

Feb. 25, 1941.

W. F. HUCK

2,233,210

WEB PRINTING MACHINE

Filed Dec. 23, 1938

3 Sheets-Sheet 2

Fig. 4.

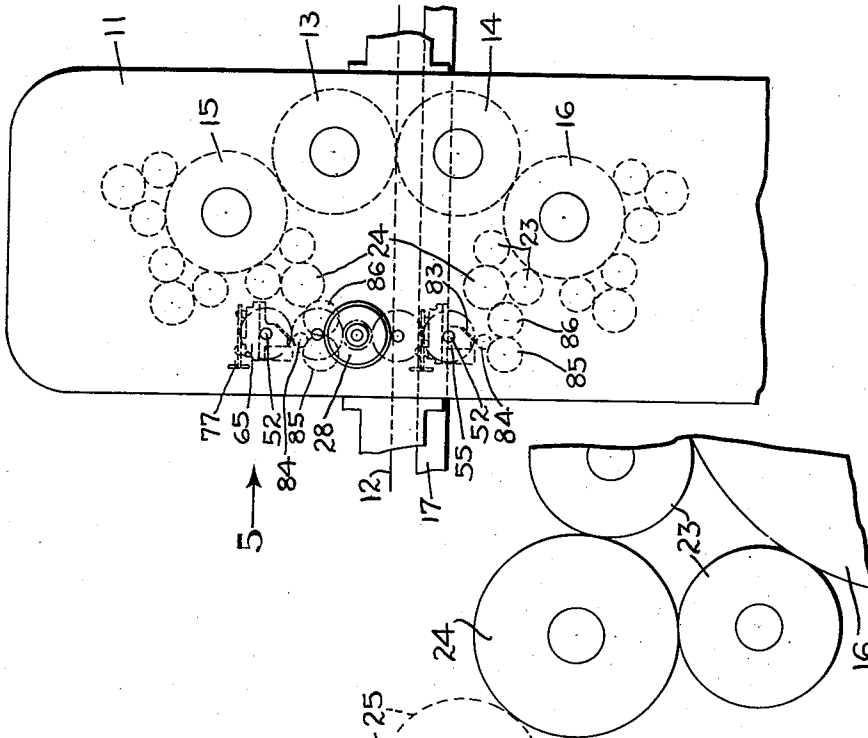
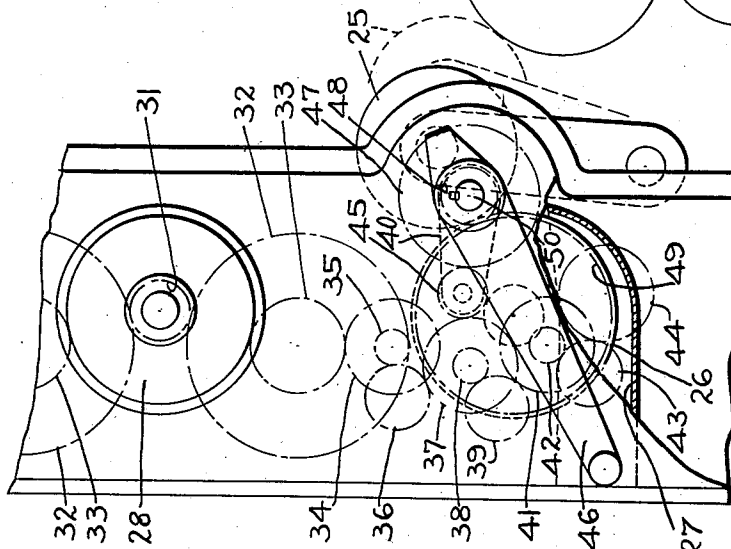


Fig. 3.



INVENTOR
William F. Huck.
BY *Alfred J. Horton*
ATTORNEY

Feb. 25, 1941.

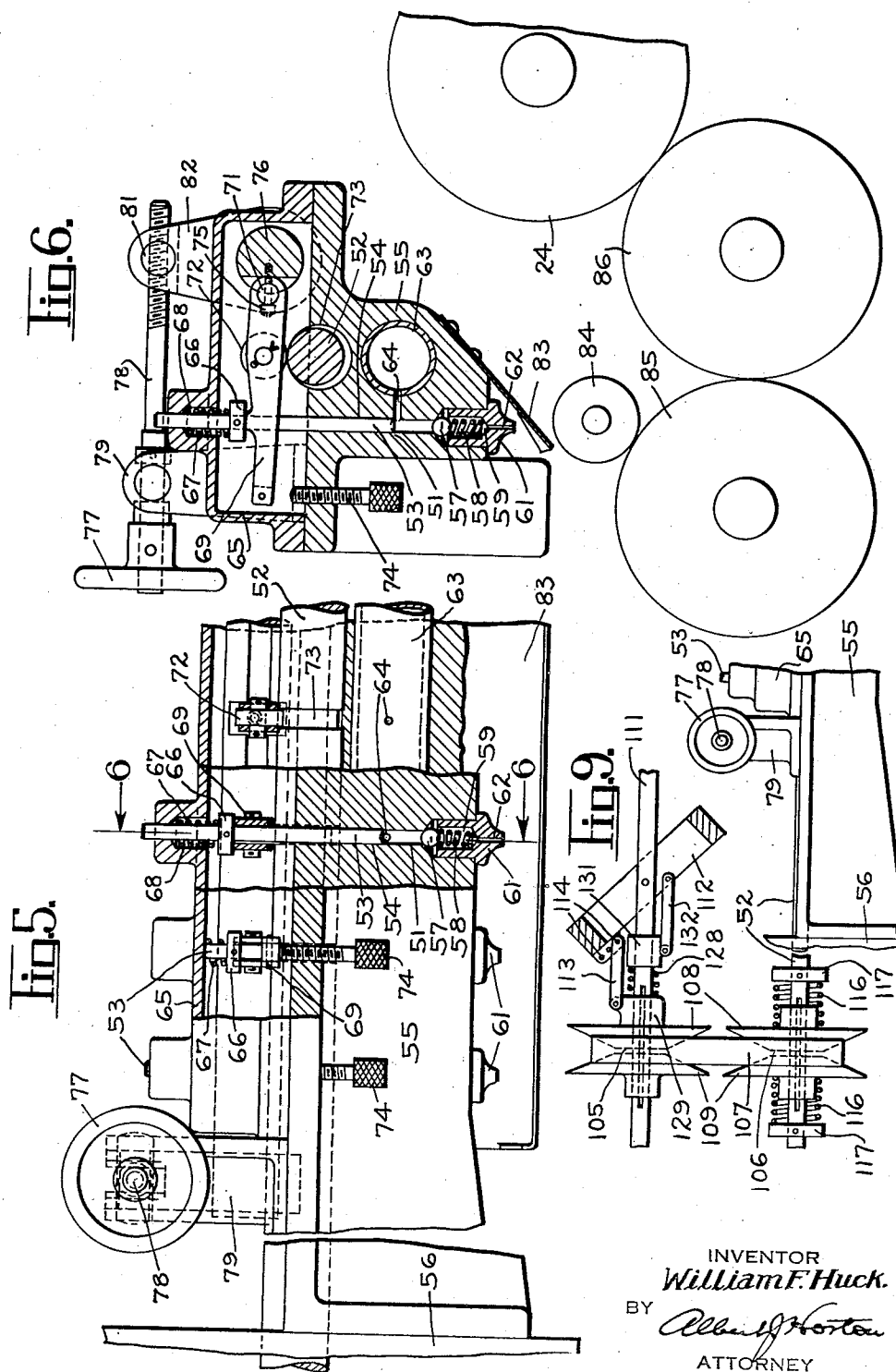
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3 Sheets-Sheet 3



INVENTOR
William F. Huck.
BY *Albion Horton*
ATTORNEY

UNITED STATES PATENT OFFICE

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WEB PRINTING MACHINE

William F. Huck, Richmond Hill, N. Y., assignor to
R. Hoe & Co., Inc., New York, N. Y., a corporation of New York

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This invention relates to lithographic printing machines and more particularly to an improved moisture distributing mechanism for such types of machines.

5 In printing machines of this type, moisture is applied to the printing plate or form and the amount of moisture required is governed partially by the work being printed which amount varies with the speed of the machine, and partially by evaporation which is substantially constant. To maintain the effect of the moistening fluid on the form uniform at all machine speeds, it is of course necessary to increase the amount of fluid delivered when the speed is increased.

10 In many printing machines, the moisture distributing mechanism is driven by direct connection to the machine and its speed therefore varies in the same ratio as the machine speed. It has been found that with machines so arranged, if the speed of the moisture distributing mechanism is properly regulated for a particular speed, if the speed of the machine is increased, the amount of fluid delivered at the increased speed is excessive and the mechanism requires adjustment whenever the speed of the machine is changed.

In other printing machines, the moisture distributing mechanism is driven by a separate source of power such as a small electric motor and its speed control is entirely independent of the speed of the machine. In machines of this type, when the speed of the machine is increased, it is necessary to also regulate the speed of the moisture distributing apparatus in order to maintain the desired moisture condition on the form.

35 The mechanism of this invention was developed to automatically maintain the proper amount of moistening fluid upon a lithographic plate at all speeds of the machine.

40 One object of this invention is to provide in a lithographic printing machine having a form cylinder and a moistening mechanism for a plate or form on said cylinder, means to automatically vary the speed of the moistening mechanism at a lesser rate of change than the rate of any change in speed of the printing machine.

Another object is to provide a mechanism whereby a fountain roller, or the action of a moistening fluid pump or the like, adapted to deliver fluid to a printing plate of a printing machine, will be increased in speed at a different ratio than the increase in speed of the machine, to obtain and maintain the amount of moisture on the form uniform at all machine speeds.

55 Still another object is to provide in such moistening mechanism, means for adjustment whereby the amount of moistening fluid distributed may be varied to suit the requirements of the form being supplied.

A further object is to provide in a multi-color printing machine, a separate motor and a variable speed power transmission for the moisture distributing mechanism for each of the forms.

Still further objects of this invention are to provide; an improved form of moisture applying mechanism wherein separate adjustments are provided; an adjustment to vary the amount of moisture supplied to each of several areas of the form; an adjustment for simultaneously increasing and decreasing the feed to all areas; and means to spread the moisture between engaging rollers as it is being applied.

It is also an object of the invention to provide a moisture distributing mechanism for a printing machine, of generally improved construction, whereby the device will be simple, durable and inexpensive in construction, as well as convenient, practical, serviceable and efficient in its use.

With the foregoing and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts, and in the details of construction hereinafter described and claimed.

Several embodiments of the invention are illustrated in the accompanying drawings, wherein:

Figure 1 is a diagrammatic illustration of a multi-color lithographic printing machine embodying the features and principles of this invention and wherein the moisture is obtained from a fountain by means of a fountain roller;

Figure 2 is an enlarged illustration of the driving mechanism for the pair of fountain rollers shown in Figure 1;

Figure 3 is an enlarged illustration of the variable speed driving mechanism for one fountain roller;

Figure 4 is a diagrammatic illustration of one unit of a multi-color lithographic printing machine wherein the moisture for the form is obtained by the use of fluid displacement pumps;

Figure 5 is a broken sectional front view of the moisture distributing mechanism shown in Figure 4, looking in the direction of arrow 5;

Figure 6 is a vertical section taken on line 6—6 of Figure 5;

Figure 7 is an electrical control and wiring diagram for the separate motors used to drive the respective fountain rollers or the displacement

ment pumps shown in Figures 1 and 4 respectively;

Figure 8 illustrates a mechanically controlled speed varying device whereby the speed of a fountain roller may be automatically varied at a lesser rate than the rate of any change in speed of the machine and in addition have its speed manually controlled; and

Figure 9 illustrates a mechanically controlled speed varying device whereby the speed of a series of pumps, such as shown in Figure 5, may be automatically varied at a different rate than the rate of any change in speed of the printing machine.

The printing machine shown in Figure 1 comprises a plurality of perfecting printing units 11, arranged to print simultaneously on both sides of the web 12 as it passes between the cylinders 13 and 14 of each unit. The printing machine shown is of the type known as an offset press but it is to be understood that this invention is not to be limited to this form of printing machine but is applicable to any form of printing machine requiring an application of moisture to printing plates secured to the form cylinders thereof. The form cylinders 15 and 16 of the machine illustrated, are arranged to be driven by a shaft 17 through gearing 18 and to cooperate with the printing cylinders 13 and 14 in the usual manner. The shaft 17 is driven by a machine driving motor 19 by bevel gears 21. A suitable inking mechanism (not shown) but including inking rollers 22 is provided for each of the form cylinders 15 and 16. Likewise, a moistening mechanism is provided for each of the cylinders 15 and 16 and includes form rollers 23, a distributing roller 24 (Figure 3), a ductor roller 25 arranged to alternately contact the distributing roller 24, and a fountain roller 26, which latter roller 26 rotates in a fountain 27, of the usual type and form, to obtain moistening fluid therefrom for distribution to the other rollers and thence to the cylinders 15 or 16.

Provision is made to rotate each fountain roller 26 or, as shown, each pair of adjacent rollers 26, by means (see Figures 2 and 3) of a separate electric motor 28 through a variable speed power transmission 29. Each transmission 29 includes a pinion 31 on the motor shaft in mesh with a gear 32 to rotate a pinion 33 connected to the gear 32 by a common shaft. The pinion 33 meshes with a gear 34 to drive a pinion 35 which meshes with an idler gear 36. The idler gear 36 meshes with a gear 37 to drive a pinion 38 which meshes with another idler gear 39. The idler gear 39 meshes with a gear 41 to drive a pinion 42 which is in mesh with still another idler gear 43. The idler gear 43 is in mesh with a gear 44. The above series of gears and pinions constitutes a speed reduction gearing whereby a roller 26 may be rotated by the motor 28 at any selected one of a plurality of speeds, by meshing a pinion 45 carried by an arm 40 connected to a shaft 50 adapted to be rocked by an operating swingable arm 46 with any one of the gears 34, 37, 41 or 44. When so connected the pinion 45 drives a gear 47, with which it is always in mesh, to drive a pinion 48 which in turn is always in mesh with a gear 49 secured to the shaft of the roller 26. By selecting the proper speed ratio at each fountain, the required amount of fluid may be supplied to the respective form cylinder for the particular work it is to print.

Figures 4, 5 and 6 illustrate a mechanism

adapted to be used in place of the ductor and fountain rollers 25 and 26 respectively, to supply moisture to the distributing roll 24 and thence through the form rollers 23 to the plates on the form cylinders 15 or 16. This mechanism includes a plurality of pumps 51, one for each column of the printed sheet or for each area corresponding to a column. The pumps 51 are actuated by a common shaft 52. The shaft 52 of each mechanism is adapted to be driven by one of the motors 28 whereby each pair of adjacent mechanisms will be driven separately from the other pairs, or when the arrangement separates the mechanisms of each pair each mechanism may be driven by a separate motor 28. Each pump 51 includes a piston 53 adapted to vertically reciprocate in one of a plurality of bores 54 provided in a base 55, which extends from one machine frame 56 to the other (not shown).

The bores 54 extend below the lower end of the pistons 53 and are each normally closed by a ball 57 urged upwardly by a spring 58 into bore closing position. The spring is disposed in a counterbore 59 formed in a nozzle 61 which has a relatively small outlet bore 62. The bores 54 are each connected to a source of moistening fluid supply, herein shown carried by a pipe 63 extending through the base 55, by a hole 64 extending from the bore 54 to the interior of the pipe 63. The pistons 53 extend upwardly into a base cover 65 and each have a collar 66 secured thereto against which a spring 67, disposed in a counterbore 68 in the cover 65, acts to constantly urge the respective piston 53 downwardly to force the moistening fluid through the ball spring valve and the nozzle 61. An arm 69, extending beneath each of the collars 66 and pivoted at one end upon a pin 71, engages each collar 66 to raise the respective piston 53 against the action of the spring 67.

A roller 72 is rotatably mounted on each arm 69 intermediate the point on the arm 69 that is engaged by the collar 66, and the pivot pin 71. Each of the rollers 72 are adapted to ride upon the periphery of an eccentric 73 formed in the shaft 52 whereby rotation of this shaft will raise and lower the arm 69 to act accordingly upon the respective piston 53. An adjustable limiting screw 74 is provided for each arm 69 and is disposed to engage the free end of the arm. By adjusting the screw 74, the volume of fluid forced through the respective bore 54 by the piston 53 will be varied and thus the amount of fluid supplied to the particular section of the form corresponding to this piston will be varied. The pins 71 are mounted in alignment and secured by screws 75 upon the periphery of a shaft 76 extending through the cover 65, whereby rotation of the shaft 76 will simultaneously adjust the stroke of all of the pistons 53 of one moistening mechanism to vary the volume of fluid being delivered thereby. The means herein shown to rotate the shaft 76 includes a handwheel 77 secured to a rod 78 which is pivotally mounted between standards 79. The rod 78 extends to and threadingly engages in a pin 81 pivotally mounted in the free end of an arm 82 secured to one end of the shaft 76.

The moistening fluid forced through the nozzles 61 engages a spreader plate 83, which extends across and below them, from which it flows onto and between rollers 84 and 85. The moisture is then transferred to a cooperating roller 86 which further spreads it and transfers it to the distributing roller 24. As in the previously de-

scribed form shown in Figure 1, the fluid is transferred from the distributing roller 24 to the form rollers 23 and thence to the forms on the cylinders 15 or 16.

In Figure 7, electrical connections are shown for controlling the motors 28 and it will be understood that these motors may be controlled either to rotate fountain rollers 26 as shown in Figures 1, 2 and 3, or pump shafts 52 as shown in Figures 4, 5 and 6, the purpose in either case being to so control the pump or fountain roller that its speed will be increased or decreased when the speed of the machine is changed, but the increase or decrease will be in lesser ratio. In general, the equipment includes a generator 87, driven by the printing machine and generating a voltage varying substantially directly with the machine speed. In addition, there are two other generators 92 and 93 driven by a constant speed motor 91. One of these last mentioned generators feeds a circuit for the fields of the several motors 28 on which a constant voltage is maintained. The other generates a constant voltage and is connected in series with the machine driven generator, and it will be seen that the voltage of this circuit is equal to the sum of the voltages of the constant speed generator and the machine driven generator. This voltage is imposed on the armatures of the several motors 28, and it will be understood that their speed will be increased when the speed of the machine increases, but in a lesser ratio because of the fact that the circuit voltage is determined in part by the voltage of the constant speed machine.

More specifically, the generator 87, as shown in Figure 1, is driven from the machine motor shaft 88, through a belt or chain 89. The motor generator set consists of a constant speed motor 91, preferably direct connected to a pair of generators 92 and 93. The voltage of each of the generators may be varied by means of a rheostat 94 connected in series with the generator shunt field coils 95, 96 and 97 respectively. The motor 91 will preferably be connected to the control switch of the machine motor 19 in a well known manner so as to start and stop when the machine is started and stopped. The generator 93, as herein shown, supplies current at constant voltage for energizing the fields of all of the generators and of the several motors 28, while the generators 87 and 92 supply current to the armatures of motors 28. Field coils 95 and 96 are connected to the terminal 98 of the generator 93 and to their controlling rheostats 94, which in turn are connected to terminal 99. Similarly, field coil 97 is connected to terminal 98 and its field rheostat is connected to terminal 99. Field coil 100 of each of the motors 28 is also connected to terminals 98 and 99 of the generator 93. As this generator runs at a uniform speed and carries a constant load, it will maintain a substantially constant voltage on the fields of the motors 28 and also on the fields of the generators 87 and 92.

A switch 90 is connected in the branch circuit to each motor 28 so that any motor may be disconnected when the printing machine is operated with less than the full number of printing units in use.

Because of its constant speed, the generator 92 will also maintain a constant voltage across its terminals, but the generator 87, being driven by the printing machine, its voltage will vary approximately directly with the printing machine speed, and from a maximum determined by its

highest speed, to a minimum determined by the resistance of its rheostat and the slowest operating speed. One side of the circuit supplying current to the armatures of the motors 28 is connected to terminal 102 of generator 92, and the other side of the circuit is connected to terminal 104 of generator 87. Terminal 103 of generator 87 is connected to terminal 101 of generator 92, thus putting these two generators in series, to supply current to the armatures of the motors 28.

It will be seen that with the arrangement herein disclosed, the speed of the moisture distributing mechanism will be increased when the machine speed is increased, due to the influence of the generator 87, on the circuit supplying current to the motors 28, but due to the influence of the generator 92 which runs at a constant speed, the increase of the speed of the motors 28 will be less than the increase in the machine speed.

It will also be seen that my manipulation of the rheostats, the relative influence of the generators 87 and 92 on the circuit can be varied to produce a wide range of control, and additional regulation can be obtained by adjustment of the rheostat controlling the field 97 of the generator 93, whereby the voltage supplied to all of the generator and motor fields may be varied simultaneously. Obviously, separate field rheostats may be connected in series with each of the fields 100, if individual regulation is desired for the purpose of supplying more or less moisture to the forms of one or more of the units than to the forms of the others.

It will be understood that if a less refined control is acceptable, the generator 93 may be omitted and the generator 92 be arranged to supply all the field current required, and in addition supply current for the motors 28, this being accomplished by rearrangement of the connection, whereby the motor fields 100 will be connected to the terminals 101 and 102, as will be understood by those versed in the art.

The modification shown in Figure 8 illustrates a mechanically operated mechanism whereby the speed of the roller 26 will be automatically varied or increased at a different or lower ratio than a variation or increase in the speed of the printing machine. This mechanism includes a variable speed device constituted by a pair of pulleys 105 and 106 of the type wherein a belt 107 drivingly engages each pulley between separable beveled members 108 and 109, both of which members of pulley 105 are keyed to and movable axially on a shaft 111 to vary the effective diameter at the belt engaging portion thereof as in the well known Reeves drive. It will be understood that the shaft 111 is drivingly connected to the machine driving shaft 17 to run in synchronism therewith. A centrifugally actuated member 112, pivoted to the driven shaft 111, is connected by a link 113 to the pulley member 108 of the pulley 105. The link 113 may be connected to the member 112 at any one of a plurality of points 114 to vary the action of the member on the pulley 105, as hereinafter explained, to vary the speed of the roller 26 through the belt 107 and pulley 106. The members 108 and 109, of the pulley 106 are keyed to and axially slidable on the shaft 115 of the roller 26 and are pressed together by coiled springs 116 reacting between the members 108 and 109 and collars 117 pinned to the shaft 115. By the above described mechanism, the speed of the roller 26 will be auto-

matically increased at a lower ratio than that of the increase in speed of the shaft 111 when the speed of the printing machine is changed, the ratio being variable by connecting the link 113 at different points 114 on the member 112.

Provision also is made in the mechanism shown in Figure 8 to vary the speed of the roller 26 to suit the requirements of the work being printed. This speed varying mechanism includes a manually rotatable handle 118 secured on a threaded spindle 119, rotatably mounted in a stationary bracket 121 and screw threaded into a bushing 122 secured to one end of a lever 123. The lever 123 is pivoted at 124 to the bracket 121 and carries a pin 125 on its other end which is adapted to ride in a groove 126 formed in the hub 127 of the member 109 of the pulley 105. By rotating the spindle 119, the effective diameter of the pulley 105 may be varied to vary the speed of the roller 26.

Increased speed of the shaft 111 due to an increase in machine speed will cause the member 112 to assume a more vertical position whereby through the link 113, the member 108 of the pulley 105 will be pulled away from the member 109 to vary the effective diameter of this pulley and thus automatically vary the speed of the roller 26 at a lower ratio than the increase in the speed of the shaft 111. To return the members 108 and 112 to the position shown in Figure 8, a spring 128, coiled about the shaft 111, is disposed between the hub 129 of the member 108 and a collar 131, slidably mounted on the shaft 111 and connected to the member 112 by means of a link 132.

A similar mechanical controlling device is shown in Figure 9 to automatically actuate the pump shaft 52 of the mechanism shown in Figures 3 and 4 and the same reference numerals denote corresponding parts therein. In this mechanism, the members 108 and 109 of the pulley 106 are keyed to and mounted for axial sliding movement on the shaft 52. No provision is made in the mechanism shown in Figure 9 for separately adjusting the member 109 of the pulley 105 as such adjustment is not required due to the provision of the adjusting shaft 76 previously described for this purpose.

It will be understood that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiments be considered in all respects as illustrative and not restrictive, and it will be further understood that each and every novel feature and combination present in or possessed by the mechanism herein shown and disclosed forms a part of the invention included in this application.

What I claim is:

1. In a lithographic printing machine having a plurality of driven form cylinders, means to drive said cylinders, cylinder moistening devices one for a form on each cylinder including a series of fluid pumps, means to drive said series of pumps from said cylinder driving means including a control mechanism to vary the speed of said pumps at a different ratio than the variation in the speed of said cylinders, means to simultaneously vary the volume of fluid delivered by all of the pumps of each series, and means to separately vary the volume of fluid delivered by each pump of a series, the said control mechanism being controlled by variations

in the speed of the said cylinder driving means.

2. In a lithographic printing machine, a form cylinder having a form thereon, means to drive said cylinder, a form moistening device including a series of pumps, means driven by said cylinder driving means to drive all of said pumps in unison, centrifugally actuated means to vary the speed of all of said pumps at a different ratio from the variation in the speed of said cylinder, means to separately vary the volume of moisture delivered by each pump, and means to simultaneously vary the amount of moisture delivered by all of said pumps.

3. In a lithographic printing machine having a plate cylinder, means to drive the plate cylinder, means to supply moisture to a plate on said plate cylinder, an electric motor for driving said moisture supplying means, a first electric generator driven in timed relation with the cylinder and electrically connected to the armature of said motor, a constant speed motor driven second generator electrically connected in series with the first generator and to the armature of said motor, whereby the speed of said motor will increase at a slower ratio than an increase in the speed of the cylinder.

4. In a lithographic printing machine having a plate cylinder, means to drive the plate cylinder, means to supply moisture to a plate on said plate cylinder, a variable speed electric motor for driving said moisture supplying means, a first electric generator driven by the cylinder driving means and electrically connected to the armature of said motor, a second generator electrically connected in series with the first generator and to the armature of said motor, whereby the speed of said motor will increase at a slower ratio than an increase in the speed of said cylinder, a third generator electrically connected to the fields of all of said generators and said motor to energize them, and a constant speed motor for driving said second and third generators.

5. In a lithographic printing machine having a plate cylinder, means to drive the plate cylinder, means to supply moisture to a plate on said plate cylinder, an electric motor for driving said moisture supplying means, a first electric generator driven by the cylinder driving means and electrically connected to the armature of said motor, a constant speed motor driven second generator electrically connected in series with the first generator and to the armature of said motor, whereby the speed of said motor will increase at a slower ratio than an increase in the speed of the cylinder, means to electrically energize the fields of said generators and of said motor, and manually adjustable variable speed means connecting said motor with said moisture supplying means.

6. In a lithographic printing machine having a plate cylinder carrying a plate, means to drive the plate cylinder, means to supply moisture to the plate, means to drive said moisture supplying means, means to increase the speed of said moisture supplying means at a lower ratio than an increase in the speed of said cylinder, including a variable speed mechanism interposed as a driving connection between the driving means for said cylinder and the said moisture supplying means, and automatically operable means actuated by variations in speed of the said cylinder driving means, to change the ratio of the variable speed mechanism when a variation in the speed of said cylinder driving means occurs.

7. In a lithographic printing machine adapted

to be driven at varying speeds, a form cylinder, a form moistening device, a member rotated in timed relation with the cylinder, means connected to the said member and responsive to variations in the speed of the member and operably connected to a variable speed ratio drive for operating the form moistening device at a speed automatically varying with respect to the speed of the form cylinder, and increasing at a slower ratio than any increase in the speed of the said form cylinder.

8. In a lithographic printing machine adapted to be driven at varying speeds, a form cylinder, a form moistening device, a member rotated in timed relation with the cylinder, means connected to the said member and responsive to variations in the speed of the member and operably connected to a variable speed power transmission driven by said member and connected to the form moistening device to drive it at a speed varying with the speed of the form cylinder but increasing at a slower ratio than any increase in the speed of the said form cylinder.

9. In a lithographic printing machine adapted to be driven at varying speeds, a form cylinder driven in timed relation with other parts of the machine and having a form thereon, a form moistening device driven by an electric motor at a speed variable with respect to the speed of the machine, a first electric generator driven in timed relation with the machine, and a second electric generator driven at a substantially constant speed, conductors connecting the said generators in series and to the motor, and voltage control means for each of the generators.

10. In a lithographic printing machine, a form cylinder having a form thereon, a form moistening device including a plurality of pumps, means for individually regulating the moisture supplied by each pump, and other means for simultaneously and variably regulating the moisture supplied by the said plurality of pumps.

11. In a lithographic printing machine, a form cylinder having a form thereon, a form moistening device including a plurality of pumps, each pump having a piston, means for reciprocating each piston including a lever having an adjustable fulcrum, means for swinging each lever on its fulcrum, and means for simultaneously adjusting the fulcrums of several of the levers.

12. In a lithographic printing machine, a form cylinder having a form thereon, a form moistening device including a plurality of pumps, each pump having a piston, means for reciprocating each piston including a lever having an adjustable fulcrum, means for swinging each lever on the fulcrum, an adjustable stop to limit the swing of each lever and regulate the stroke of its piston, and means for simultaneously adjusting the fulcrums of several of the levers.

13. In a lithographic printing machine having a plurality of driven form cylinders, means to drive the cylinders at varying speeds, moistening devices one for a form on each cylinder and including a series of fluid pumps, means to drive said series of pumps at varying speeds from said cylinder driving means and including a control mechanism to vary the speed of the pump driving means at a different ratio than the variation in the speed of the cylinder driving means, means to simultaneously vary the action of all of the pumps of each series to vary the volume of fluid delivered thereby and means to separately vary the action of each pump of a series to vary the volume of fluid delivered thereby.

14. In a lithographic printing machine, a form cylinder having a form thereon, a form moistening device including a plurality of pumps, means for individually and variably regulating the action of each of the pumps to regulate the volume of moisture delivered thereby, and other means for simultaneously and variably regulating the action of all of the pumps to vary the volume of moisture delivered thereby.

WILLIAM F. HUCK.