

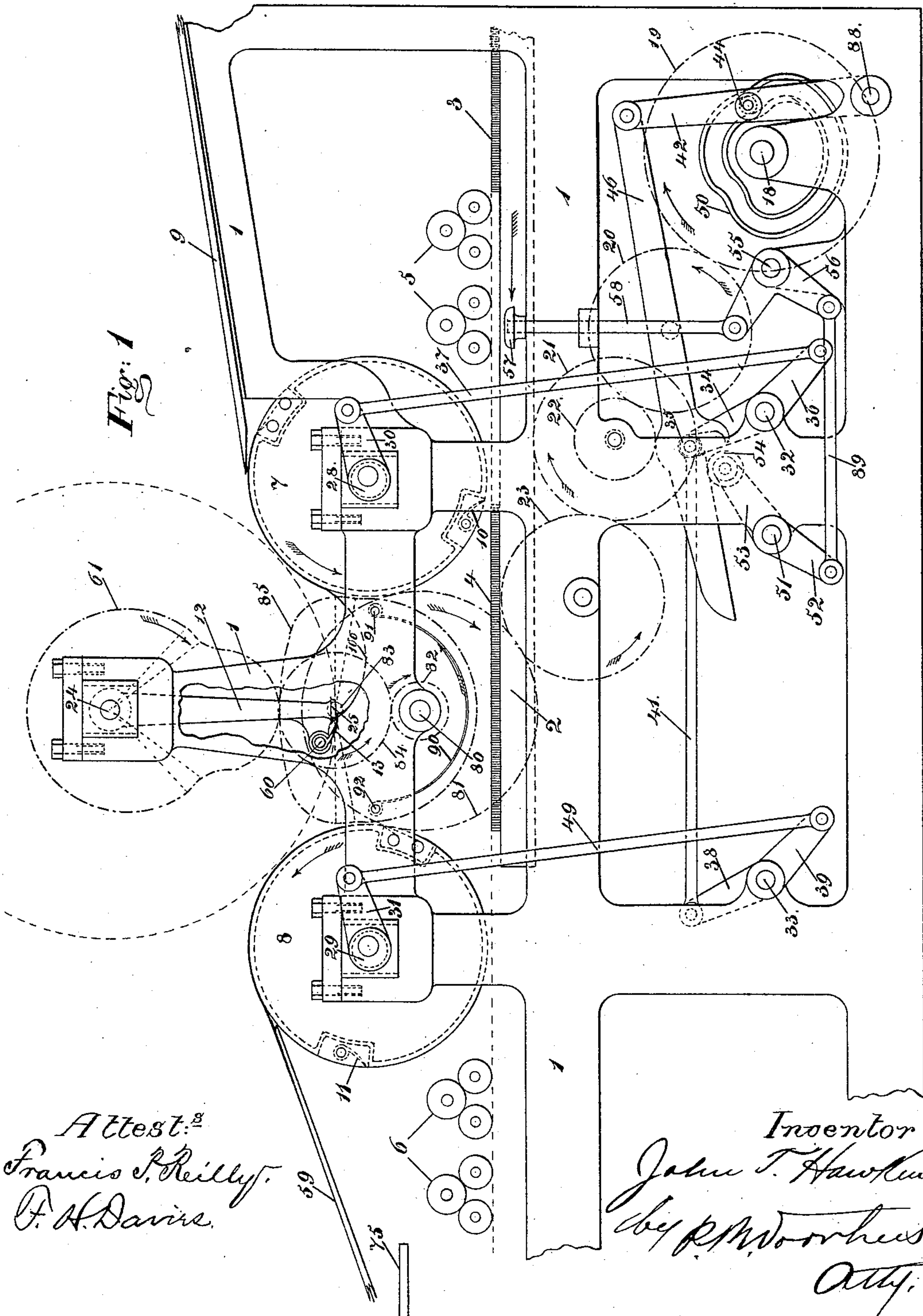
(No Model.)

2 Sheets—Sheet 1.

J. T. HAWKINS.  
TWO COLOR PRINTING MACHINE.

No. 429,906.

Patented June 10, 1890.



2 Sheets—Sheet 2.

No. 429,906.

Patented June 10, 1890.



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# UNITED STATES PATENT OFFICE.

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## TWO-COLOR PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 429,906, dated June 10, 1890.

Application filed February 13, 1890. Serial No. 340,256. (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 new and useful Improvements in Two-Color 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 separate colors or two separate impressions upon one side of a sheet, by means of two forms attached to a single reciprocating bed and two impression-cylinders corresponding thereto, 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 other 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 or two impressions in one color 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 and the fly, the ink-fountain, and other parts of the inking apparatus, all these being capable of construction in a variety of ways well known in the art and not necessary to a full illustration of this invention. Figs. 2, 3, and 4 are diagrams on a reduced scale, showing the relative positions of several parts for three different positions of the sheet in passing through the machine.

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

The numbers 1 indicate the main frames.

The form-bed 2 carries two forms 3 and 4, the numbers 5 and 6 indicating the form-inking rollers, respectively, for forms 3 and 4.

The number 7 indicates the impression-cylinder for form 3, and 8 the impression-cylinder for form 4, both cylinders 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 provided with grippers 10 and 11, operated to take and release the sheets at the proper time by any of the well-known methods.

To a shaft 24, journaled in the frames 1, are secured between the frames 1 a series of arms 12, carrying on their free ends gripper-rests 25. Journaled in the arms 12 is a rock-shaft 60, carrying a series of grippers 13. Outside of one frame 1 an irregular spur-gear is secured to shaft 24, as indicated by the dotted pitch-line 61. On a stud 80, secured in one of the frames 1, is mounted a spur idler-gear, (indicated by a dotted pitch-line 81,) meshing with two similar gears of equal diameter mounted on the axis of the impression-cylinders 7 and 8, the pitch-lines of which may be indicated by their peripheries. Secured to the spur-gear 81 is a spur-pinion, (indicated by the dotted pitch-line 82.) Mounted upon another stud 83, secured in the frame 1, is a spur-wheel of twice the diameter of the pinion 82 and meshing with it, as indicated by the dotted pitch-line 84. Secured to gear-wheel 84 and rotated with it is an irregular spur-gear, as indicated by a dotted pitch-line 85, meshing with the irregular gear 61. The gears 82 and 84, being in the proportion of one to two, will cause the irregular gear 85 to make one revolution to each two revolutions of the impression-cylinders 7 and 8. The irregular gears 61 85 are given such form as to cause the gripper-arms 12 to describe one complete revolution for each two revolutions of the impression-cylinders 7 and 8, and at such variable rate that the grippers 13 will pass from the point of taking the sheet from impression-cylinder 7 to that where they deliver it to impression-cylinder 8 at a retarded rate, so that the grippers 13 meet the grippers 11 of impression-cylinder 8 at the proper time, and the remainder and larger part of their revolution at an accelerated rate, so that the grippers 13 again meet the grippers 10 of impression-cylinder 7 at the proper time, while the speed of grippers 13 will coincide with the surface velocity of impression-cylinders 7 and 8 or their grippers at the time of transferring the sheet from grippers 10 to grippers 13 or from grippers 13 to grippers 11, the grippers 13 making the remainder and larger part of their



complete revolution at such faster rate as to bring them to meet the grippers 10 of impression-cylinder 7 again at the proper time.

The impression-cylinders are caused to rise and fall to clear and make contact with their respective forms by the following described mechanism. A shaft 18 is journaled in the frames 1 and actuated by a suitable train of gearing, as indicated by the circles 19, 20, 21, 22, 23, and 81, 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 29, whose eccentricity is shown in dotted lines. The boxes 28 29 have arms 30 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 33. On rock-shaft 32, inside the frame 1, is secured a lever 34, carrying on its free end a roller 35. On the same shaft, outside the frame 1, is carried a lever 36. Secured to the rock-shaft 33, inside the frame 1, is a lever 38, and a similar lever 39 outside frame 1. Levers 34 and 38 are connected by a link 41. Fulcrumed on the inside of the frame 1, on a stud 88, is a lever 42, carrying a roller 44. To the free end of lever 42 is connected a hook-bar 46, whose hooked end engages a roller 35. Connecting the free ends of levers 30 36 for impression-cylinder 7 and levers 31 39 for impression-cylinder 8 are links or connecting-rods 37 49. Eccentric boxes 28 29, levers 30 31, links 37 49, and levers 36 39 are the same for both sides of the machine. A box-cam 50 is secured to shaft 18, and the roller 44 engages a groove of cam 50, as shown. The groove of cam 50 is so formed as to oscillate the eccentric boxes 28 29 at the proper times. A short rock-shaft 51 is journaled in one of the frames 1. Outside of the frame a lever 52 and inside the frame a lever 53 are secured to rock-shaft 51. The free end of lever 53 carries a roller 54, which engages the under side of the free end of hook-bar 46. On a stud 55, secured to the frame 1, is fulcrumed a bell-crank lever 56, to one arm of which is articulated a link 89, connecting with the free end of lever 52, and to the other arm a vertical sliding rod 58, provided with a tread 57 in its upper end. A depression of the tread 57 by the attendant disengages the hook-lever 46 from roller 35, keeping the impression-cylinders 7 and 8 raised from the forms, whenever desired. An oscillating fly 59, operated by any well-known means, receives the sheet from the top and front of the impression-cylinder 8 and deposits it on the usual receiving-board 75. A supporting-apron 90 is secured to rods 91 92, which are themselves secured at their ends in frames 1. The apron 90 is for the purpose of supporting the tail of the sheet away from the forms during its transfer from impression-cylinder 7 to impression-cylinder 8 after being printed on the first form. While the grip-

pers 13 are passing from the impression-cylinder 8 at the slower or retarded rate the sheet coming from impression-cylinder 7 loops downward, as shown at 100, Fig. 1, and finally drops down in the apron 90.

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 the grippers 10 release and grippers 13 take the sheet, both sets of grippers 10 and 13 moving at the time of transfer of the sheet at the same speed. From this point grippers 13 are retarded up to their arrival midway between the cylinders 7 and 8, as shown in Fig. 1, and the sheet moves downward. From this point grippers 13 are accelerated up to the same speed as grippers 11 upon meeting them, and during this part of the revolution of grippers 13 the tail of the sheet falls down into the apron 90. The sheet is now released by grippers 13 and taken by grippers 11 of impression-cylinder 8, carried around, and printed in its second color or impression on form 4, during which time the grippers 13 complete their revolution in time to meet grippers 10 for the transfer of the succeeding sheet. During the non-printing revolution of impression-cylinder 8 the sheet is released by grippers 11 and passes to and upon and down the fly 59, which turns it over and lays it on the board 75. In the above operation the sheet will lie in the apron 90, printed side up, and will pass down the fly 59 with the blank side in contact therewith, and nothing will have touched the printed side of the sheet during transfer or delivery. In the diagrams 2 to 4, inclusive, the passage of the sheet is traced and the several positions of the parts are shown for three different positions of the sheets. In Fig. 2 the bed 2, with its forms 3 and 4, will have just started on its printing-stroke, the grippers 10 of impression-cylinder 7 will have taken the sheet 76 from feed-board 9 and carried it down nearly to contact with the form 3, and grippers 11 of impression-cylinder 8 will have taken a previous sheet 77 and have it in position to meet form 4, the tail of the sheet passing up out of the apron 90. In Fig. 3 the bed has reached the middle position, sheet 76 has nearly completed printing on form 3, and sheet 77 is partially printed on form 4. In Fig. 4 the bed will have reached the extreme end of its printing-stroke and started upon its non-printing stroke, sheet 76 will have been taken from impression-cylinder 7 by the grippers 13 of the rotating gripper-arm 12, and sheet 77 will be completely printed and about to pass down the fly 59. In passing from the position in Fig. 4 to that in Fig. 2 again, sheet 77 will be laid on the board 75, sheet 76 will have been transferred to impression-cylinder 8, and impression-cylinder 7 will have taken another sheet, and passing again to Fig. 3, sheet 76 will begin to be printed in its second color, and still



again to Fig. 4, sheet 76 will be entirely printed on its second form and ready to pass down the fly 59.

Having thus fully described my invention, I claim—

1. In a printing-machine printing two impressions or colors upon one face of the sheet at one feeding of said sheet and having two flat forms, as 3 and 4, and two corresponding impression-cylinders, as 7 and 8, carrying grippers, as 10 and 11, and making two revolutions to each impression, the combination, with said impression-cylinders and their grippers, of a series of rotating gripper-arms, as 12, carrying grippers, as 13, operated by irregular gears, as 61 85, to perform one revolution to each two revolutions of said impression-cylinders at such variable rate as to properly time the transfer of the sheet printed on the first form from the first impression-cylinder to the second impression-cylinder, so as to meet and be printed on the second form, substantially as and for the purposes set forth.

2. In a printing-machine printing two impressions or colors upon one face of the sheet at one feeding of said sheet and having two flat forms, as 3 and 4, and two corresponding impression-cylinders, as 7 and 8, carrying grippers, as 10 and 11, and making two revolutions to each impression, the combination, with said impression-cylinders and their grippers, of rotating gripper-arms, as 12, carrying grippers, as 13, operated by irregular gears, as 61 85, to perform one revolution to each two revolutions of the said impression-cylinders at such variable rate as to properly time the transfer of the sheet printed on the first form from the first impression-cylinder to the second impression-cylinder, so as to meet and be printed on the second form, and a supporting-

apron, as 90, between said impression-cylinders for holding the sheet from contact with the form during its transfer from one impression-cylinder to the other, substantially as and for the purposes set forth.

3. In a printing-machine printing two impressions or colors on one face of a sheet at one feeding of said sheet, the combination of the following-named elements: two reciprocating flat forms, as 3 and 4, two impression-cylinders, as 7 and 8, printing, respectively, thereon, carrying grippers, as 10 and 11, and making two revolutions to each impression, rotating gripper-arms, as 12, carrying grippers, as 13, arranged to rotate at variable speed and operate to coact with the grippers of the impression-cylinder, so as to transfer the leading edge of said sheet from one to the other of said impression-cylinders after receiving its first impression, a supporting-apron, as 90, between said impression-cylinders for preventing contact of the blank side of the sheet with the forms during its transfer from one impression-cylinder to the other, a feed-board, as 9, leading to the first impression-cylinder, and an oscillating fly, as 59, arranged to take the sheet from the top and front of the second impression-cylinder after being printed upon the second form, 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 delivered upon said fly, all without contact of the printed surfaces of the sheets with any part of the mechanism, substantially as set forth.

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Witnesses:

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