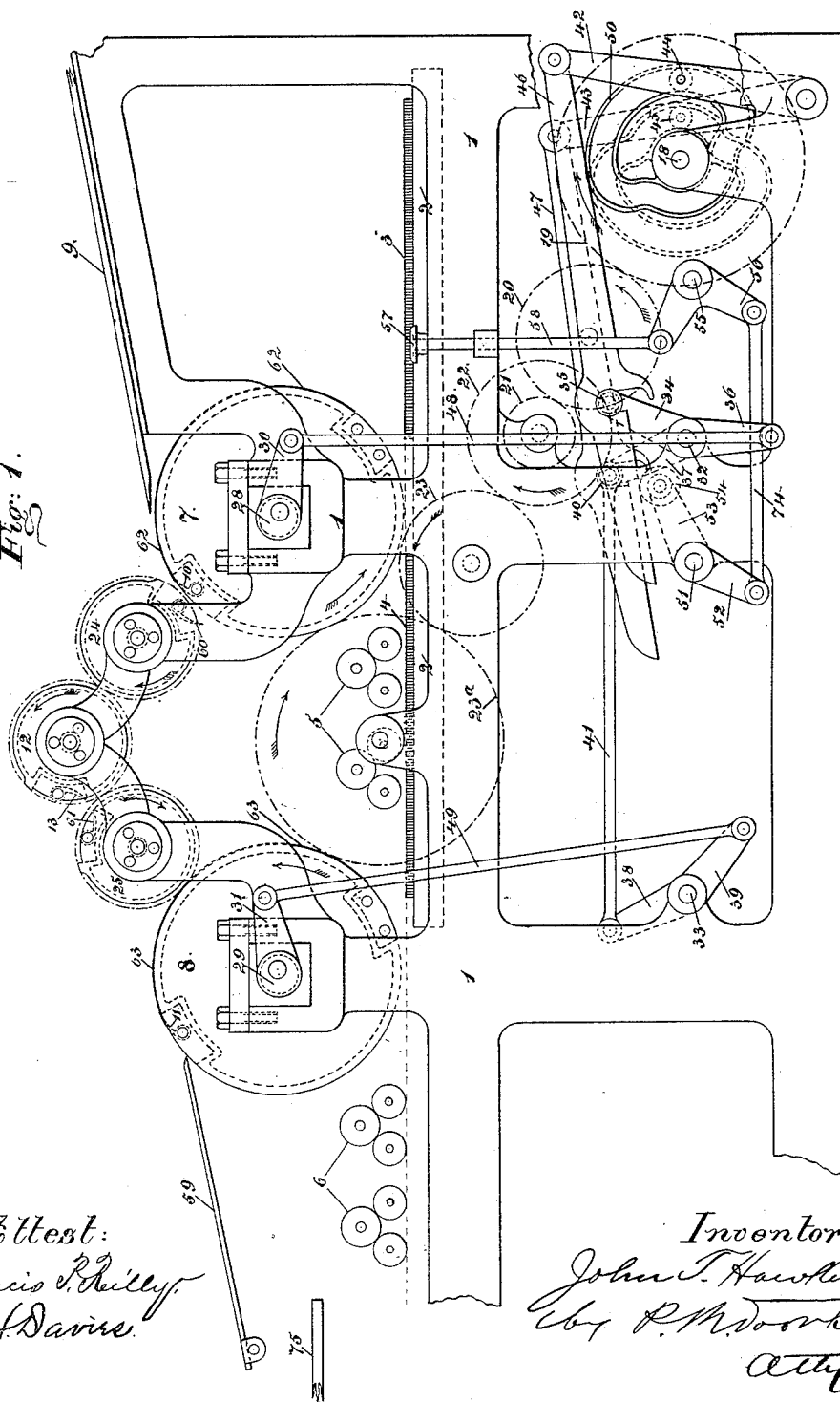


J. T. HAWKINS.  
MULTICOLOR PRINTING MACHINE.

No. 445,059.

Patented Jan. 20, 1891.

Fig. 1.



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att'y.

(No Model.)

2 Sheets—Sheet 2.

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MULTICOLOR PRINTING MACHINE.

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*Fig. 2.*

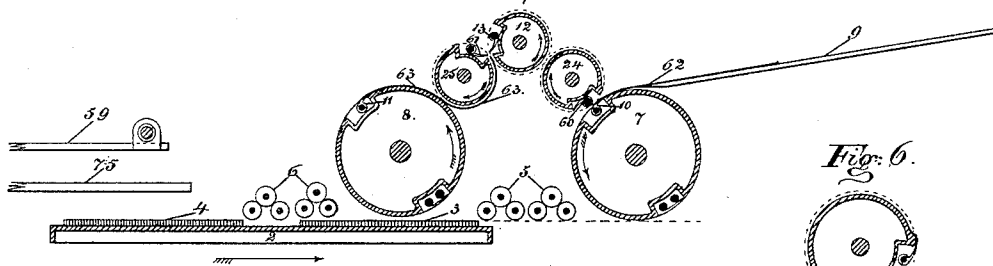
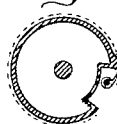
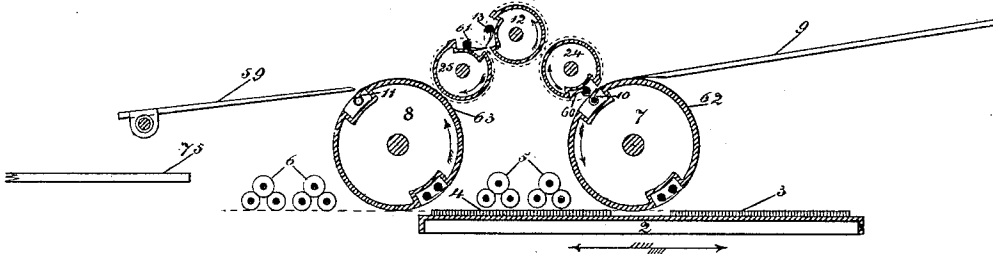


Fig. 6.



*Fig: 3*



*Fig: 4*

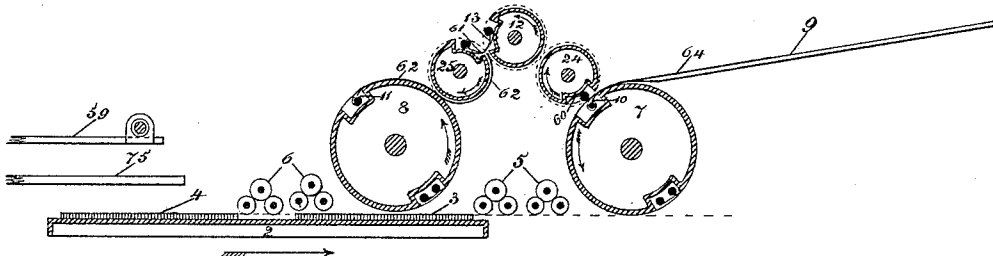
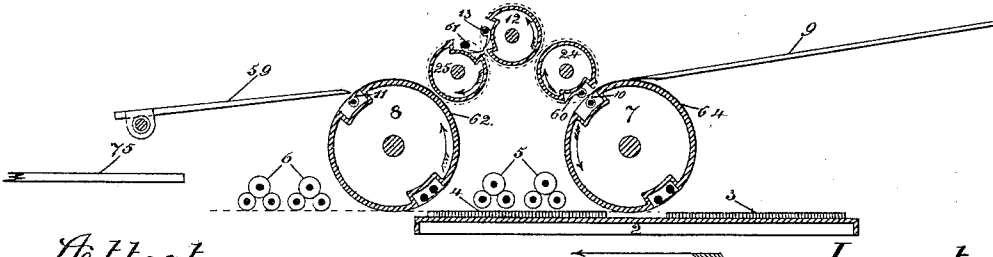


Fig: 5.



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# UNITED STATES PATENT OFFICE.

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## MULTICOLOR-PRINTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 445,059, dated January 20, 1891.

Application filed February 13, 1890. Serial No. 340,254. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN THOMAS HAWKINS, of Taunton, in the county of Bristol and State of Massachusetts, have invented a new and useful Improvement in Multicolor-Printing Machines, which invention is fully set forth and illustrated in the following specification and accompanying drawings.

The object of this invention is to provide a machine which shall print two or more separate colors upon one side of a sheet by means of a plurality of forms attached to a single reciprocating bed and a corresponding number of impression-cylinders in passing the sheet once through the machine, and to effect this without contact of the printed side of the sheet with any part of the mechanism in the transfer from one impression-cylinder to the others or in the process of delivery.

The invention will first be described in detail, and then particularly set forth in the claims.

In the accompanying drawings, Figure 1 is a side elevation of so much of a machine for printing in two colors as is necessary to the complete illustration of the invention, sundry parts being omitted—such as the mechanism for reciprocating the form-bed, that for operating the various grippers, the ink-fountain, and other parts of the inking apparatus, all these being constructed in a variety of ways well known in the art, and therefore not necessary to a full illustration of this invention. Figs. 2, 3, 4, and 5 are diagrams, on a reduced scale, showing the relative positions of the several parts for four different positions of the sheet in passing through the machine. Fig. 6 is a transverse section of one of the transfer-cylinders hereinafter described.

In said figures the several parts are indicated by reference-numbers, as follows:

The numbers 1 1 indicate the main frames. The form-bed 2 carries two forms 3 and 4, one for each color, and 5 and 6 are the form-inking rollers, respectively, for said forms.

The number 7 indicates the impression-cylinder for form 3, and 8 the impression-cylinder for form 4, both cylinders being continuously revolving and making two revolutions to each impression. From the feed-board 9 the sheets are fed to the impression-cylinder 7.

The impression-cylinders 7 and 8 are pro-

vided with the usual grippers 10 and 11, operated to take and release the sheets at the proper times by any of the well-known methods. The transfer-cylinders 24, 12, and 25 are each provided with grippers 60, 13, and 61. Said transfer-cylinders are but one-half the diameter of impression-cylinders 7 and 8, except as hereinafter explained for Fig. 6, and make each two revolutions to one revolution of the impression-cylinders, and by means of spur-gears on the axes of impression-cylinders 7 and 8 and transfer-cylinders 24, 12, and 25, as indicated by the several circles, the whole forming a train from impression-cylinder 7 to impression-cylinder 8, the several sets of grippers 10, 11, 13, 60, and 61 are timed to meet each other and coact in transferring the sheet from impression-cylinder 7 to impression-cylinder 8.

The impression-cylinders 7 and 8 are caused to rise and fall to clear and make contact with their respective forms by the following-described mechanism: A shaft 18, journaled in the frames 1, is actuated by a suitable train of gearing, as indicated by the circles 19 20 21 22 23 23<sup>a</sup>, in such proportion as to make one revolution to each sheet printed, or one revolution to each two revolutions of the impression-cylinders 7 and 8. The journals of the impression-cylinders 7 and 8 run in eccentric-boxes 28 and 29, whose eccentricity is shown in dotted lines. The boxes 28 and 29 have arms 30 and 31 secured to them, the boxes and arms being the same for both sides of the machine. Journaled in the frames 1 are rock-shafts 32 and 33. On rock-shaft 32 inside the frames is secured a lever 34, carrying on its free end a roller 35. On the same shaft 32 outside the frame is secured a lever 36. Mounted loosely on rock-shaft 32 is a lever 37, carrying on its free end a roller 40. Secured to rock-shaft 33 inside the frame 1 is a lever 38, and a similar lever 39 outside of frame 1. Levers 38 and 37 are connected by a link 41. Fulcrumed on the inside of frames 1 are two levers 42 and 43, respectively carrying rollers 44 and 45. To the free ends of the levers 42 and 43 are connected hook-bars 46 and 47, whose hooked ends engage the rollers 35 and 40. Connecting the free ends of levers 30 and 36 for one impression-cylinder and 31 and 39 for the other are links or con-

necting-rods 48 and 49. Eccentric-boxes 28 29, levers 30 31, links 48 49, and levers 36 39 are the same on both sides of the machine. A double box-cam 50 is secured to shaft 18, the lever 42 being on one and the lever 43 on the other side of it, and the roller 44 engages the cam-groove (shown in full lines) on the inner side of cam 50 and the roller 45 the groove (shown in dotted lines) on the far side, as seen in Fig. 1. A short rock-shaft 51 is journaled in the frame 1. Outside the frame 1 a lever 52 and inside the frame 1 a lever 53 are secured to the rock-shaft 51. The free end of lever 53 carries on each side of it rollers 54, one of which engages the under side of the free end of hook-bar 46 and the other the under side of the free end of hook-bar 47. On a stud 55, secured in the frame, is fulcrumed a bell-crank lever 56, to one arm of which is articulated a link 74, connecting with the free end of lever 52, and to the other arm a vertical sliding rod 58, provided with a tread 57 upon its upper end.

By means of the mechanism just described the impression-cylinders 7 and 8 are automatically lifted to clear the forms on the non-printing stroke, and are held in contact therewith while printing, while the depression of the tread 57 by the attendant disengages the hook-levers 46 and 47 from the rollers 35 and 40, keeping the impression-cylinders 7 and 8 raised from the forms whenever desired.

An oscillating fly 59, operated by any well-known means, (not shown,) receives the sheet from the top and front of the impression-cylinder 8 and deposits it on the usual receiving-board 75.

It is evident that the transfer-cylinders 24, 12, and 25 may be either continuous or consist of a series of narrow-faced pulleys, these pulleys being in every case an equivalent for such cylinders, as is well-known in the art, and all reference herein to transfer-cylinders 24, 12, and 25 is to be understood to cover either of these methods.

The operation of the mechanism is as follows: A sheet being fed from the feed-board 9 to the first impression-cylinder 7 is carried around and printed on the first form 3. After a complete revolution of impression-cylinder 7 grippers 10 release and grippers 60 take the sheet and convey the same to the grippers 13 of transfer-cylinder 12 with the printed side outward on that cylinder. Grippers 13 convey it to grippers 61, and these last to grippers 11 of the second impression-cylinder 8, when it is carried around and printed on the second form 4, and during the succeeding non-printing revolution of impression-cylinder 8 the sheet is delivered, with the blank side in contact therewith, upon the fly 59, which by means of any of the well-known means turns it over upon receiving-board 75. In the diagrams 2 to 5, inclusive, the passage of the sheet is traced and the several positions of the parts are shown, as

follows: In Fig. 2 a sheet 62 is just taken by impression-cylinder 7 and a previous sheet 63 has been taken by impression-cylinder 8, both sheets being in position to meet their respective forms, and the forms at the extreme left-hand position about to commence their printing-stroke. In Fig. 3 sheets 62 and 63 have been printed on their respective forms, sheet 62 is about to be taken by the transfer-cylinder 24, sheet 63 about to be delivered upon the fly 59, and the forms at their extreme right-hand position are about to commence their non-printing-stroke. In Fig. 4 sheet 63 has been laid upon the receiving-board 75, sheet 62 has been transferred to the impression-cylinder 8, the impression-cylinder 7 has taken a new sheet 64, the forms are again at their extreme left-hand position, ready to commence their printing-stroke, and the sheets are in position to meet them at the proper time. In Fig. 5 sheet 64 has been printed on the form 3 and sheet 62 on form 4 receiving a second impression or color, and is about to be delivered upon the fly 59. It has been stated heretofore that transfer-cylinders 24, 12, and 25 were one-half the diameter of the impression-cylinders 7 and 8. In order, however, to prevent contact and pressure of the printed side of the sheet with transfer-cylinders 24 and 25, all that part of the said transfer-cylinders 24 and 25 except the point upon which the grippers rest will be made of slightly less diameter, as shown in Fig. 6, so as to prevent such pressure and contact of the printed side therewith, the sheets themselves being beneath the cylinder, their weight tending to keep them away from contact, and as in passing over transfer-cylinder 12 the blank side of the sheet will be in contact therewith, and similarly the printed side will be uppermost in passing down the fly 59, the printed side will be kept from contact with any part of the transfer or delivery mechanism during such transfer or delivery.

In the construction of the machine shown in the diagrams the two impression-cylinders are sufficiently separated to permit of the placing of each set of inking-rollers on the same side of each cylinder, and in such an arrangement it is evident that by multiplication of forms, impression-cylinders, transfer-cylinders, inking apparatus, and cylinder-lifting mechanism this construction may extend to the printing of any number of colors on a sheet corresponding to the number of forms and impression-cylinders used.

It is obvious that for the transfer-cylinders 24, 12, 25 may be substituted "gripper-arms"—that is, a series of short cylinders or radial arms, each arm provided with a gripper. Such gripper-arms are shown and described in my application, Serial No. 340,253, (Case B,) filed herewith, and are herein regarded as full equivalents of the transfer-cylinders 24 12 25.

Having thus fully described my invention, I claim—

1. In a multicolor-printing machine, in com-

5 bination with a plurality of reciprocating  
 forms, as 3 and 4, and a corresponding num-  
 ber of continuously-revolving impression-cyl-  
 10 inders, as 7 and 8, each making two revolu-  
 tions to one impression and carrying grippers,  
 as 10 and 11, means for transferring the sheet  
 from one impression-cylinder to the next suc-  
 ceeding impression-cylinder and timing the  
 15 sheet to meet the successive forms, consisting  
 of three successive intervening transfer-cyl-  
 inders, as 24 12 25, each carrying grippers, as  
 60 13 61, geared by spur-gears on their re-  
 spective axes and on the axes of the said im-  
 20 pression-cylinders in a train from one impres-  
 sion-cylinder to the next succeeding impres-  
 sion-cylinder and so adjusted and timed that  
 the respective grippers shall coact to transfer  
 the sheet from one to the next succeeding im-  
 25 pression-cylinder in proper time to meet the  
 succeeding forms, substantially as and for the  
 purposes set forth.

2. In a multicolor-printing machine, the  
 combination of the following-named elements:  
 a reciprocating bed, as 2, carrying a plurality  
 25 of forms, as 3 and 4, a corresponding number  
 of continuously-revolving impression-cylin-  
 ders, as 7 and 8, each making two revolutions  
 to one impression and carrying grippers, as  
 10 and 11, placed at sufficient distance apart  
 30 to admit of an inking apparatus being placed  
 between any two impression-cylinders, and for  
 any two impression-cylinders means for trans-  
 ferring the sheet from one impression-cylin-  
 der to the succeeding impression-cylinder  
 35 and timing the sheet to meet the correspond-  
 ing form, consisting of three successive inter-  
 vening transfer-cylinders, as 24 12 25, each  
 carrying grippers, as 60 13 61, geared by  
 spur-gears on their respective axes and on the

axes of the said impression-cylinders in a 40  
 train from one impression-cylinder to the  
 next succeeding impression-cylinder and so  
 adjusted and timed that their respective grip-  
 pers shall coact to transfer the sheet from one  
 impression-cylinder to the next succeeding 45  
 impression-cylinder in proper time to meet the  
 succeeding form, a feed-board, as 9, leading to  
 the first impression-cylinder, and a fly, as 59,  
 to receive the sheet from the last impression-  
 cylinder, substantially as and for the purposes 50  
 set forth.

3. In a multicolor-printing machine print-  
 ing from flat forms, the combination of the  
 following-named elements: two or more forms,  
 as 3 and 4, mounted on a reciprocating bed, 55  
 as 2, a corresponding number of continuously-  
 revolving impression-cylinders, one for each  
 form, each making two revolutions to one  
 impression and placed so as to permit of a  
 set of inking form-rollers between every two 60  
 impression-cylinders, a corresponding number  
 of sets of form-inking rollers, as 5 and 6, each  
 placed upon the same side of its respective  
 impression-cylinder, and a sheet-transfer ap-  
 65 paratus, substantially as described, for each  
 impression-cylinder less one, whereby sheets  
 fed to the first impression-cylinder are printed  
 on the first form, transferred to the second  
 impression-cylinder, printed on the second  
 form, and similarly for as many impression- 70  
 cylinders, forms, and sets of inking-rollers as  
 may be used, substantially as and for the pur-  
 poses set forth.

JOHN T. HAWKINS.

Witnesses:

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 FRANCIS P. REILLY.