Nov. 5, 1929. A. J. CLINE 1,734,077

DRIVING MECHANISM FOR PRINTING PRESSES

Filed May 25, 1928 5 Sheets-Sheet 1

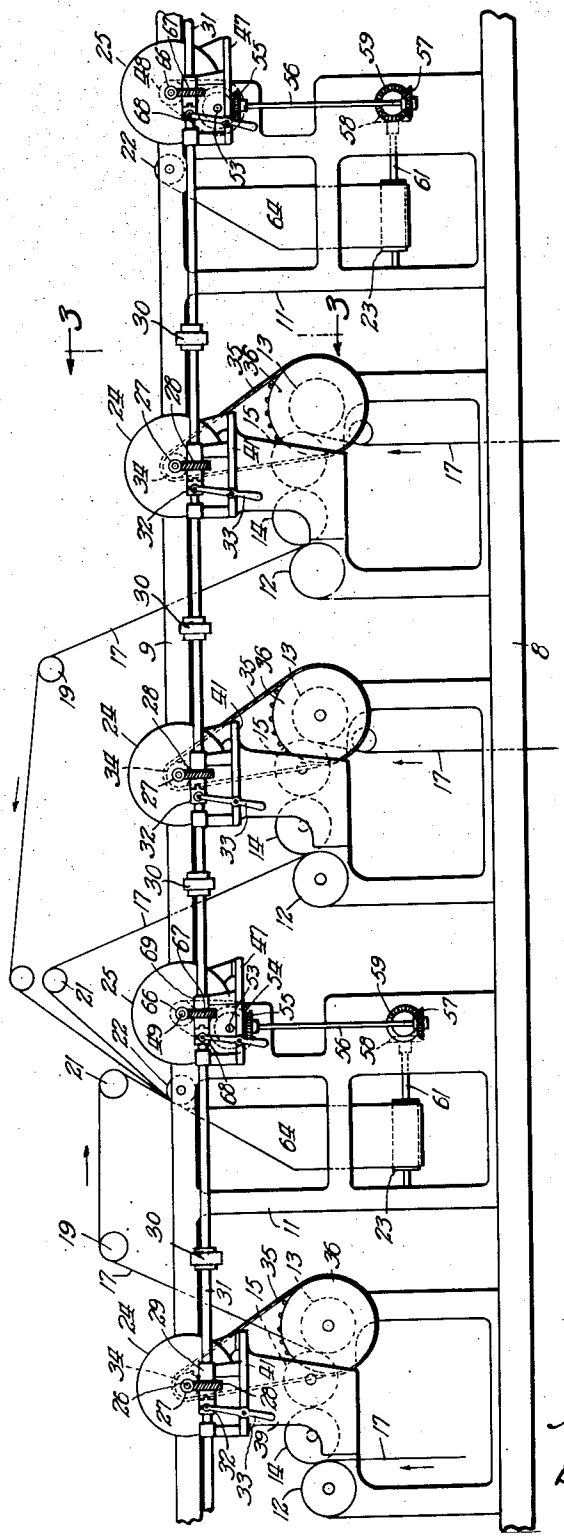


Fig. 1

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DRIVING MECHANISM FOR PRINTING PRESSES

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Fig. 2

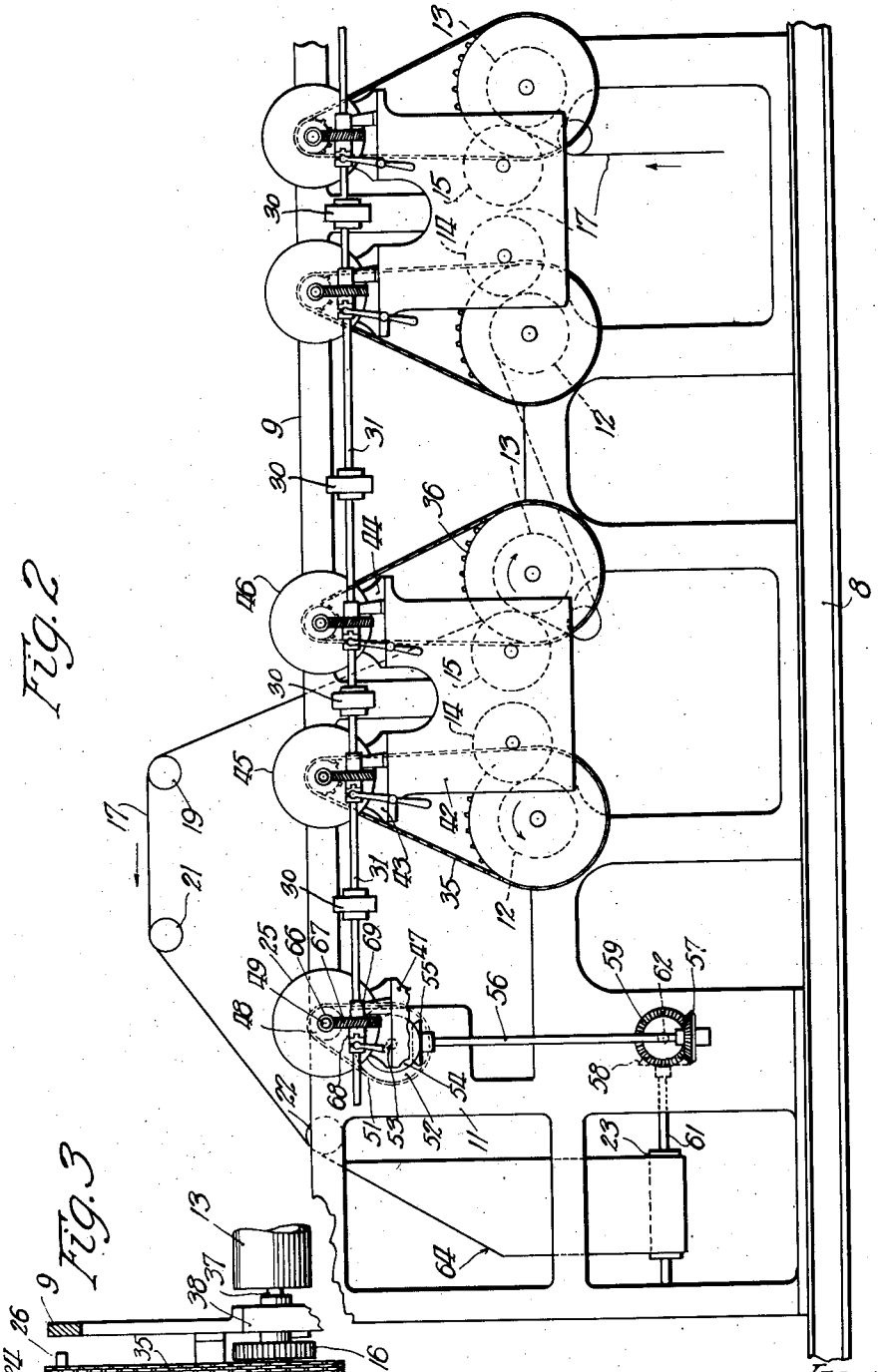


Fig. 3

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DRIVING MECHANISM FOR PRINTING PRESSES

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Fig. 4

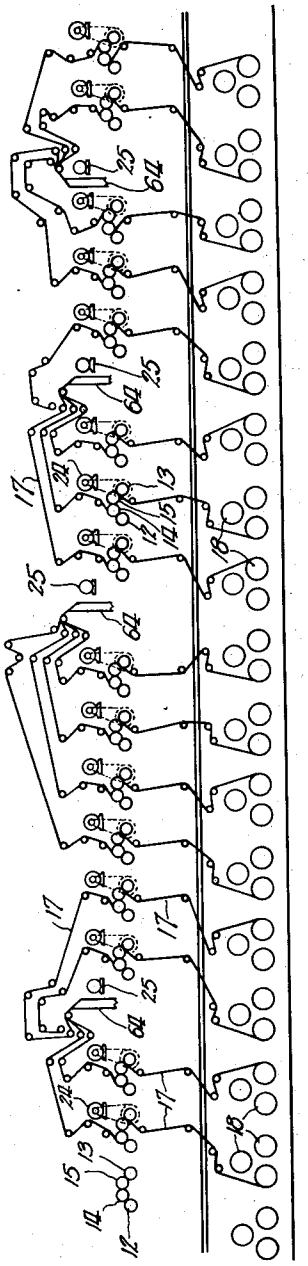
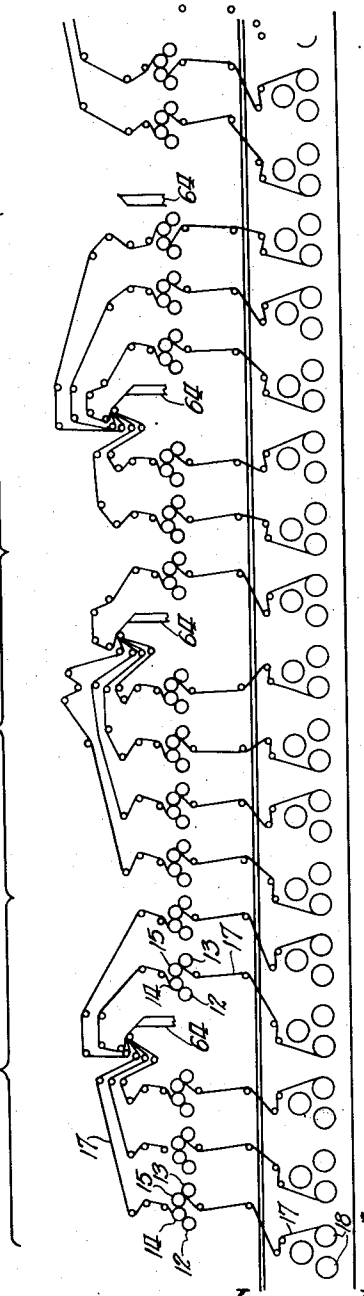


Fig. 4a



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DRIVING MECHANISM FOR PRINTING PRESSES

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Fig. 5

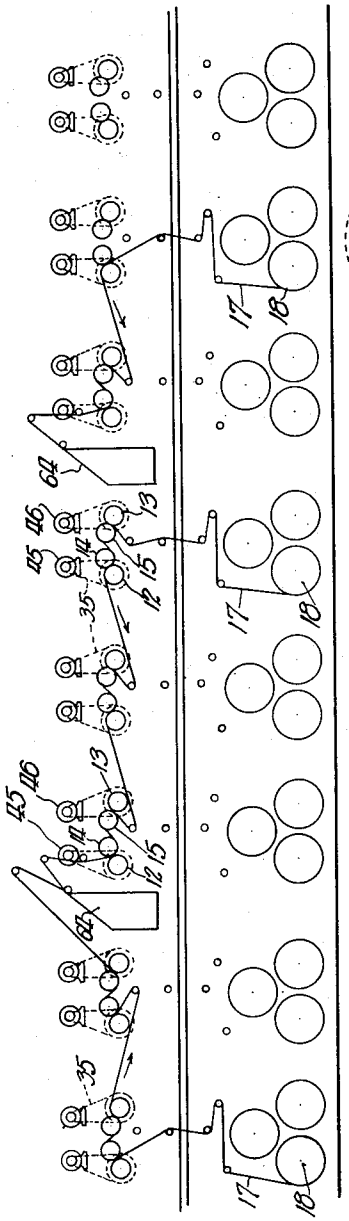
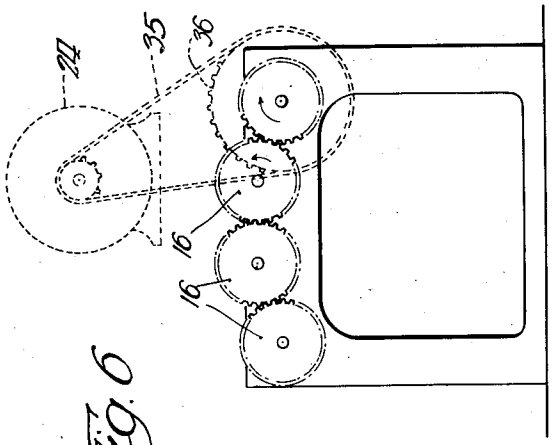


Fig. 6



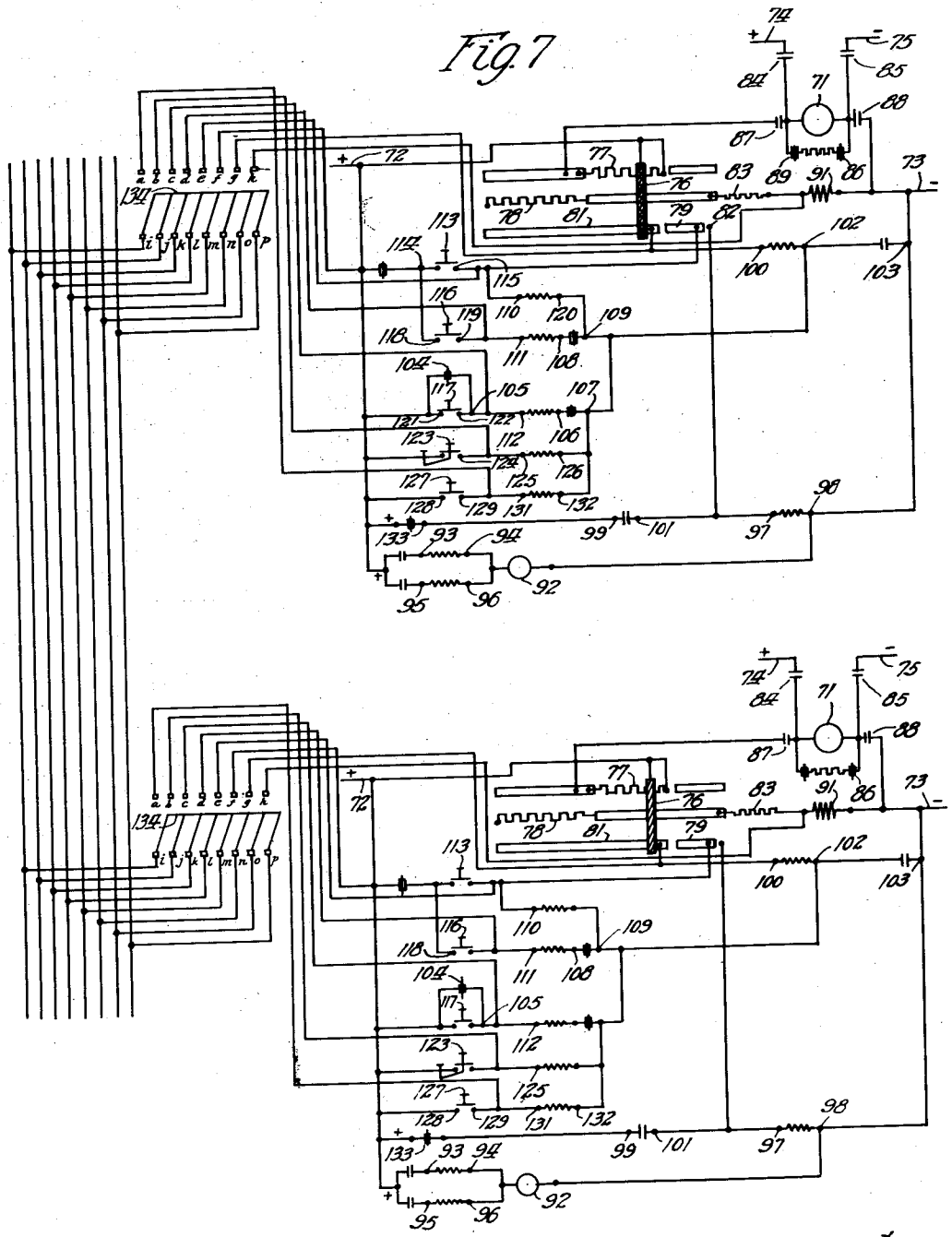
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DRIVING MECHANISM FOR PRINTING PRESSES

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Fig. 7



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UNITED STATES PATENT OFFICE

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DRIVING MECHANISM FOR PRINTING PRESSES

Application filed May 25, 1928. Serial No. 280,550.

My invention relates to printing presses, and more particularly to press drives and controls.

In modern development of newspaper printing presses, particularly in large establishments, the so-called unit type press has come into use and consists of a plurality of separate printing units, preferably arranged in a continuous row or line and with folders interspersed between the units at intervals, or in selected arrangement, so that the printing units may be most advantageously associated with the folders to thereby obtain maximum flexibility in the use of the printing units to conform to the conditions of newspaper production which present varying requirements as to numbers and association of pages from day to day and from one edition to another. The printing units, in a press of this kind, are arranged on the same level, as preferably also are the folders, a separate web supply mechanism being provided for each unit, such mechanism being ordinarily located on a lower level and the web extending from a roll of paper supported by such mechanism up through the floor to the printing cylinders of the press. According to present practice, the entire number of printing units, or, in any event, a large number thereof, are driven from a common source of power, such as a large motor, from which power connections for the individual printing units and folders take off at intervals along the shaft. This heavy power shaft and the framework and bearings therefor are very costly, a considerable portion of the cost of the press being represented thereby. Furthermore, a very large motor is required, and any mishap to the motor or power shaft incapacitates all of the units and folders served thereby.

The principal object of my present invention is to provide individual drives and controls for the separate units and folders of the press, whereby the latter may be driven individually or in selected grouping, thus dispensing with the heavy power shaft and common source of power and rendering each unit subject to individual control, irrespective of the other units though adapted to be suitably related to any other units or folders which may be selectively brought into an operating group.

A further object of the invention is to provide means whereby the speed of the drives for the several units and folders may be equalized, so that such units and folders as are associated in a particular group will operate in proper timed relationship to produce accurate registration and proper feeding of the webs through the printing units and into the folder, or folders.

While I have mentioned particularly the unit type newspaper press, which has been selected for illustration in the accompanying drawings, I desire that it be understood that my invention, though perhaps particularly useful in connection with such a press, is not restricted thereto, but may be advantageously employed in connection with black and color presses of various types and particular construction, and arrangement of printing elements and means for receiving the newspapers or other printed product.

Other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings,

Figure 1 is a broken elevational view of a unit type press in which my invention is embodied, the elements being for the most part diagrammatically shown;

Fig. 2 is a similar view of a press equipped with a somewhat modified form of drive, the press shown in this figure being more particularly suited to color printing;

Fig. 3 is a detail view of one of the motors and associated driving elements, the same being taken substantially on the plane 3—3 of Fig. 1;

Fig. 4 is a diagrammatic view, somewhat extended, of the press shown in Fig. 1, this view illustrating certain selected groupings of printing units and folders and showing a typical situation in which one of the units is idle;

Fig. 4ª is a similar view, illustrating a different combination of units utilizing the unit

which is shown idle in Fig. 4, this combination, however, leaving an idle folder;

Fig. 5 is a diagrammatic view on the order of Figs. 4 and 4ª but showing the press and drive arrangement therefor illustrated in Fig. 2;

Fig. 6 is a detail view, showing the gear connection between the cylinders of a printing unit of the press shown in Figs. 1 and 4; and

Fig. 7 is a wiring diagram and schematic illustration of the press controls.

Upon said drawings I have shown in Figs. 1 and 4, for illustrative purposes only, a unit type press, in which the several printing units and folders are arranged in a continuous row and mounted in a frame, of which the base 8, top bar 9, and uprights 11 are shown in Fig. 1.

Each printing unit in this form of press comprises a pair of printing couples, each consisting of a plate cylinder and an impression cylinder, the plate cylinders of said couples being respectively indicated by the reference characters 12 and 13 and the impression cylinders being indicated by the reference characters 14 and 15, the several cylinders being geared together at one end by means of a train of gearing illustrated at 16 in Fig. 6. The web 17 is adapted to be drawn from a roll 18 (see Figs. 4 and 5) mounted on a roll support (not shown), ordinarily supporting three rolls in the basement or on a sub-level, the web, in the unit shown at the left in Fig. 1 passing first between the cylinders 12 and 14, by means of which it is printed on one side, and then passing beneath the cylinder 15 and upwardly between said cylinder and the plate cylinder 13, by means of which the web is printed on the other side, the printed web being thence directed over rollers 19, 21, and 22, into a folder, the rollers of which are indicated at 23.

It is to be understood that the number and arrangement of the folders may be that best suited to the particular conditions for which the press is designed and that the relationship of the folders and printing units will be such as to provide maximum flexibility in the grouping of the printing units according to the number of pages to be contained in the paper and the page association, as, for example, the provision of different sections to be included in the complete paper as varying conditions may indicate.

As shown in Fig. 1 of the drawings, an individual motor is provided for each printing unit, and also for each folder, printing unit motors being identified by the reference character 24 and folder motors being indicated by the numeral 25. The armature shaft 26 of each motor 24 carries a spiral pinion 27, meshing with a spiral gear 28, which is provided with a hub 29, mounted upon an equalizing shaft 31, to which it is adapted to be secured by means of a clutch 32, operable by a hand lever 33, which preferably is positioned so as to be readily accessible to the pressmen. Clutches 30 are provided in said shaft 31 between the motors in order that the shaft may be divided in accordance with the particular grouping of units, or couples, selected for any given run of the press.

The motor shaft 26, as clearly shown in Fig. 3, is extended at the rear of the motor and carries a sprocket 34, over which a driving chain 35 is trained, said chain also taking over a sprocket 36, mounted on the outer end of a spindle 37, projecting from the end of the plate cylinder 13, said spindle being journaled in a framepart 38 of the press, to which is also secured a bracket 39, which extends upwardly and provides a support 41 for the motor. Of course, a gear drive, or other suitable mechanical drive, might be provided between the motor and the driven cylinder if desired.

It is to be understood that the motor drive just described is duplicated for each of the printing units and folders of the press as shown in Figs. 1 and 4.

In the press illustrated in Figs. 2 and 5, a somewhat modified form is shown, in that a separate motor is provided for each printing couple, a couple comprising a single printing or plate cylinder and an impression cylinder associated therewith.

Referring to Fig. 2, it will be observed that a bracket 42, somewhat larger than the bracket 39 shown in Fig. 1, is secured to the press frame and provides separate supports 43 and 44 for motors 45 and 46, which are adapted respectively to drive the cylinders 12 and 13, it being, of course, understood that in this embodiment of the invention only the two cylinders of a couple are geared together, instead of the four cylinders comprising the printing unit as shown in Fig. 1. The drive from the motors to the driven cylinders is the same as has heretofore been described, the driving elements being identified by the same reference characters, as also are the elements connecting the motors to the equalizing shaft 31. The embodiment of the invention in which a separate motor is provided for each couple is perhaps particularly useful in connection with color printing, which often requires running the web through a number of printing couples to successively print a number of colors thereon, it being understood that only one color is printed by a single couple. In ordinary black printing, the web is completely printed on both sides by running it through a single printing unit, one couple of which prints one side and the other couple the other, but in color work, it may be necessary to pass the web through additional printing couples, according to the num-

ber of colors required to be printed, and it may well happen that, in certain units, only one couple will be required, in which case it is possible, when this embodiment is employed, to drop out the other couple of the unit entirely, so that no couples are required to run idle. Provision may obviously be made, if desired, for reversing the drive of the cylinders if conditions require that the web be run in opposite direction.

It will be observed that in Fig. 2, the web 17 is directed through three printing couples, the fourth couple shown in this figure, i.e., the one to the left, being idle, and in Fig. 5, the web is shown as being directed through a selected number of couples with the remainder idle.

Referring now to the folders, it will be observed by reference to Figs. 1 and 2 that each folder motor 25 is supported upon a bracket 47 and has a driving connection with its associated folder, the drive being through a sprocket 48 on the armature shaft 49 of the motor and by way of a chain 51, sprocket 52, horizontal shaft 53, and beveled gears 54 and 55 to a vertical shaft 56, upon the upper end of which the bevel gear 55 is carried in intermeshing relation with the gear 54, which is secured to the shaft 53. On the lower end of the shaft 56 there is a gear 57, meshing with a bevel gear 59 which in turn meshes with a gear 58, said gears 58 and 59 being secured respectively upon a longitudinal shaft 61 and a transverse shaft 62, from which the various elements of the folder are driven. The shaft 61 is shown as carrying one of the rollers 23 of the folder mechanism, between which the web 64 passes after being directed over the guiding rollers 22, 21, and 19 intermediate the folder and the press.

The motors 25 are each adapted to be connected to the equalizing shaft 31 by means of a spiral pinion 66 on the armature shaft 49 of the motor and a spiral gear 67 mounted upon the equalizing shaft 31, to which it is adapted to be rigidly secured by means of a clutch 68 between a hub 69 of the gear 67 and the shaft 31.

Each of the motors 24 and 25, in the embodiment of the invention shown in the drawings, is adapted to be controlled by means of a controller system, the diagram for which is illustrated in Fig. 7, and the controls for the several motors are so related that any selected number of the motors may be operated at a given time and in any selected grouping, provision being preferably made for the control of all of the motors in a selected group by the operation of the controls at any controller station, this being accomplished by an interconnection of the controllers, as will hereinafter appear.

Referring now to Fig. 7, the wiring diagram will be described, it being understood that the same is entirely diagrammatic and that, in practice, the electrical devices are mechanically related in convenient manner, the rheostat and the several contacts and controlling relays being preferably mounted upon a panel in suitable location and the controller buttons, which require constant operation by the pressman, being ordinarily located at a press control station, which is readily accessible to the pressmen, as, for example, on an upright of the press frame.

Said Fig. 7 is a diagram for the control circuit necessary to operate a number of motors in parallel. Only two motors and associated control elements are shown in the drawings, but it is to be understood that the control is duplicated for each motor of the press, the several controls being related in the manner shown. Each motor may be of the direct current type and of suitable size for the service required, ordinary requirements calling for motors of approximately fifteen to twenty horsepower, each associated with a press unit or folder, as has been hereinbefore described, and the several motors being adapted to be connected by the comparatively small common shaft 31, to which reference has been previously made. It will be understood that with all of the motors connected to this shaft, the units will run in synchronism and maintain the proper register on the plates, and the folders will be driven in proper timed relationship to the printing units.

The apparatus included in each control set will now be described, the same reference characters indicating corresponding parts in the duplicated portions of the figure.

The motor armature is indicated at 71, which may be considered to represent the point identified in the earlier described figures by the reference characters 26 and 49, identifying the armature shafts of the motors 24 and 25, respectively. There are two sources of voltage for each motor, one of which may be a standard 230-volt direct current circuit, the positive line of which is indicated by the reference character 72 and the negative line of which is indicated at 73. The other circuit may be a lower voltage circuit, as, for example, a 40-volt direct current circuit, the positive line of which is indicated at 74 and the negative line of which is indicated at 75. The high voltage circuit is used for production, or operating speeds, and the low voltage circuit is for the purpose of turning over the press for plating up or for threading the paper through the machine at a constant slow speed, as will presently be described. The current for the low voltage circuit may be obtained from a motor generator set large enough to supply all of the units in a given plant.

Mounted on the control panel is a rheostat, or controller arm 76, which is movable across

a combined face plate and armature resister, indicated at 77, a field resister 78, a slow speed segment 79, and normal running speed segment 81, a reset button being provided at 82 and there being a shunt field resister, identified by the reference character 83. Slow speed contactors are indicated at 84, 85, and 86, the last-mentioned contactor being normally closed, as indicated by the symbol. Normal speed contactors are shown at 87, 88, and 89, the last-mentioned of which is also normally closed. A motor shunt field is illustrated at 91, and it will be noted that dynamic braking is shown through the normally closed, or back contacts 86 and 89 of the line contactors. A pilot motor is illustrated at 92 and is provided with a split series field comprising an increase field 93 to 94, and a decrease field 95 to 96. A low voltage relay coil 97 to 98 is provided in association with contacts 99 to 101 and 102 to 103, a back contact 104 being provided between the positive side of the line and 105. Pilot motor limit switches are illustrated at 106 to 107 to minus, and 108 to 109 to minus, respectively. An inch button 113 is provided between 114 and 115, and increase and decrease buttons, identified respectively by the numerals 116 and 117, are provided as shown, the former being between 118 on the positive side of the line and 119, and the latter being between 121 on the positive side and 122. The inch button 113 closes the circuit to a relay 110 to 120, which is adapted to control the contacts 84 85, and 86. A relay 100 to 102 serves to actuate the contacts 87, 88, and 89, as will presently appear.

The increase button 116 closes the circuit to increase pilot motor relay 111 to 108, which in turn controls contact, plus to 93.

The decrease button 117 closes the circuit to decrease pilot motor relay, 112 to 106, which in turn controls the contact, plus to 95.

An interlocking safe, run button 123, plus to 124, is provided in association with safe relay, 125 to 126, and safe relay contact, plus to 114.

A stop button 127 is provided between 128, on the plus side, and 129, and is adapted to close the circuit to stop relay, 131 to 132, which in turn controls a back contact, plus to 133.

Paralleling circuits *a*, *b*, *c*, *d*, *e*, *f*, *g*, and *h*, are adapted to be associated with a series of paralleling circuits *i*, *j*, *k*, *l*, *m*, *n*, *o*, *p*, to which any number of controllers may be connected, a suitable switch 134 being provided to associate the paralleling circuits of a particular controller with the paralleling circuits of the series when desired.

The operation of the controller will now be briefly described by further reference to the diagram.

Assuming that the controller arm is in the "off" position, i. e., in contact with the reset button 82, all the contacts on the diagram will be open or closed, as shown. The circuit will then be from the positive side of the high voltage line to the reset contact 82, through the low voltage coil 97 to 98, which will close the low voltage contacts, 102 to 103 to minus, and 99 to 101, at the same time opening the back contact 104 between the points 121 and 122.

When the safe button 123 is depressed, the normally closed safe relay contact, plus to 114, will be open and it will be impossible to turn the machine over by means of the inch button 113 or the increase button 116.

With the run button depressed, however, the machine can be operated by means of the inch button as long as this button is held depressed. The operating circuit of the inch button is from the high voltage plus line through the safe contact to 114, through the inch button to 115, through the coil 110 to 120 (which operates the low voltage contacts 84, 85, and 86) through the low voltage contact 102 to minus.

With the aforesaid run button depressed, the machine can be turned over at any desired speed by depressing the increase button 116. The increase circuit is from the positive side of the high voltage line through the safe button to 114, thence through the increase button to 119, the increase relay coil to 108, limit switch to 109, through the low voltage, to minus. Energizing the increase pilot motor relay, 111 to 108, closes the contact, plus to 93, through the increase field of the pilot motor, to minus. This causes the rheostat arm 76 to be moved toward the left, and when the arm makes contact with the segment 79, the relay coil 110 to 120 actuates the contacts 84, 85, and 86, throwing the main motor armature 71 on the 40-volt circuit, and the press continues to run at slow speed as long as the arm 76 is in contact with the segment 79. Further depression of the increase button 116 moves the controller arm 76 further to the left, until contact is made with the segment 81, which closes the circuit to the coil, 100 to 102, which actuates the contacts 87, 88, and 89, throwing the motor armature 71 on the high voltage line, with the resistance 77 in series, this actuation of the contacts 87, 88, and 89 being accompanied by reverse actuation of the contacts 84, 85, and 86, thereby dropping out the low voltage circuit. As the controller arm moves further toward the left, the armature resistance is gradually decreased, and the motor speed is increased, such movement of the controller arm later cutting in the field resistance 78, which brings the motor up to any desired operating speed.

Depression of the decrease button 117 closes the circuit from the positive side of the line to the decrease relay, 112 to 106, through the limit switch, 106 to 107, to minus. The decrease relay, when so energized, closes the cir-

cuit from plus to 95, through the decrease pilot motor field, 95 to 96, through the pilot motor armature, 92 to minus. This has the effect of moving the controller arm 76 toward the right, viewing Fig. 7, or in an opposite direction to that in which it is moved by depression of the increase button. It will be noted that the decrease button is not affected by the safe, run button and is effective at all times.

The holding circuit from the low voltage relay, 97 to 98, is from the positive side of the high voltage line, through the stop contact, plus to 133, through the contacts, 99 to 101, 102 to 103, through the low voltage, to minus.

Depression of the stop button 127 closes the circuit from the positive side to the coil, 131 to 132, through the low voltage contact, to minus. When energized, the stop relay coil, 131 to 132, opens the normally closed contact, plus to 133, which breaks up the holding circuit for the low voltage relay so that it cannot be closed again until the arm 76 moves back to the reset button 82. The stop button, as will be seen, has precedence over everything else at all times. Dropping out the low voltage relay, 97 to 98, by means of the stop button 127, or failure of voltage, closes the back contact 104 associated with the low voltage relay, which has the same effect as the decrease button circuit, and automatically returns the rheostat arm 76 to the reset position.

Instead of having separate pilot motors 92 for each of the controllers, it might be preferred to have a single large pilot motor with means for mechanically connecting the several rheostat arms 76 to the motor drive. Whether a single pilot motor or individual pilot motors be employed, however, the operation of any button on any unit will operate all of the rheostats or controller arms in an operative combination, but it may be said that the individual pilot motor drive has the advantage of making it possible to plate up any unit without turning over the rest of the press.

The operation of the controller system having been described and it having been pointed out that any one of the motors, whether for driving a printing unit or a folder, may be driven separately or in any desired combination with other motors of the press, the operation of the machine as a whole will be evident to anyone familiar with the art to which the invention relates.

In the embodiment shown in Figures 1 and 4, any unit may be driven entirely independently of other units, and the units may be associated in any desired grouping, it being necessary that only those which are required for a particular operation be driven. The same flexibility applies to the folders and to combinations of the units and folders.

In the embodiment of the invention shown in Figures 2 and 5, even further flexibility is possible, in that not only the units but the individual couples of of a unit may be driven independently and may be associated in desired combination with other units and printing couples, with the result that no parts of the press need be run idle at any time.

By connecting the various motors together through the equalizing shaft 31, they may be caused to run in absolute synchronism, it being understood that the variation between motors driven from a common source of voltage will be slight and that a small shaft will serve to equalize the speed by retarding any motor which may tend to run slightly faster than the others, or by speeding up any which may tend to run slightly slower than the others, with the result that the several units and folders will operate in proper timed relation and the webs will be directed through the printing units and into the folders in proper registration, and the pages of the paper properly related in the folder. In addition to the flexibility and economy in operation thus accomplished, the massive and expensive main drive shaft and take-off drives, including a large number of heavy and expensive gears, shafts, and bearings, may be eliminated and the likelihood of the entire press being put out of commission by some mishap to the drive is obviated.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction, and arrangement of the parts without departing from the spirit and scope of the invention, or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. A printing press comprising a printing unit, a motor drive individualized to said unit, a folder, a motor drive individualized to said folder, and means other than said drives for equalizing said motors.

2. A printing press comprising a plurality of associated printing units, a separate motor drive for each of said units, a folder, an individual motor drive for said folder, power transmission means and means other than said transmission means for equalizing the speed of the motors.

3. A printing press comprising a plurality of associated printing units, a separate motor drive for each of said units, a folder, a motor for driving said folder, and means other than said drives for equalizing the speed of said printing unit and folder motors.

4. A printing press comprising a series of associated printing units, folders associated in desired relation to said units, an individual motor drive for each unit, an individual mo-

tor drive for each folder, and means other than said drives for equalizing the speed of the several motors so that said units and folders may be driven in unison.

5. A printing press comprising a series of associated printing units, folders associated in desired relation to said units, an individual motor drive for each unit, an individual motor drive for each folder, means other than said drives for equalizing the speed of the several motors so that said units and folders may be driven in unison, and means whereby said units and folders may be driven separately or in any selected grouping.

6. A printing press comprising a series of associated printing units, folders associated in desired relation to said units, an individual motor drive for each unit, an individual motor drive for each folder, means for equalizing the speed of the several motors so that said units and folders may be driven in unison, and switch mechanism for associating said units and folders at will whereby the individual units and folders may be driven in any selected grouping or separately.

7. A printing press comprising a plurality of printing couples, a separate motor associated with and driving each couple, power transmission means, means other than said power transmission means for equalizing the speed of said motors and means for selectively connecting said motors with said equalizing means whereby the printing couples may be operated in selected combinations.

8. A printing press comprising a plurality of printing couples, a separate motor associated with and driving each couple, power transmission means, an equalizing shaft other than said transmission means for connecting said motors and means for selectively connecting said motors with said equalizing means whereby the printing couples may be operated in selected combinations.

9. A printing press comprising a plurality of printing units each containing a plurality of printing couples, and a separate motor associated with and driving each couple of the press.

10. A printing press comprising a plurality of printing units each containing a plurality of printing couples, a separate motor associated with and driving each couple of the press, and an equalizing shaft connecting said motors.

11. A printing press comprising a plurality of printing couples, a separate motor associated with and driving each couple, a folder, an individual motor for driving said folder, and an equalizing shaft connecting said motors.

12. A printing press comprising a plurality of printing units each containing a plurality of printing couples, a separate motor associated with and driving each couple of the press, a plurality of folders, a separate motor for driving each folder, and an equalizing shaft connecting said motors.

13. A unit type press comprising a series of associated printing units, folders arranged at intervals in the series, an individual motor for each unit and one for each folder, means mechanically connecting all said motors to equalize the speed thereof, a controller for each motor, and means for associating said controllers in selected groupings whereby operation of any controller in a group of associated controllers will operate all the controllers in the group.

14. A printing press comprising a plurality of associated printing units, a plurality of motors individualized to said units for driving the latter individually, an equalizing shaft extending between the several motors and being independent of the drive for said units, and means whereby the motors may be selectively connected to said shaft.

15. A printing press comprising a printing unit, a motor for driving said unit, a folder, a separate motor for driving said folder, power transmission means, and means other than said power transmission means for equalizing the speed of the motors.

16. A printing press comprising a series of three or more printing units, separate motors for driving said units individually, power transmission means between said motors and printing units, means other than said power transmission means for equalizing the speed of said motors, and means for selectively connecting said motors with said equalizing means whereby the printing units may be operated in selected combinations.

17. A printing press comprising a series of three or more printing units, separate motors for driving said units individually, power transmission means between said motors and printing units, an equalizing shaft independent of said transmission means for connecting the several motors, and means for selectively connecting said motors with said equalizing means whereby the printing units may be operated in selected combinations.

18. A printing press comprising a series of three or more printing units, separate motors for driving said units individually, power transmission means between said motors and printing units, an equalizing shaft independent of said transmission means for connecting the several motors, means for selectively connecting said motors with said equalizing means whereby the printing units may be operated in selected combinations, separate circuits and control devices for said motors, and means for relating the circuits so that those for any selected group of units may be operated from any selected set of control devices in said group.

19. A printing press comprising a printing unit, a motor for driving said unit, a folder, a separate motor for driving said folder, power

transmission means, an equalizing shaft independent of said transmission means for connecting said motors, and coupling devices whereby said motors may be selectively connected to said shaft.

20. A unit type press comprising a series of associated printing units, folders arranged at intervals in the series, an individual motor for each unit and one for each folder, means for selectively connecting said motors to equalize the speed thereof, and an electrical control system for said motors including a plurality of operating stations and means whereby said system may be operated from any one of the said stations.

In witness whereof, I hereunto subscribe my name to this specification.

ALLAN J. CLINE.