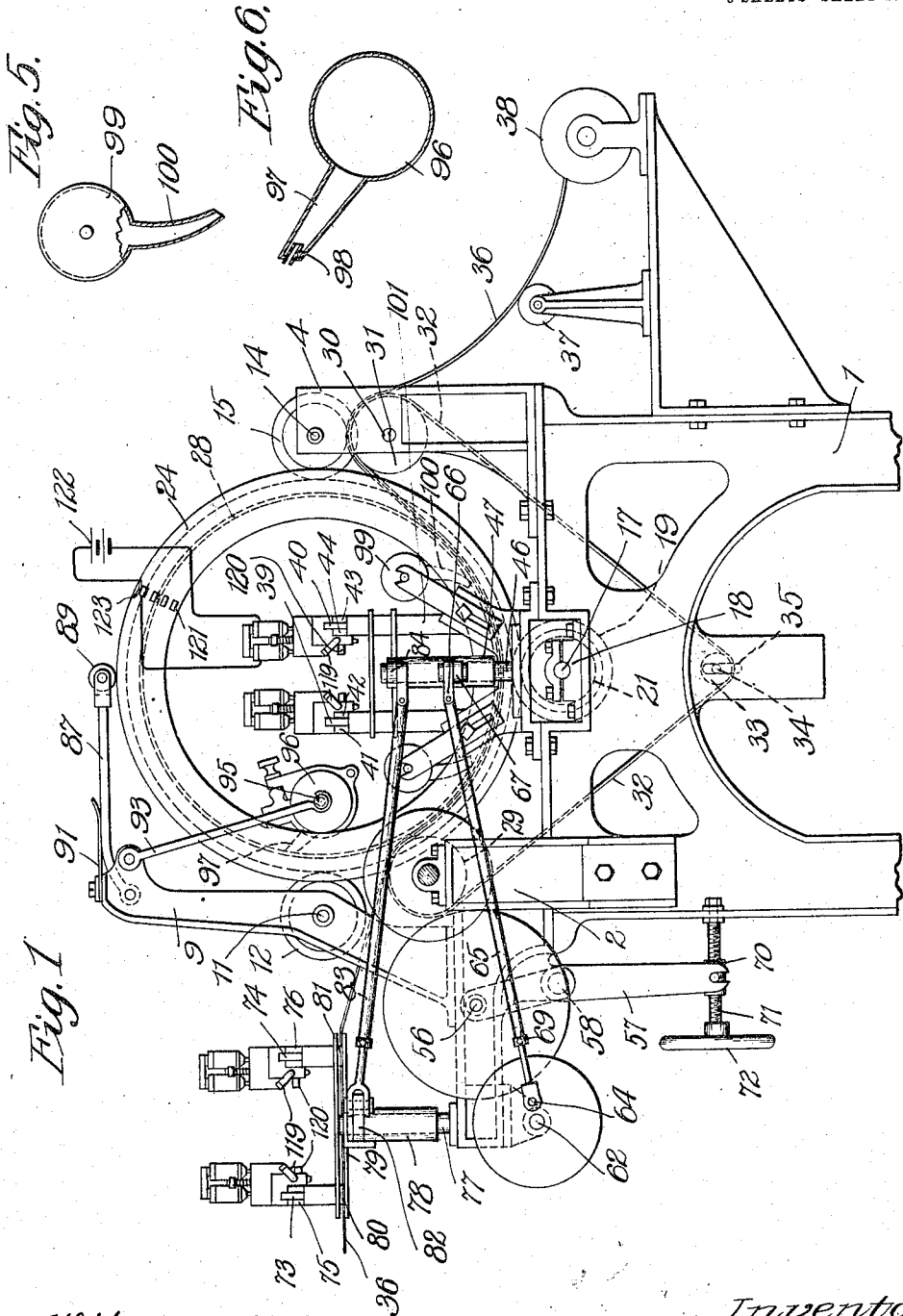


C. L. BURDICK,
 STENCIL PRINTING MACHINE.
 APPLICATION FILED OCT. 14, 1908.

Patented Aug. 31, 1909.
 3 SHEETS—SHEET 1.

932,600.



Witnesses:
Frank J. Shelton
Albert E. McCall

Inventor
Charles L. Burdick
 By *George Williams*
 Attorneys

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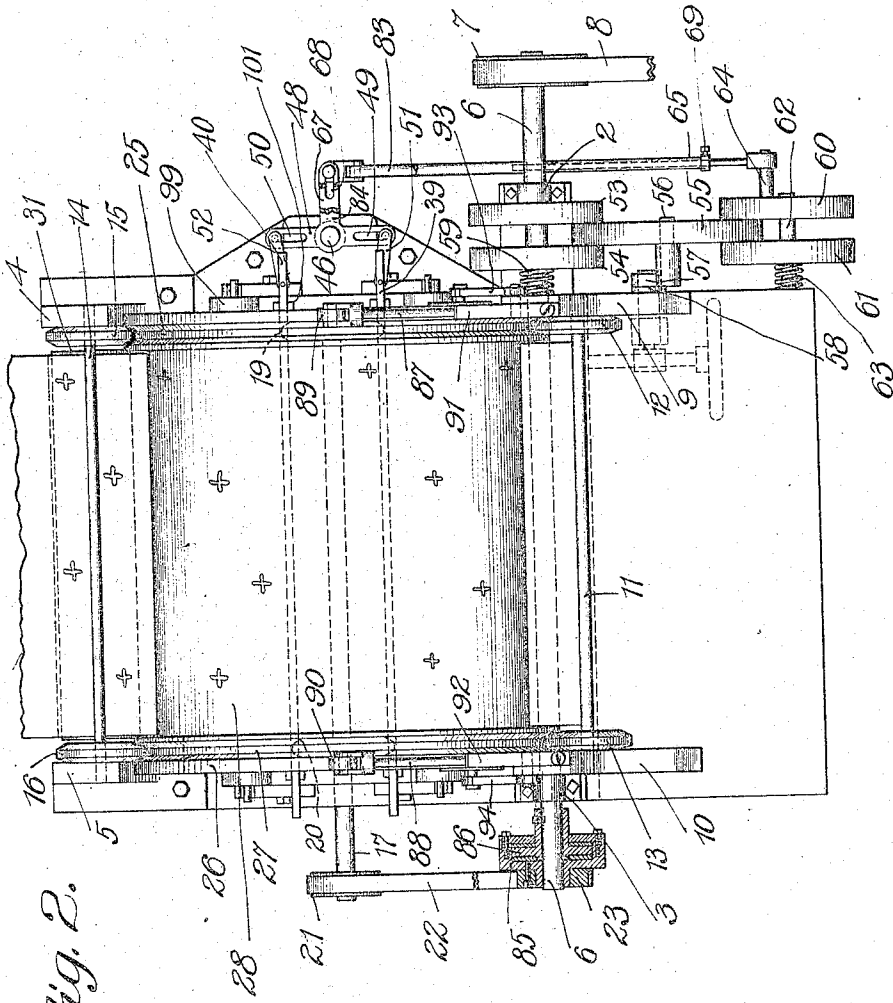


Fig. 2.

Witnesses:
 Frank J. Thelen
 Albert L. McCaleb

Inventor
 Charles L. Burdick
 By *Charles Williams*
 Attorneys

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 3 SHEETS—SHEET 3.

Fig. 3.

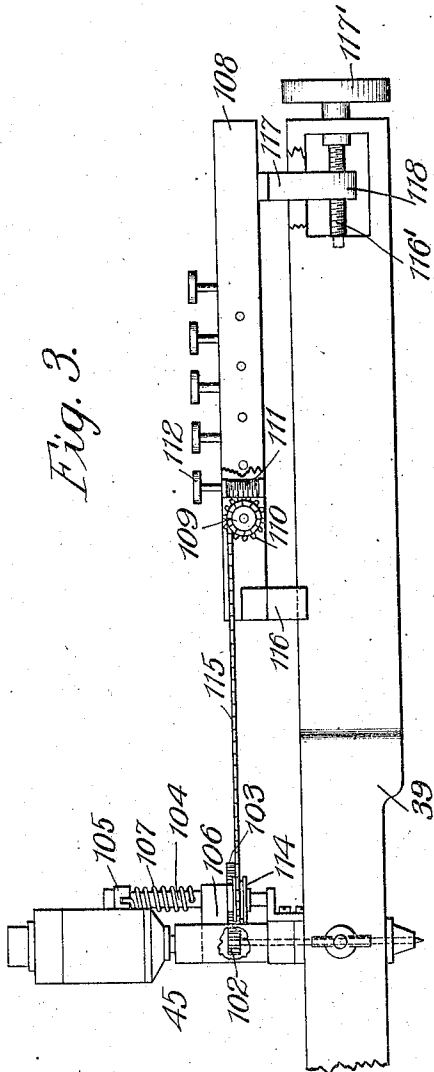
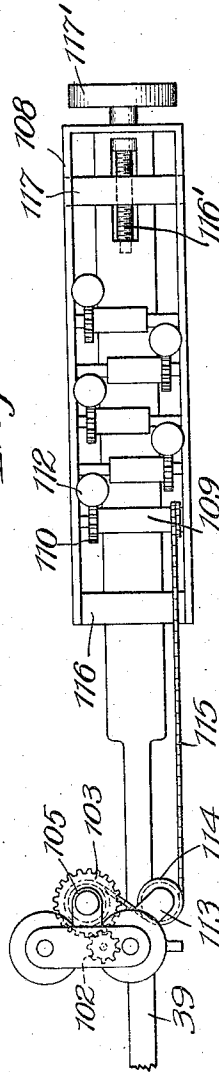


Fig. 4.



Witnesses:
 Leonard W. Nozander.
 Frank J. Thelen

Inventor
 Charles L. Burdick.
 By *Prosser Williams*
 Attorneys

UNITED STATES PATENT OFFICE.

CHARLES L. BURDICK, OF LONDON, ENGLAND.

STENCIL-PRINTING MACHINE.

932,600.

Specification of Letters Patent. Patented Aug. 31, 1909.

Application filed October 14, 1908. Serial No. 457,628.

To all whom it may concern:

Be it known that I, CHARLES L. BURDICK, a citizen of the United States, residing at London, in the county of Middlesex, England, have invented a certain new and useful Improvement in Stencil-Printing Machines, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to stencil printing machinery, the object being to provide improved and more efficient construction and operation.

My invention will be considered as an improvement over the stencil printing machine disclosed in my Patent No. 767,684, of August 16, 1904. In the machine of this patent, the electrically controlled sprayers are mounted on stationary supporting bars, and in order to attain greater uniformity in the application of the printing fluid, the sprayers are in stagger arrangement, and the nozzles are elliptical, in a direction transverse to the direction of travel of the stencil.

Some classes of work, however, require greater uniformity of application of coloring matter than can be obtained by the construction of this patent, and one of the main objects of my present invention is to provide for more efficient regulation of the sprayers, so that more perfect uniformity can be attained. In the patent, also, the color valves are individually adjustable; but the adjustment can be accomplished only with more or less difficulty, particularly when the machine is in motion, it being necessary to manually turn the adjusting nut for the particular sprayer which it is desired to adjust.

Another feature of my present invention is, therefore, to enable individual and multiple adjustment to be made of the valves in a simplified manner.

A third feature lies in means for compensating for the stretch of the printed material, in order to prevent the wet material from wiping color on the edges of the stencil, and a fourth feature lies in the more efficient wiper, or sucking devices, for removing the surplus color from the stencil.

I shall describe the several features of my invention more in detail by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of the machine; Fig. 2 is a top view; Fig. 3 is an enlarged elevation view of the end of a sprayer support-

ing bar, showing the valve adjusting means; Fig. 4 is a top view of the parts shown in Fig. 3; Fig. 5 is an end and part-sectional view of the dust collector, and Fig. 6 is a sectional view of the color wiper.

The supporting framework for the machine is represented by 1, and has the upright members 2, 3, 4 and 5. Journaled at the top of the uprights 2 and 3 is the driving shaft 6, carrying at its one end the driving pulley 7 connected as by the belt 8 with some driving engine not shown. Standards 9 and 10 supported from the left of the framework bear at an intermediate point a shaft 11, which carries the two guide pulleys 12 and 13. Bearing at the top of the uprights 4 and 5 is a shaft 14 carrying guide pulleys 15 and 16. Below and midway between the shafts 11 and 14 is a shaft 17 engaging in bearings 18 at the top of the framework 1. This shaft supports driving pulleys 19 and 20. Driving pulley 19 and guide pulleys 12 and 15 are in one plane at one side of the machine, and driving pulley 20 and guide pulleys 13 and 16 are in another plane at the other side of the machine. Shaft 17 also carries a chain wheel or pulley 21 connected by a chain or belt 22 with the driving chain wheel or pulley 23 on the main shaft 6. Disposed in the plane of the driving pulley 19 is a supporting ring 24, which has the V slot 25 in its periphery, which slot is engaged by the beveled surfaces of the pulleys 12, 15 and 19. At the opposite side of the machine, in the plane of pulley 20, is a similar ring 26, having the V slot 27 engaged by the beveled surfaces of the pulleys 13, 16 and 20. Supported between and from said rings, and concentric therewith, is the stencil 28, the rings and stencil forming a stencil drum. The rotation of the driving shaft 6 is transmitted through the belt 22 to shaft 17 and to driving pulleys 19 and 20, and thence to the stencil drum, the guide pulleys 12, 13, 15 and 16 serving to guide and to hold the drum in proper position. On the driving shaft 6 there is also a drum or roller 29, and bearing in the uprights 4 and 5, below the shaft 14, is a shaft 30 carrying a roller 31. Passing about the rollers 29 and 31 is a belt 32, whose upper section engages against the stencil drum, and whose lower section loops about a tightening roller 33 carried on shaft 34, adjustably secured in slots 35 in the framework 1. Between the upper belt section and the drum is fed the fabric 36 which is to

be printed through the stencil, this fabric passing over roller 37 and to the in-take drum 38.

Extending through the stencil drum, I have shown two sprayer supporting rods 39 and 40, the rod 39 engaging in slide ways 41 and 42 suitably supported from the framework at opposite sides of the stencil, while the bar 40 is supported in slide ways 43 and 44 suitably supported from the framework at opposite sides of the drum. The end of a sprayer supporting rod is shown more in detail in Fig. 3, which shows each rod supporting a plurality of sprayer outfits 45 for directing coloring matter through the stencil to the fabric. At the right of the machine, and extending upwardly from the framework, is a shaft 46, bearing a sleeve 47. This sleeve at its upper end carries a cross piece 48, having in its ends the bearing slots 49 and 50. A link 51 pivots to the sprayer supporting rod 39, and can be adjustably pivoted in the slot 49 of the cross piece 48. A link 52 pivots to the sprayer supporting rod 40, and has adjustable pivotal connection in the slot 50 of the cross piece 48. With this construction, rotational reciprocation of sleeve 47 will cause longitudinal reciprocation of the sprayer supporting bars, so that the sprayers mounted on said bars are reciprocated transversely over the stencil.

The mechanism for automatically reciprocating the sleeve 47 is as follows: On the main driving shaft 6 there are two wheels 53 and 54, which engage between them the edge of a transmission friction wheel 55 mounted on a shaft 56 extending from the upper end of a lever 57 pivoted to the framework at an intermediate point 58. The friction wheel 53 engages against the bearing upright 2, while a compression spring 59 engages between the framework and the wheel 54, so that the transmission wheel 55 is engaged by the wheels 53 and 54 with more or less friction. The opposite edge of the transmission wheel 55 is engaged between the friction wheels 60 and 61 mounted on a shaft 62 extending from the framework, the wheel 60 being at the end of said shaft and a spring 63 intervening between the framework and the wheel 61, so that the wheels 60 and 61 are held in frictional engagement with the edge of the transmission wheel 55. Rotation of shaft 6 is, therefore, transmitted through the friction train to the friction wheel 60. Extending from the friction wheel 60 is a crank pin 64, connected by connecting rod 65 with a link 66 pivoted to an arm 67 extending to the right from the sleeve 47, so that rotation of the friction wheel 60 will result in rotational reciprocation of the sleeve 47 and longitudinal reciprocation of the sprayer supporting bars 39 and 40. The link 66 has adjustable pivotal connection in the slot 68 in arm 67, and

the rod 65 may also be adjustable in length so that the longitudinal reciprocation of the sprayer bars can be adjusted. As shown, the connecting rod comprises telescoping members which may be secured in any adjusted position by the set screw 69. The lower end of lever 57 engages a threaded sleeve 70 adapted to travel on a screw shaft 71, actuated by hand wheel 72. Movement of the sleeve 70 along the shaft 71 will cause the upper end of said lever to swing to adjust the transmission relation of transmission wheel 55 with respect to the friction wheels engaged thereby, and in this manner the speed of the sprayer bars can be controlled, and a very nice synchronizing between the pattern of the stencil design and the moving of the sprayer bars may be obtained. This nice adjustment is very necessary in the production of wall papers, and some kinds of stenciled fabric where the edges of the pieces must correspond exactly with the varying patterns.

Besides applying coloring matter to the fabric through the stencil, coloring matter could also be applied to the fabric after it passes the stencil, as, for instance, where the fabric is to be given a background. I have shown two sprayer bars, 73 and 74, suitably mounted in slide ways 75, 76. Extending upwardly from the framework is a shaft 77, bearing a sleeve 78 having at its top the cross piece 79 connected with the bar 73, through link 80, and with the bar 74 through link 81, in precisely the same manner as the cross piece 48 is connected with the bars 39 and 40 within the stencil. Extending from the sleeve 78 is an arm 82 connected by connecting rod 83 with an arm 84 extending from the sleeve 47. The rotation of this sleeve 47 therefore causes reciprocation of the rod 83 and longitudinal reciprocation of the sprayer bars 73 and 74 in front of the stencil, so that the fabric 36 may be treated after passing the stencil.

It has been found in practice that when the fabric is leaving the stencil machine, the wet surface thereof, if there is any tendency of the fabric to stretch, will mark the upper edge of the stencil openings, and these repeated markings and accumulation of color matter at these edges will cause blotting, after a number of revolutions. To obviate this difficulty I have devised friction driving connection between the belt rollers and the stencil driving wheels. As shown in Fig. 2, the main driving shaft 6, which carries the belt roller 29, has secured thereto an inner friction clutch driving member 86, which is surrounded by an outer driving member 85 rotatably mounted on said shaft. This outer clutch member carries the driving pulley part 23, which is connected by a belt with the pulley 21 carried on shaft 17, which supports the drum-driving wheels 19 and

20. The relative sizes of the pulleys and the wheels are such that the tendency will be to give the stencil a greater peripheral speed than the belt pulleys, but so long as the fabric 26 travels at the same rate of speed as the belt, the friction between the paper and stencil will be greater than the friction between the clutch members, and the clutch members will slip and the stencil and belt will travel at the same speed. However, should the fabric between the stencil and belt stretch after being printed, the friction between the stencil and paper will, of course, immediately become reduced, and the friction clutch will cause the stencil to increase its peripheral speed and to follow the fabric, so that relative movement between the fabric and stencil is automatically prevented, and discoloration or soiling of the fabric will therefore be prevented.

Extending rearwardly from the upper end of the uprights 9 and 10 are arms 87 and 88, terminating in rollers 89 and 90, which are held against the drum by springs 91 and 92, respectively, so that the drum is held against the driving and guide wheels. Also pivoted at the upper ends of uprights 9 and 10 are rods 93 and 94, which extend downwardly at the outside of the stencil drum and pivot in their ends the trunnions 95 extending from the ends of suction tube 96, from which extends a duct 97, whose end is adjacent to the inner surface of the stencil, the tube 96 being connected with some suitable suction source not shown. The outlet of the duct is divided into passageways by thin wiper plates or tongues 98, which engage the stencil and which wipe the color from the face of the stencil and conduct it into the interior of the duct, from whence it is carried into and through the tube by the suction, to be deposited in some suitable receptacle. Also extending through the stencil at the lower part thereof are one or more tubes 99 also connected with some exhaust source, ducts 100 extending from these tubes into engagement with the stencil, to remove dust and foreign particles therefrom. The tubes 99 can be supported from rods 101 extending upwardly from the framework at the sides of the stencil drum, as shown. The stencil and fabric thereunder are thus cleansed of dust, dirt and other foreign particles during the stenciling operation, and the surplus coloring matter is scraped and removed from each stencil section before it comes again into contact with the fabric, and clean-cut printing results.

The sprayers which I use may be of the construction shown in my Patent No. 767,684 already referred to, with the exception that improved valve adjusting mechanism is provided. In the construction of the patent, a thumb nut having threaded engagement with the color valve stem must be

manually turned, if it is desired to adjust the color valve. Where a plurality of sprayers are disposed within the stencil drum, these thumb nuts are not always readily accessible, and it would be more or less difficult to obtain proper adjustment of the valves. In my present machine, I substitute a pinion 102 for the thumb nut shown in the patent. As best shown in Figs. 3 and 4, this pinion is engaged by a gear 103 carried on an arbor 104, bearing extensions 105 and 106 on the sprayer framework. A spiral spring 107 on the arbor is secured at one end to the extension 105, and at its other end is secured to the arbor, the spring tending to rotate the gear 103 and pinion 102 to hold the color valve in closed position, and to resist opening thereof. Above the end of each sprayer bar, outside the stencil drum, is a frame 108 mounting a plurality of drums 109, one for each sprayer. At the end of each drum is a gear 110 engaged by threads 111 of a screw 112. Each extension 106 has an arm 113 pivoting a guide wheel 114 in the plane with the gear 103. Secured to the periphery of each gear 103 is a chain 115, which meshes with the teeth of the gear and which passes about the guide wheel 114, and whose other end is secured to one of the drums 109. Therefore, by turning of one of the screws 112, the drum controlled thereby is rotated and the chain connected with the drum is wound on said drum, which results in the pulling of the chain and rotation of the gear 103 and pinion 102 to adjust the corresponding color valve, this movement being against the force of spring 107. When the screw is turned in the opposite direction, the spring rotates the gears in the opposite direction to close the valve. Thus, the color valve of each sprayer is very readily adjustable from the outside of the stencil drum. The framework 108 at its inner end has the slide block 116 engaging the sprayer-rod 39, while at the outer end is the extension 117 terminating in the rider block 118, which has threaded engagement with the screw 116' pivoted in the outer end of the rod 39 and having the head 117'. By turning the head and screw the block 118 is shifted longitudinally and the frame 108 carried longitudinally over the sprayer-rod 39, and therefore all the chains 115 are simultaneously moved and the sprayers controlled thereby simultaneously adjusted. Thus, the sprayer valves can be individually adjusted by the screws 112, or simultaneously by means of the screw 117'. Each sprayer has suitable air and color inlets 119 and 120, respectively, connected with suitable sources of supply which it is not necessary to show here. The sprayers could also be initially opened to operate continuously, or they could be electromagnetically opened at suitable periods, or their outlet increased or diminished at suitable periods, as described in

my patent referred to. The circuit and contact arrangement could be like that shown in the patent referred to. In Fig. 1, I have shown the contacts 121 each connected with one terminal of one or more sprayer electromagnets, the other terminals of which connect with a source of current 122, there being also a brush 123 for each contact. In the figure, one of the brushes is shown in engagement with its contact to close one of the sprayer circuits, and during closure of this circuit the valves of the connected-in sprayers will be opened by the electromagnet means, and the flow of color therefrom controlled. The sprayers at the outside of the stencil can, of course, be controlled in the same manner.

I thus provide a stencil printing machine in which close synchronization can be attained between the pattern of the stencil and the movement of the sprayers over the stencil. Adjustment can very readily be made for this synchronizing even during the operation of the machine, by means of the hand wheel 72. The color controlling valves can at any time be quickly and very readily adjusted, either singly or simultaneously. All blotting or discoloration of the fabric is also overcome by the driving arrangement which causes the stencil and fabric to travel at the same speed. The improved construction of the surplus coloring mechanism enables me to keep the stencil absolutely clean of all such surplus coloring matter. All these various features taken together enable me to print a fabric which is perfectly clean, and whose colorings are in perfect match.

I desire to secure the following claims by Letters Patent:

1. In a printing machine of the class described, the combination of a stencil, driving means for said stencil, means for causing fabric to travel with said stencil, sprayers associated with the stencil, means actuated by the driving means for reciprocating said sprayers across the stencil, and means whereby the speed of reciprocation of said sprayers may be adjusted with respect to the rate of travel of the stencil.

2. In a stencil printing machine, the combination of a stencil, driving means for continuously driving said stencil, means for causing fabric to be printed to travel with said stencil, sprayers connected with said driving means to be continuously moved over the stencil during travel thereof, and adjusting means for adjusting the rate of movement of the sprayers with reference to the rate of movement of the stencil.

3. In a printing machine of the class described, the combination of a stencil drum, driving means for continuously rotating said drum, means for associating fabric to be printed with said stencil drum, supporting bars extending through said stencil drum over the stenciling area thereof, sprayers

mounted on said bars, reciprocating mechanism connected with said bars for causing alternate reciprocation thereof, and adjustable transmission mechanism connecting said reciprocating mechanism with the driving means, whereby the speed of reciprocation of the bars can be controlled with respect to the rate of rotation of the stencil drum.

4. In a stencil printing machine, the combination of a stencil, driving means for driving said stencil, means for causing material to be printed to travel with said stencil, a supporting bar, sprayers supported on said bar for applying coloring matter to the material through the stencil, means connected with the driving means for causing reciprocation of said bar during movement of the stencil, a second supporting bar away from the stencil and associated with the material to be printed, sprayers on said second bar for applying coloring matter directly to the material, and means connected with the driving means for causing reciprocation of said second bar during movement of the material.

5. In a stencil printing machine, the combination of a stencil, driving means for driving said stencil, means for associating material to be printed with said stencil, a supporting bar adjacent the stencil, sprayers supported on said bar for directing coloring matter to the material through the stencil, a second supporting bar, sprayers on said second supporting bar for directing coloring matter directly to the material to be printed, and means connected with both bars and with the driving means for causing reciprocation of said bars during the movement of said stencil.

6. In a printing machine of the class described, the combination of a stencil, driving means for moving said stencil, means for associating material to be printed with said stencil, a supporting bar, sprayers mounted on said bar for applying coloring matter to the material, reciprocating mechanism connected with said bar for causing reciprocation thereof over the material, a train of friction wheels connecting said reciprocating mechanism with the driving means, and means for moving one of the friction wheels with reference to the other friction wheels whereby the rate of reciprocation can be adjusted with respect to the speed of movement of the stencil.

7. In a printing machine of the class described, the combination of sets of sprayers, a supporting member for each set, means for causing material to be printed to travel continuously through the field of said sprayers, means for causing alternate reciprocation of the supporting members of the sprayer sets across the material during its travel, and means for adjusting the rate of reciprocation with respect to the speed of travel of the material.

8. In a stencil printing machine, the combination of a stencil drum, a belt for holding material to be printed against said drum, a main driving shaft connected with said belt for causing rotation thereof and of the drum to carry the material with the drum, sprayers mounted in rows to apply coloring matter to the material through the stencil, reciprocating mechanism connected with the rows of sprayers to cause alternate reciprocation thereof over the material, a friction wheel, a connecting rod connecting between said friction wheel and the reciprocating mechanism so that rotation of said friction wheel will cause operation of the reciprocating mechanism, a friction wheel on the driving shaft, an intermediate friction wheel for transmitting the rotation of the driving shaft friction wheel to the friction wheel connected with the connecting rod, and means for bodily shifting the intermediate friction wheel with reference to the other friction wheels to adjust the speed of rotation of the connecting rod friction wheel with reference to the driving shaft friction wheel, so that the rate of reciprocation of the sprayer rows can be adjusted with respect to the speed of travel of the material to be printed.

9. In a printing machine of the class described, the combination of a stencil, means for driving said stencil, means for causing material to be printed to travel with said stencil, sprayers for applying coloring matter to the material through the stencil, said material tending to stretch and to move relatively to the stencil, and means for adjusting the movement of the stencil to prevent such relative movement.

10. In a printing machine of the class described, the combination of a stencil, means for driving said stencil, means for causing material to be printed to travel with said stencil, sprayers for applying coloring matter to the material through the stencil, said material tending to stretch and to move relatively to the stencil, and means for increasing the speed of the stencil to counteract such relative movement.

11. In a printing machine of the class described, the combination of a stencil, means for carrying with said stencil the material to be printed, sprayers for applying coloring matter to the material, said material tending to stretch and to creep with reference to the stencil, and means for advancing the speed of the stencil to counteract such creeping.

12. In a stencil printing machine of the class described, the combination of a stencil drum, a belt engaging said drum, means for driving said belt, the material to be printed passing between said belt and said drum so that travel of the belt will carry the material with the drum, sprayers associated with the stencil for applying coloring matter, the material after being printed tending to stretch

and to creep with reference to the stencil, and means associated with the stencil for increasing its speed to counteract such creeping movement and to cause the stencil and material to travel at the same speed.

13. In a printing machine of the class described, the combination of means for moving the material to be printed, a supporting bar, a plurality of sprayers on said bar for applying coloring matter to the material, a valve for each sprayer, individual means for controlling each valve, and a common means for simultaneously controlling said valves.

14. In a printing machine of the class described, the combination of a plurality of sprayers for applying coloring matter to material to be printed, a valve for each sprayer, individual adjusting means for each valve, and individual controlling means for each adjusting means, said controlling means being grouped at a distance from the sprayers.

15. In a printing machine of the class described, the combination of a plurality of sprayers for applying coloring matter to material to be printed, a valve for each sprayer, individual adjusting means for each valve, individual controlling means for each adjusting means, said controlling means being grouped at a distance from the sprayers, and a common means for simultaneously actuating the valve adjusting means.

16. In a printing machine of the class described, the combination of a supporting bar, a plurality of sprayers mounted on said bar for applying coloring matter to material to be printed, a valve for each sprayer, adjusting mechanism for each valve, a controlling means for each adjusting means, a supporting frame at the end of the supporting bar on which all the controlling means are mounted, so that the adjusting means for each valve can be individually controlled at a distance from the sprayers, and means for causing relative movement between the supporting frame and the bar to cause simultaneous control of the valve adjusting mechanisms.

17. In a printing machine of the class described, the combination of a plurality of sprayers for applying coloring matter to material to be printed, a controlling valve for each sprayer having a stem, a pinion on each stem, a gear for each pinion, a supporting frame at a distance from the sprayers, a plurality of drums grouped on said frame, a sprocket chain connecting each gear with one of said drums, means on said frame for individually rotating said drums to thereby rotate the associated gear and pinion to adjust the valve, and means for bodily moving said supporting frame whereby all said gears are simultaneously rotated and the sprayer valves simultaneously adjusted.

18. In a printing machine of the class described, the combination of a stencil drum, a belt engaging said drum, driving means for

said belt, the material to be printed passing between said belt and said drum so that travel of the belt will tend to carry the material with the drum, sprayers associated with the stencil for applying coloring matter, the material after being printed tending to stretch and to creep with reference to the stencil, and positive driving means for the drum adjusted to increase the speed of the drum to counteract such stretching and creeping.

19. In a stencil printing machine of the class described, the combination of a stencil drum, a belt engaging said drum, driving means for said belt, the material to be printed passing between said belt and part of said drum so that travel of the belt will carry the material with the drum, means for applying coloring matter to the stencil, the material after being printed tending to move faster than the drum at a point where the material leaves the drum, and means for positively driving the stencil drum to cause said drum and the material to travel together to prevent such relative movement.

20. In a stencil printing machine, the combination of a stencil, a driving shaft, means connecting said driving shaft with said stencil to cause movement thereof, sprayers associated with the stencil to apply coloring matter thereto, said sprayers being reciprocable with reference to the stencil, a pair of friction wheels on said shaft, a second pair of friction wheels pivoted adjacent said shaft, a transmission friction wheel engaging between the friction wheels of the pairs, and means for bodily shifting said transmission friction wheel with reference to the pairs of friction wheels to change the speed of the additional friction wheels, and a connecting rod connecting said additional set of friction wheels with said sprayers.

21. In a printing machine of the class described, the combination of a stencil, sprayers, a reciprocable support for said sprayers, a member adapted when driven to reciprocate

said support, a driving shaft, means connecting said driving shaft with the stencil to cause movement thereof, a pair of friction wheels on said shaft, an additional pair of friction wheels pivoted adjacent said shaft, a transmission friction wheel pivoted between the friction wheels of the pairs, a connecting rod pivoted to said additional set of friction wheels and connecting with the member for reciprocating the sprayer support, rotation of the driving shaft thereby causing movement of the stencil and reciprocation of the sprayers, said transmission friction wheel being shiftable with reference to the pairs of friction wheels whereby the rate of reciprocation of the sprayers can be adjusted with reference to the speed of the stencil.

22. In a printing machine of the class described, the combination of a stencil, sprayers for applying coloring matter to the stencil, a support for the sprayers, a driving shaft, means connecting said driving shaft with the stencil to cause travel thereof upon rotation of said shaft, a driving friction wheel on said shaft, an additional friction wheel pivoted adjacent said shaft, mechanism connecting said additional friction wheel with the sprayer support the adapted upon rotation of said additional friction wheel to cause reciprocation of the sprayer support, a friction transmission wheel connecting the other friction wheels, and means for adjusting said transmission friction wheel with reference to the other friction wheels whereby the rate of reciprocation of the sprayer support can be adjusted with relation to the speed of travel of the stencil.

In witness whereof, I hereunto subscribe my name this 30th day of September A. D. 1908.

CHARLES L. BURDICK.

Witnesses:

H. W. JAMESON,
F. L. RAND.