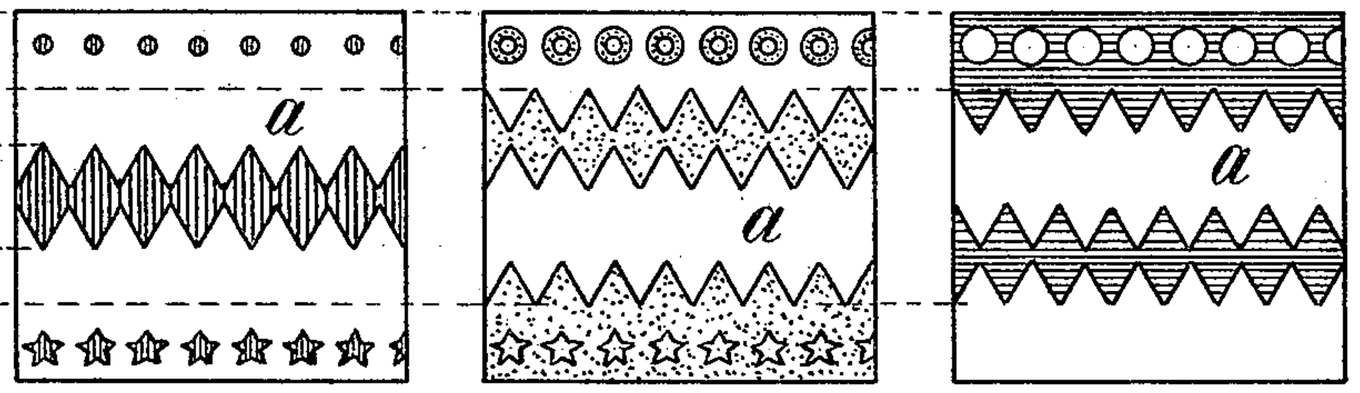


Fig. 10.

Fig. 11.

Fig. 12.

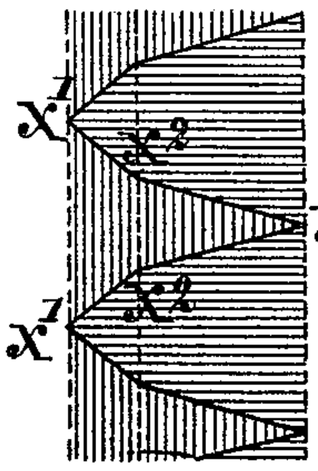
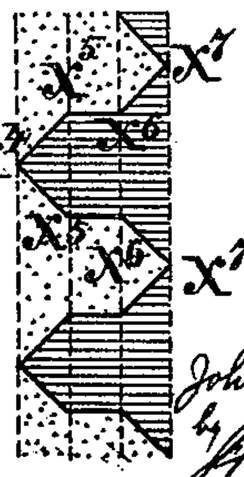


Fig. 13.



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UNITED STATES PATENT OFFICE.

JOHANN MARTIN HEPPLER, OF LEER, GERMANY.

PROCESS OF AND APPARATUS FOR PRODUCING IRISATED PRINTS.

SPECIFICATION forming part of Letters Patent No. 624,030, dated May 2, 1899.

Application filed January 3, 1898. Serial No. 665,493. (No model.)

To all whom it may concern:

Be it known that I, JOHANN MARTIN HEPPLER, a subject of the German Emperor, and a resident of Leer, (Ost Friesland,) in the German Empire, have invented a certain new and useful Improved Process and Apparatus for the Production of Irisated Prints, of which the following is a specification.

The methods hitherto known for the production of irisated, variegated, or rainbowed prints only admit of the gradations of the rainbow shades being marked in parallel strips the width of which is not exactly defined or delimited.

The subject of this invention is a process enabling irisated prints of any pattern to be produced at will in perfectly neat tints or shadings of limited width and for gradual blending into one another. This result is attained, first, by giving the ground-color patterns such forms that the ground colors when applied to the color-distributing device (roller, cone, table, or the like) do not lie side by side in mere juxtaposition, but "gear" or interfit together with their contiguous edges, which are preferably toothed or zigzag-shaped for this purpose, and, second, by rubbing or commingling with one another the tongues or zigzags of the contiguous edges of the ground colors applied to the color-distributing device, which mixing or commingling is effected not in the direction of the gradation or shading, but transversely to the latter and to the teeth or zigzags of the ground colors, following the course of the interfitting of the latter. By giving the marginal teeth or projecting parts of the ground colors a tapering shape a soft and gradual blending of the one tint into the other is obtained when such tapering and interfitting color parts are rubbed into or commingled with each other. The blending will be the more gradual the narrower and the more tapering the projecting parts of the ground colors are made. If the projecting parts of the ground colors were made of uniform width or breadth throughout their length, the consequence would be that only one stripe of the tint resulting from the fusion or commingling of the two adjoining colors would be formed. Instead of tapering the said projecting color parts the gradual diminution in the width of these parts may, however, be effected by offsets or undulations formed in the adjoining margins or edges of the ground colors. Thus, in consequence of the fact that the rubbing or commingling of the ground colors takes place transversely to the direction in which the irisated effect is to be obtained, the formation of an irisated stripe or field of a predetermined width is insured by the simplest conceivable means, so that a straight-lined, as well as a curved, rainbow pattern or figure may be produced at will.

Apparatus capable of carrying out my improved process of producing irisated prints may be arranged in different ways. In one form of construction the ground-color patterns, having zigzag or the like shaped edges and being carried by special color-blocks, are applied to the distributing device in any well-known manner, so that the projecting parts of the ground colors gear with or interfit each other. The said color parts are then rubbed into or commingled with one another upon the distributing device by suitable rollers of proper shape and size in order to produce the blending of the respective ground colors and the irisated effect between the latter. When by the aid of the small rollers the margins or edges of the ground colors have been sufficiently mixed and properly distributed upon the surface of the distributing device, the printing-block is inked or colored in its turn by the said distributing device, whereupon the rainbow-prints are taken from the printing-block in any convenient manner. In another constructional form of my improved apparatus the mixing or commingling of the toothed margins of the ground colors may be effected during the transferring or applying of such colors to the distributing device or printing-block by imparting by any suitable means to the color-blocks provided with the ground-color patterns a rotating or reciprocating motion, respectively. To suit the proposed object, the color-blocks should be specially constructed—that is to say, be made up of a number of separate parts capable of being moved at right angles to the shading being formed at the time. The simplest motion is that required for the production of irisated effects in a circular or annular form, as in this case the corresponding parts of the color-blocks need only be turned

about their axes. For radiated, as well as for straight, irisated designs, however, it is necessary to make provision for a rectilinear motion of the requisite parts of the color-blocks. From what has been explained before, however, it will be readily understood that there can be but a limited scope for the application of apparatus of the first-mentioned type, whereas any desirable or conceivable rainbow patterns may be obtained by the other form of apparatus.

In the accompanying drawings, Figures 1 and 2 represent an arrangement of the first-named form enabling the novel color-printing process to be carried out by means of a hand-operated press, Fig. 1 being an elevation, and Fig. 2 a plan, of such arrangement. Figs. 3 to 6 illustrate the arrangement of the color-blocks for the ground colors in the production of rather more complicated patterns according to the second method, Fig. 3 being a longitudinal section, Figs. 4, 5, and 6, plan views, and Fig. 4ª a cross-section, of the block on the line I II, Fig. 4. Fig. 7, moreover, is a diagrammatic side elevation of a color-distributing device constructed with a view to the application of the improved process to steam or mechanical printing-presses and readily attachable to presses of this description. Figs. 8 and 9 represent color blocks and rollers fitted for the production of irisated prints in strips running in rectilinear directions only, and Figs. 10, 11, 12, and 13 illustrate methods of producing various irisated effects.

In color-distributing apparatus applicable to hand-presses—such, for example, as may be used in representing irisated rainbows (or similar figures or designs made up of concentric rings)—the first requirement, common to this as well as to every other color-printing press, is the provision of a special color-block *a*, Figs. 1 and 2, for every ground tint. Now the whole series of these color-blocks *a* are secured on a carriage A and adapted to be moved backward and forward along with such carriage. In the example shown the blocks *a* are so arranged upon the carriage A that the corner nearest to the center of the arc or curve of the pattern is situated as near as practicable to the vertical spindle *b* of the color-distributing apparatus.

This apparatus consists of two cones *c c*, revolubly mounted in the spindle *b* and retained by screws *e e* in such a position that their outer surfaces may revolve in contact with or roll upon the color-block *a* or the printing-block *a'*, as the case may be, the said screws *e e* being fitted in stirrup-shaped frames *d d*, also secured onto the said spindle *b*. Over the space or "width" in which the rainbow effect is to be produced small commingling-cones *f* are arranged to roll against the outer surfaces of the larger or color-distributing cones *c*, the circumference of a cone *c* being, however, no multiple of the circumference of a cone *f*, which causes by its rubbing and rolling action that the relative displacement or commingling of the colors or tints is effected transversely to the direction in which the gradations of shade or tone take place between such tints. Each of the rubbing-cones *f* is connected by arms *f'* to a rocking shaft or spindle f^2, revolubly supported in bearings f^3, provided on the frames *d*, and so acted upon by a spring f^4 that it keeps the rubbing-cone *f* in contact with the corresponding coloring (or inking) cone *c*.

In order to provide for the positive motion of the coloring or inking cones *c*, they are all revolved simultaneously through the medium of toothed gearing. To this end the said cones *c* are fitted with toothed rims *c'* at their bases, such rims engaging in gear-wheels *h*, each of which is mounted upon a spindle *h'*, supported in a bracket or bearing *g'* upon an arm *g* of the corresponding frame *d*, the opposite end of such spindle *h'* carrying a second wheel *i*, gearing with a toothed rim *i'*, firmly attached to the main frame B of the mechanism.

The bottom end of the vertical spindle or shaft *b* is supported in a step-bearing, while its upper part is held by the frame B, and it is arranged to be set in rotary motion by means of a crank *k* in such a manner that as it rotates corresponding motion is transmitted by the intermediate toothed gearing to the large cones *c c*, which in their turn take around the small cones *f f* by friction.

The printing-block *a'* is arranged on the printing-press, which during the color-distributing operation, as shown in Fig. 2, is moved up to the color-distributing device just described, so that the said printing-block *a'* is in the proper position for receiving the color or ink. In other respects the printing-press may be constructed in any suitable manner.

x is the printing-cylinder.

The hatched or shaded portions of the color-blocks *a* are raised, and each block being charged with a liberal supply of its respective ink or color by means of usual inking-roller arrangement, then one such block after the other is placed under the above-mentioned color-distributing device, and the pattern formed on each block is successively transferred to the two color-distributing cones *c* by turning these cones through the medium of the crank *k*. When by the aid of the cones *f* the colors or inks have been sufficiently mixed and properly distributed, the printing-block *a'* is inked in its turn, being for this purpose brought to the position shown in Fig. 2 under the coloring or inking cones *c c*. The surface of the printing-block *a'* may be either plain or striated after any desired pattern, and from it the color is transferred to the sheet placed upon the printing-roller *x*.

Where more complicated color effects—say a rainbowed sun with irisated rays, as illus-

trated in Figs. 4, 5, and 6—are to be obtained, the color-distributing device just described will not quite answer the desired purpose. In this case in order that the ground tints may be extended transversely to the direction of the gradations or shadings the color-blocks should be specially constructed to suit the proposed object—*i. e.*, be made up of a number of separate parts capable of being moved at right angles to any shading that may be in course of formation at the time. The simplest motion is that required for the production of irisated effects in a circular or annular form, as in this case the corresponding parts of the color-blocks need only be turned about their axes. For radiated as well as for straight designs, however, it is necessary to make provision for a rectilinear motion of the requisite parts of the block.

In the example shown in Figs. 3, 4, 5, and 6, where it is supposed that a rainbowed sun with irisated rays is the pattern to be produced, the part l of each of the color-blocks serving to form the sun is secured on a spindle l', passing through the whole body K of the combined color-blocks in the vertical direction and carrying a toothed wheel l^2 at its lower end, which gears with another toothed wheel l^3, actuated by any suitable ratchet mechanism or escapement l^4. In order to insure the requisite displacement of the parts m, designed to form the irisated rays, those parts are guided between fillets or rails m', formed on the ground-block K, and pressed by springs m^2 against an eccentric m^3, fast upon the spindle l', whereby the desired motion is produced. At each movement of the ratchet-wheel, which may be induced by a suitable stop or catch—say at the completion of each forward or rearward journey of the carriage whereon the color-blocks are placed—both the part l of such blocks, which is to form the rainbowed sun, and the parts m, which serve to produce the irisated rays, are displaced for a predetermined distance at right angles to the direction of the proposed shading, so that gradually a close fusion of tints is obtained at the adjoining margins of the bands or stripes of ground colors.

From what has been said it is obvious that curvilinear irisated bands may also be produced by forming the fields of different colors, so that the line or lines of separation between them form the desired curves and by imparting to the inked-in block or to the blending-block a partial rotary motion in the direction of the curve or curves, or by transferring the colors onto a plate or block and effecting the blending by a revoluble conical roller moving at the same time in the direction of the curve or curves of demarcation, or, finally, by transferring the design on a block to a conical roller and effecting the blending by a second conical roll, as shown in Figs. 1 and 2.

By arranging a series of color-blocks in juxtaposition or one behind the other, care being taken to see that the pinion l^3, actuating the vertical spindle l', which serves to set in motion the several parts of one color-block, is in gear with the pinion performing the same function with regard to the next preceding block in the rear, and also that the two wheels l^2 of the foremost blocks engage with the operating-wheel l^3, actuated by the the ratchet mechanism l^4, a number of such color-blocks be arranged in two sets or rows, so that several irisated impressions, which may be alike or different, as desired, shall be produced simultaneously on the same sheet.

In carrying out this improved color-printing process by means of hand-presses the color-blocks, constructed as specified above, may be supplied with color or inked in the usual manner; but where the process is to be applied to bed-and-cylinder presses, in which case the ground tints may be caused to move (relatively to each other) at right angles to the direction of the shading by the employment of color-blocks consisting of parts movable in relation to each other, the color-supplying apparatus may be arranged as illustrated in Fig. 7. The color-blocks a, together with the printing-block a', are firmly secured upon the bed n of the printing-press in accurately-determined positions behind each other and at equal distances apart. The bed n is supported by means of journals n' in the upper forked ends of the supporting-levers o, the lower ends of which, also forked, embrace the fixed pins p' of the rails p. These rails p, arranged on either side of the bed, are made movable in the longitudinal direction upon the carriage-frame, their length being such that either one or the other of their ends must in all cases extend beyond the said frame. These projecting ends of the rails, whenever the moving carriage reaches either end of its journey, impinge on stops q, securely arranged on the frame, so that the further progress of the carriage results in a displacement of the rails p in relation to the bed n.

In order to prevent the color-blocks a, arranged in the rear of each other, as stated, from touching any roller except the one charged with the particular color or ink they require, it is necessary that the color-rollers r, operating in conjunction with such blocks, should be raised out of contact with them as soon as the block to be supplied with a given color has passed underneath the roller charged with that color. This result is obtained by means of simple lever mechanism $s\ s'\ s^2$, the bell-crank lever s^2 of which carries a roller s^3 at its free end, such roller resting in contact with a cam t, which is rigidly connected with another lever t' by means of a pin t^2. All the levers t' are connected together by a pushing or draw rod u in such a manner that they may all be set in motion at the same time through the medium of the bell-crank lever $v\ v'$, the forked end of which engages with the pin u' of the draw-rod u. The arm v' of

this bell-crank lever, pivoted onto a fast spindle, has its free end bent downward and carries a roller v^2, under which, as the carriage travels away and whenever the proper color-block a has passed under each of the color-distributing rollers r, the guide-rail w, moving backward and forward with the blocks a a', takes up its position, the left-hand extremity of such guide-rail being also bent down. By such means the horizontal arm v' of the bell-crank lever is raised, while the vertical arm v is moved to the right, in which movement all the levers t' must participate. Thus through the medium of the cams t the rollers s^3 are moved in the same direction, while through the medium of the lever mechanism s^2 s' s the color-delivering rollers r are lifted from the blocks, so that as the carriage moves farther along the color-blocks next succeeding cannot come into contact with rollers charged with other than the required colors, while at the same time the color-delivering rollers r, whenever their corresponding inking-rollers y with which they are adapted to come into contact are raised are charged with a fresh supply of colored ink. In all other respects the printing-machine may be constructed like any other bed-and-cylinder printing-press.

As shown in Fig. 7 the bed is supposed to be traveling from right to left, the rollers r inking in the forms a and are about to move off their right-hand edges, at which moment the bar w comes in contact with the lever-arm v', thereby lifting the inking-in rolls r clear of the forms through the mechanism above described. The bed continues its motion toward the left, the printing-cylinder x being in position to take an impression from printing-plate a and continuing its movement to the left until all the forms a have passed under the transfer-rolls c c and have transferred their inked pattern to said rollers, Fig. 8, the blending of the colors to form the irisated bands or strata being effected by rollers f. (Not shown in Fig. 7, but one of which is shown in Fig. 8.) The bed n now reaches the limit of its movement toward the left, the rails p coming in contact with the abutments provided at that end of the frame, thereby moving said rails toward the right and tilting the bed toward the left to move the printing-plate and forms clear of the transfer and inking-in rolls. The bed n remains in this lowered position until it reaches the limit of its movement to the right, during which movement the roller v^2 on lever-arm v' leaves the bar or rail w, thus allowing the inking-in rolls r to drop back into their operating position. As the bed is about to reach the limit of its movement toward the right the rails or bars p come in contact with the stop q, whereby said rails are moved toward the left and the bed toward the right and upwardly into position with the left-hand edge of the forms a on the right of the inking-in rolls. The bed n now moves back toward the left, whereby the inked-in and irisated pattern on the transfer-rolls is first transferred to the printing-plate a', after which it moves to the printing-cylinder. During this movement of the bed the transfer-rolls are again inked in, and so on, one impression being taken at each complete reciprocation of the bed n, as will be readily understood. The bending-rolls f need not be positively driven, but are preferably revolved by frictional contact with their respective transfer-rolls.

The object of using a plurality of transfer-rolls is to insure a proper supply of ink to the printing-plate; but of course a single transfer-roll may be used.

When the guide-rail w has left the lever v v' v^2, such lever redescends into its initial position by its own weight, reverses the eccentric mechanisms t t' t^2, and allows the lever arrangements s^3 s^2 s' s to descend also along with the rollers r.

Figs. 8 and 9 illustrate by diagrams how rainbowed impression may be conducted in straight bands or stripes. The portions of the color-blocks a which are to form the irisated stripes are laterally zigzagged in such a manner that the dents or tongues of one fit in the dent-spaces of the other. Owing to the tapering shape of the dents, the intensity of one tint gradually decreases and that of the other tint increases. The color-blocks a after having been supplied with ink are conducted underneath the rollers c, transferring color or ink to such rollers as they proceed. In order so to mix the colors upon any one of the rollers c as to obtain the rainbow effect, a smaller roller f is arranged over the roller c, which may be so constructed that it shall only touch the roller c at those parts where rainbow-stripes are to be produced. The roller f is taken around by the roller c by frictional contact, and inasmuch as the circumference of c is no multiple of the circumference of f this roller f touches the roller c at a different point at each revolution, whereby and by reason of the zigzag-shaped margins of the color-stripes the fusion of adjoining tints and the gradual change from one tint into the other are insured. Where the roller f only touches the roller c at the parts where the irisated stripes are situated, any desired ornaments or decorative designs may be formed on the color-blocks in addition to the stripes and transferred to the roller c without being rubbed or commingled with one another, along with main stripes, by the roller f.

Figs. 10 to 13 exemplify various irisated patterns, Fig. 10 showing a uniform zigzag line employed to effect the gradual change from one tint into the other. In Fig. 11 the change is supposed to be effected by means of offset-dents, and in Fig. 12 the change is comparatively rapid between the dotted lines x' and x^2 and slower and more gradual between the dotted lines x^2 and x^3. In Fig. 13 an irisated effect is obtained only between the

dotted lines $x^4 x^5$ and $x^6 x^7$, while no such effect is produced between the dotted lines $x^5 x^6$. In other words, in the field bounded by $x^5 x^6$ the colors of the adjacent fields will not be graduated or irisated; but said field will be of a uniform color, such as will result from the uniform blending of the colors of adjacent fields.

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

1. In the production of irisated prints, the process which consists in blending the colors of adjacent differently-colored fields solely in the direction in which the irisated field is to be produced, the boundary between said differently-colored fields being angular to said direction of the irisated field, for the purpose set forth.

2. In the production of irisated prints, the process which consists in blending the colors of adjacent differently-colored fields solely in the direction in which an irisated field is to be produced, the boundary between said differently-colored fields being of irregular form and angular to said direction of the irisated field, for the purpose set forth.

3. In the production of irisated prints, the process which consists in blending the colors of adjacent differently-colored fields solely in the direction in which an irisated field is to be produced, the boundary between said differently-colored fields being serrated and interlocking, for the purpose set forth.

4. The process of producing irisated prints, which consists in transferring parts of a design or pattern from a plurality of forms inked in different colors, onto a suitable surface, and blending the colors of adjacent differently-colored fields solely in the direction in which the irisated field is to be produced, the boundary between the differently-colored fields being angular to the direction of the irisated field, for the purpose set forth.

5. In a machine for producing irisated prints, a ground-color surface having adjacent fields of ink of different color, the boundary between said fields being angular to the direction in which the irisated field is to be produced; in combination with a blending-surface moving in contact with the ground-color surface solely in said direction of the irisated field, for the purpose set forth.

6. In a machine for producing irisated prints, the combination with a ground-color surface having adjacent fields of ink of different color, the boundary between said fields being angular to the direction in which the irisated field is to be produced; of a blending-roller having rotary motion solely on the ground-color surface in the direction in which such irisated field is to be produced, for the purpose set forth.

7. The combination with a printing-cylinder, a reciprocating bed, a printing-plate, and a plurality of forms arranged in tandem on said bed, an inking-in roller for each of said forms, and a transfer-roll arranged to take the ink from the forms and transfer it to the printing-plate; of mechanism for raising the bed to the inking-in rollers before said bed moves to the cylinder, mechanism for raising said rollers clear of the forms after the latter have been inked in, mechanism for lowering the bed after a print has been taken from the printing-plate, and mechanism for lowering the inking-in rolls before said bed is again raised and moved to the printing-cylinder, for the purpose set forth.

8. The combination with a printing-cylinder, a reciprocating bed, a printing-plate, and a plurality of forms arranged in tandem on the bed, an inking-in roll for each form, a transfer-roll arranged to take the ink from the forms and transfer it to the printing-plate, and a blending-roll revolving in contact with the transfer-roll; of mechanism for raising the bed to the inking-in rolls before said bed moves to the printing-cylinder, mechanism for raising the inking-in rolls clear of the forms after the latter are inked in, mechanism for lowering the bed after a print has been taken from the printing-plate, and mechanism for lowering the inking-in rolls before the bed is again raised and moved to the printing-cylinder, for the purpose set forth.

9. The combination with a printing-cylinder, a reciprocating bed, a printing-plate and a plurality of forms arranged in tandem on said bed, an inking-in roller for each of said forms, and a transfer-roll arranged to take the ink from the forms and transfer it to the printing-plate; of mechanism for raising the bed to the inking-in rollers before said bed moves to the cylinder, mechanism for simultaneously raising said rollers clear of the forms after the latter have been inked in, mechanism for lowering the bed after a print has been taken from the printing-plate, and mechanism for simultaneously lowering the inking-in rolls before said bed is again raised and moved to the printing-cylinder, for the purpose set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 16th day of December, 1897.

JOHANN MARTIN HEPPLER.

Witnesses:

JOHN H. SCHNABEL,

W. G. GERLACH.