G. E. PANCOAST.

PRINTING PRESS.

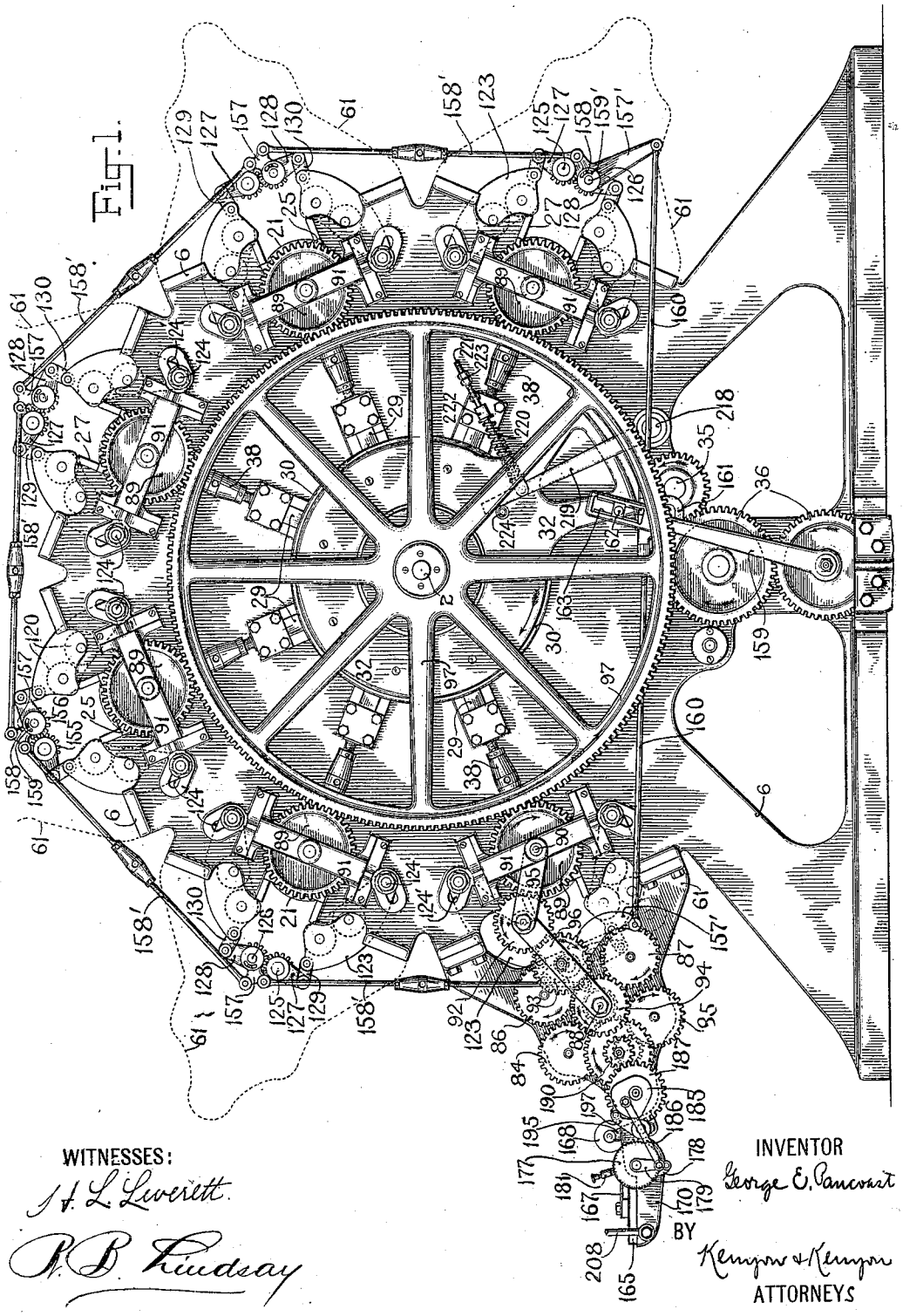
APPLICATION FILED JAN. 29, 1900.

979,791.

Patented Dec. 27, 1910.

13 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

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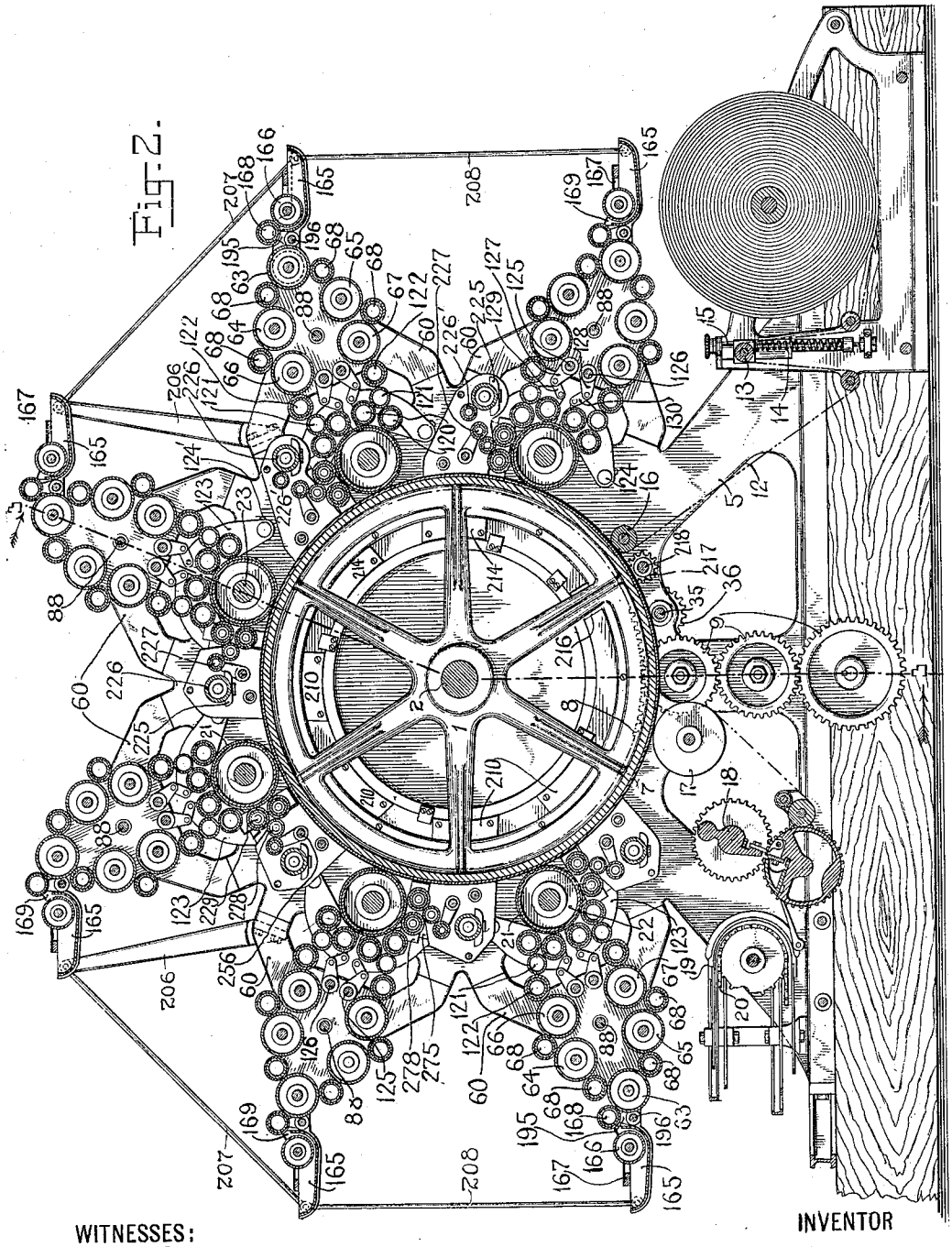
13 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:

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13 SHEETS—SHEET 3.

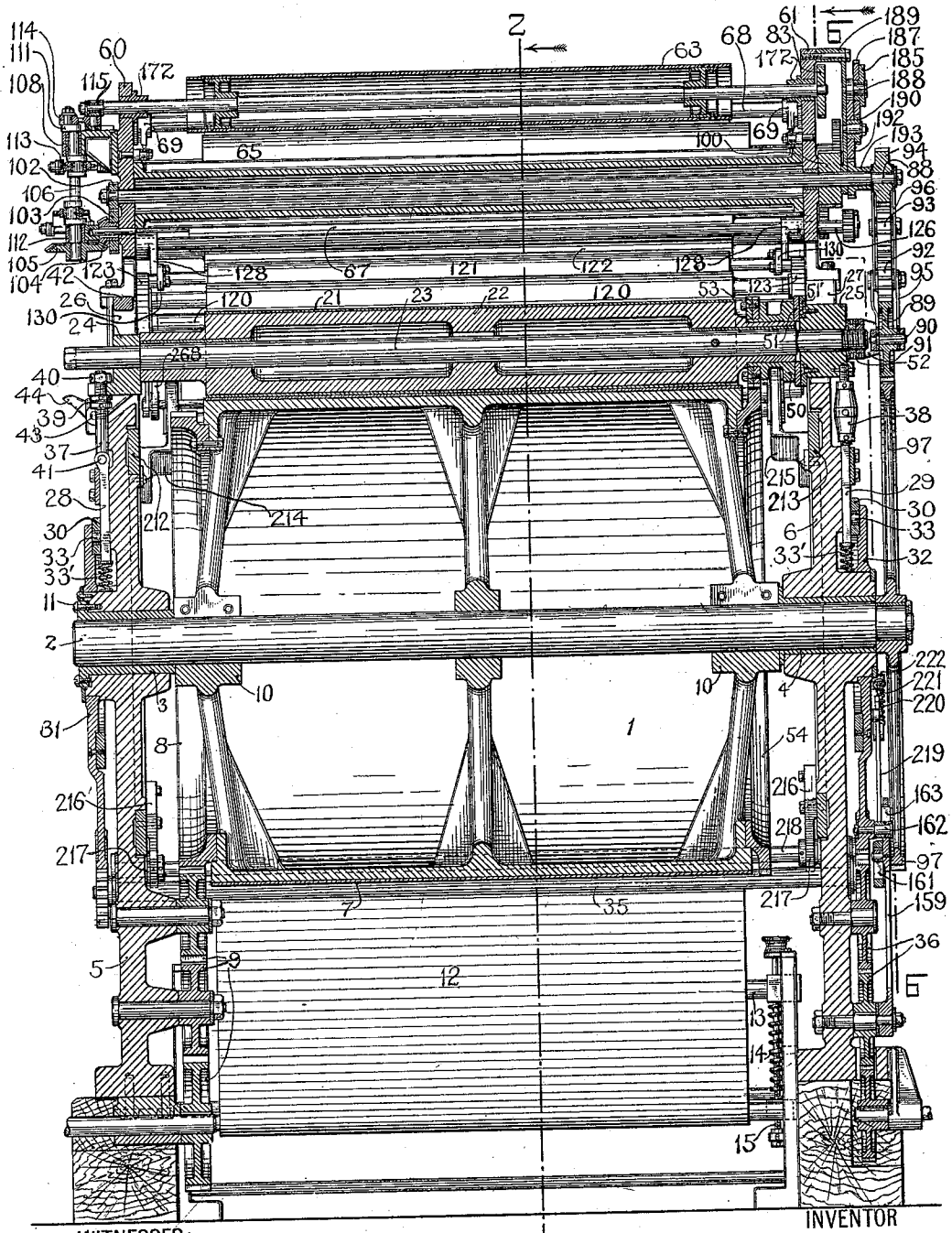

Fig. 3.

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979,791.

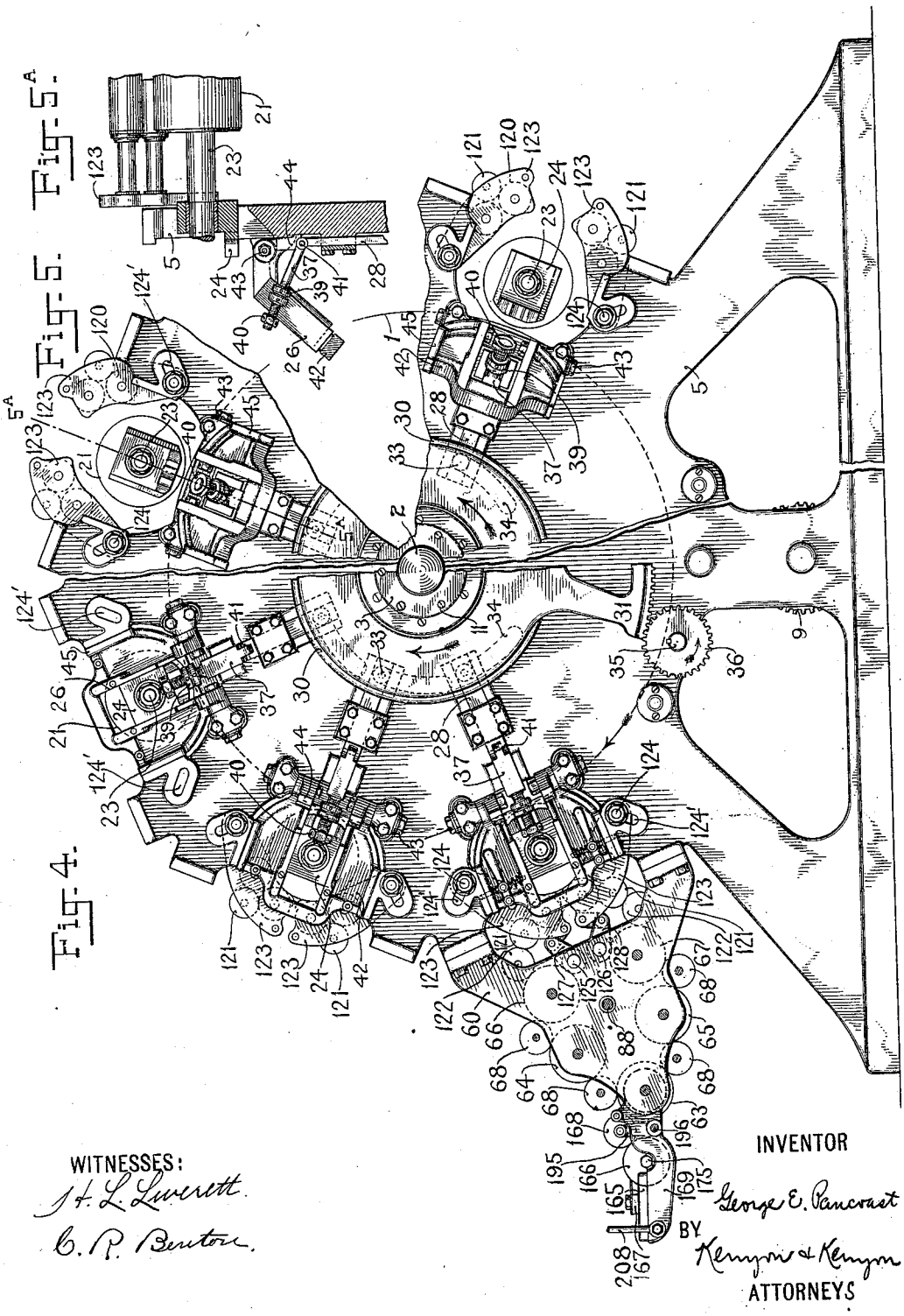
Patented Dec. 27, 1910.

13 SHEETS—SHEET 4.

Fig. 5A.

Fig. 5.

Fig. 4.



WITNESSES:

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13 SHEETS—SHEET 5.

Fig. 6.

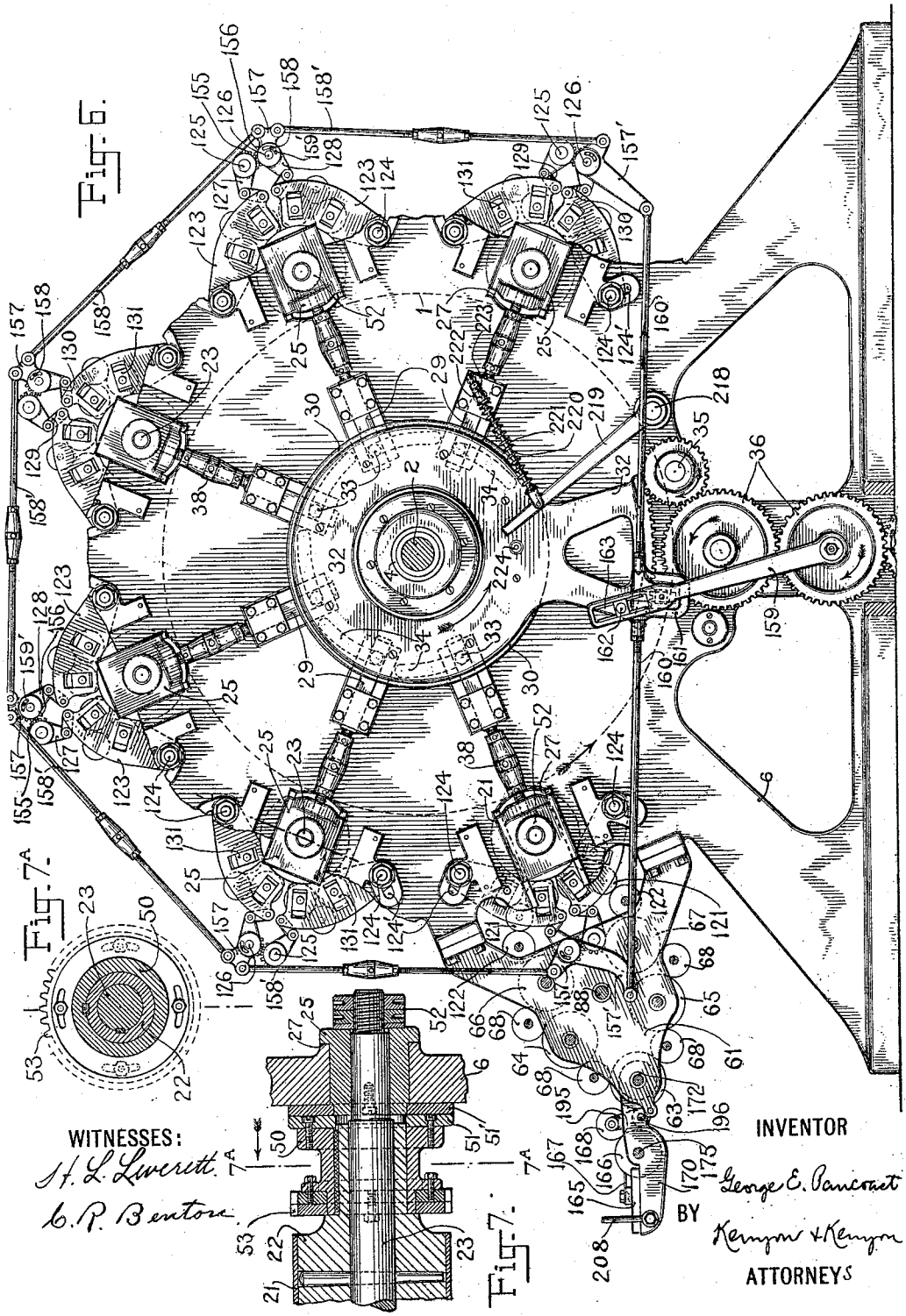

Fig. 7A.

Fig. 7.

WITNESSES:

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13 SHEETS—SHEET 6.

Fig. 8.

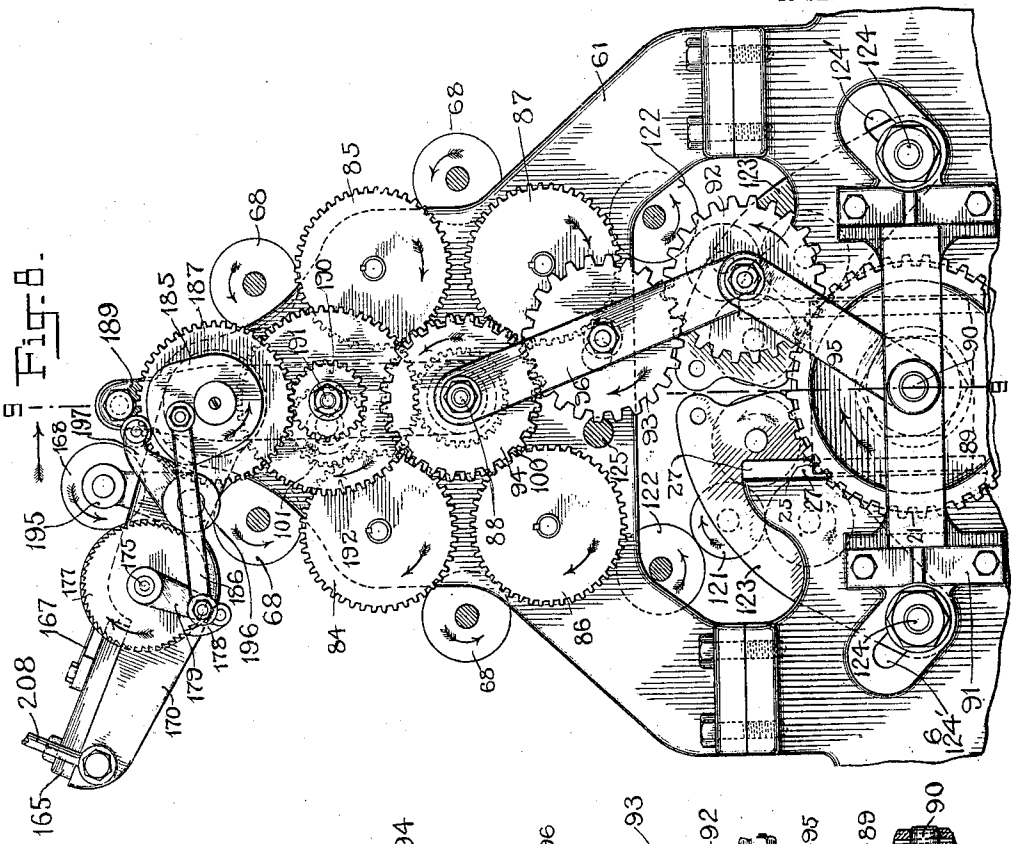
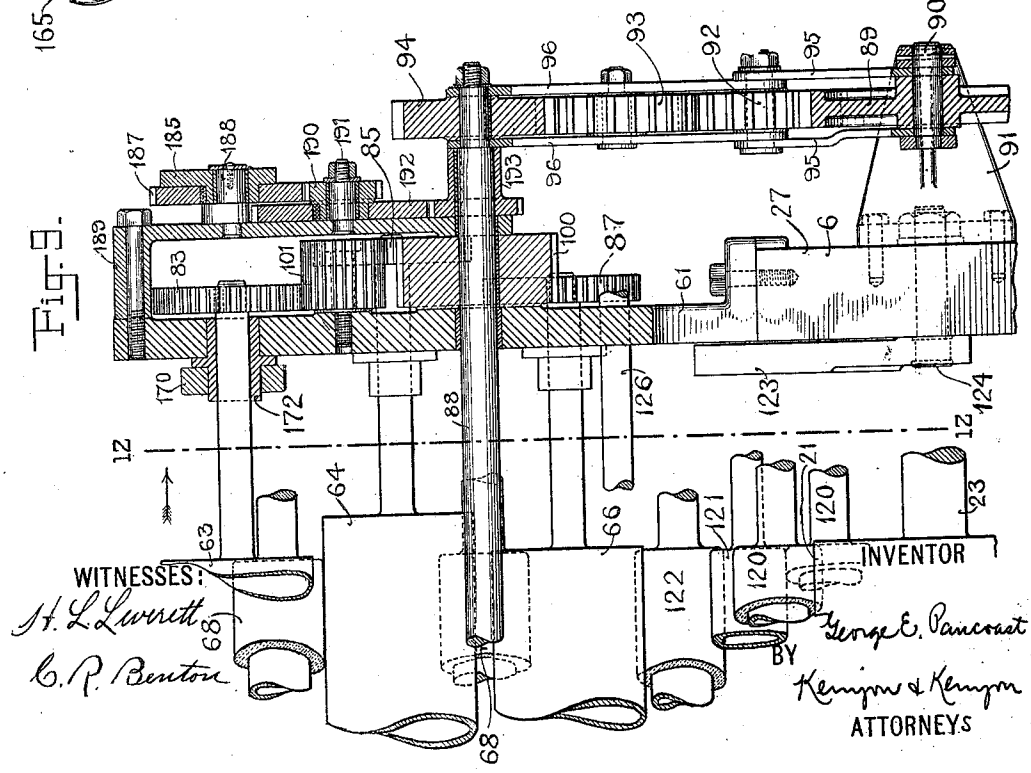


Fig. 9.



WITNESSES:

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Patented Dec. 27, 1910.

13 SHEETS—SHEET 7.

Fig. 11.

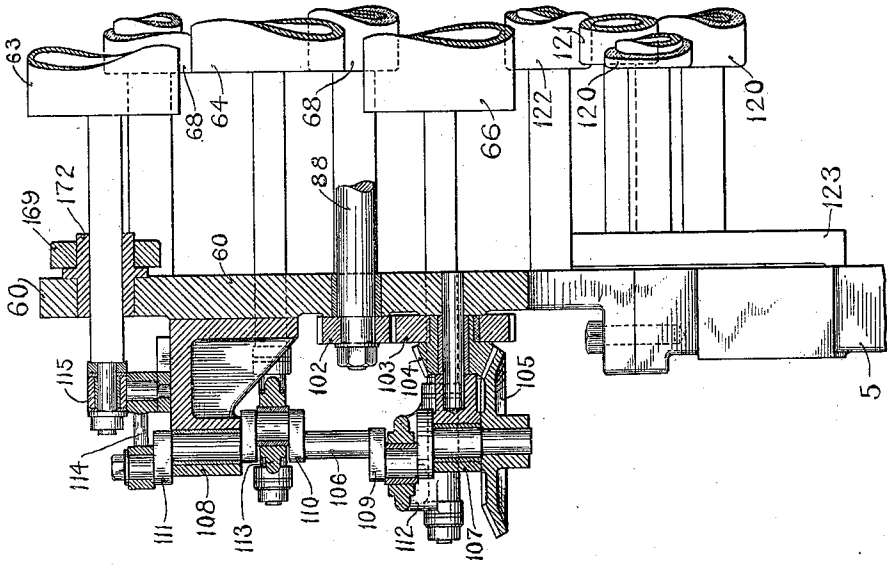
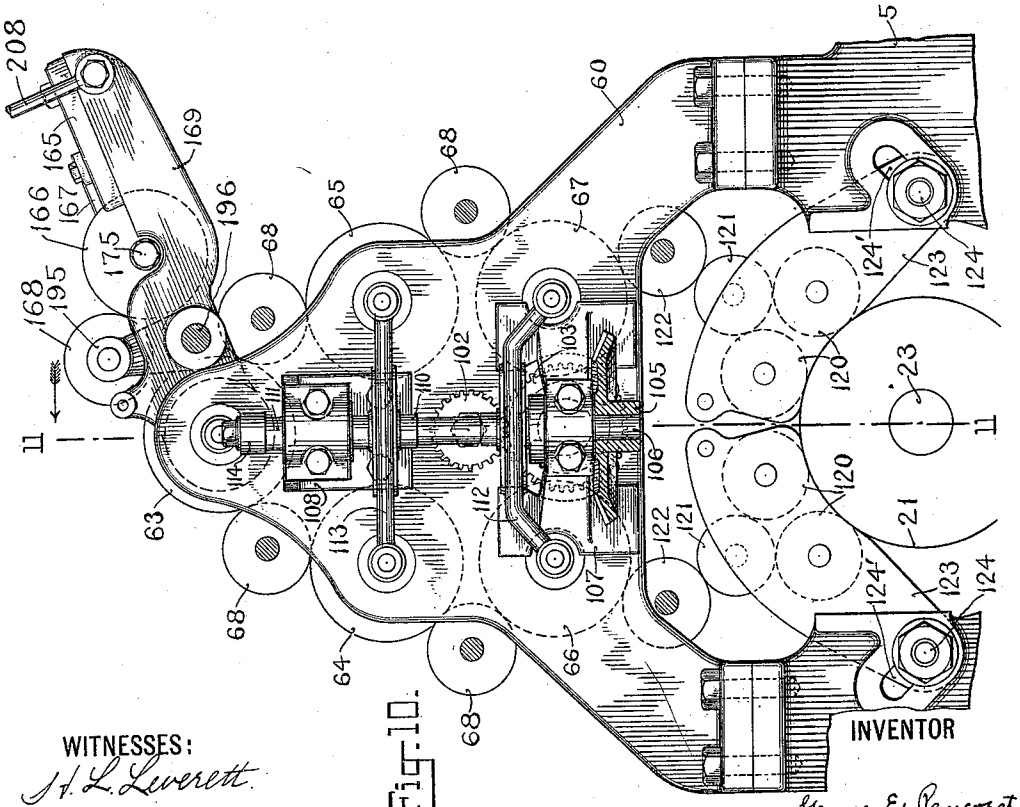


Fig. 10.



WITNESSES:

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APPLICATION FILED JAN. 29, 1900.

979,791. **Patented Dec. 27, 1910.**

13 SHEETS—SHEET 8.

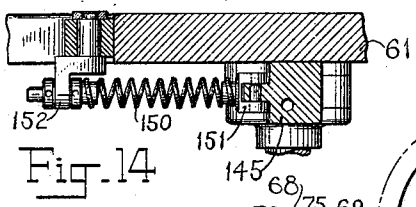

Fig. 14.

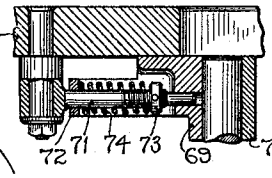

Fig. 15.

Fig. 12.

Fig. 13.

WITNESSES:

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13 SHEETS—SHEET 9.

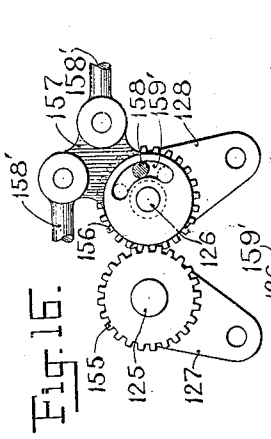

Fig. 16.

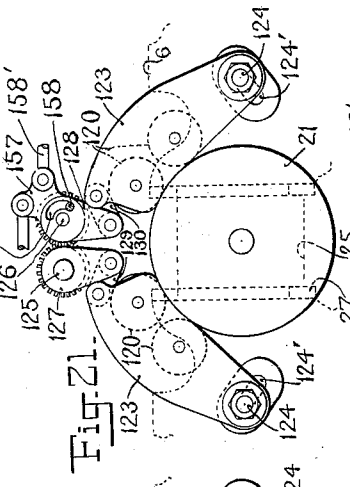

Fig. 21.

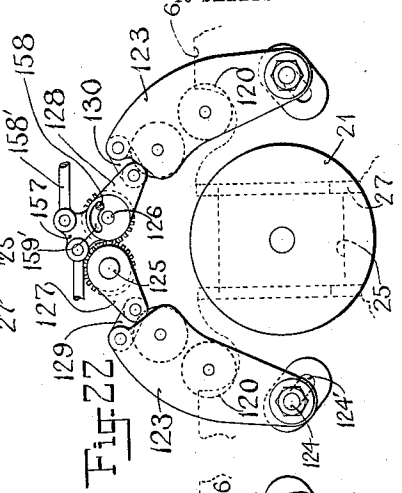

Fig. 22.

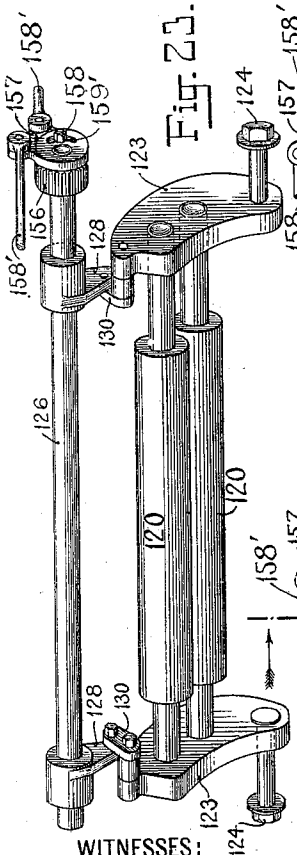

Fig. 23.

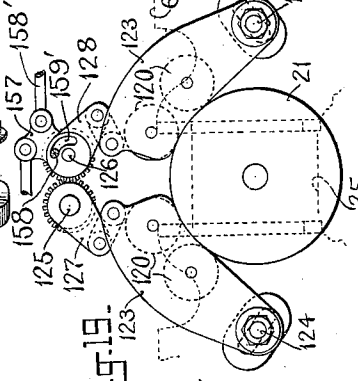

Fig. 19.

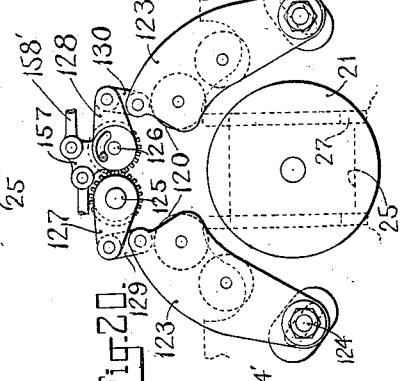

Fig. 20.

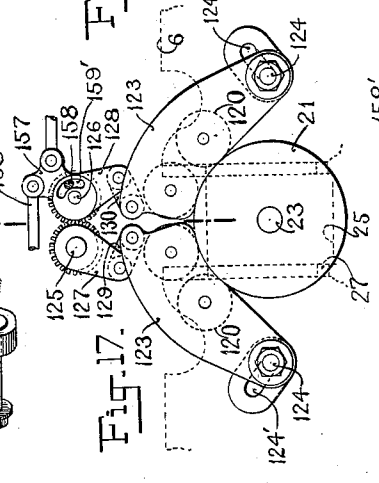

Fig. 17.

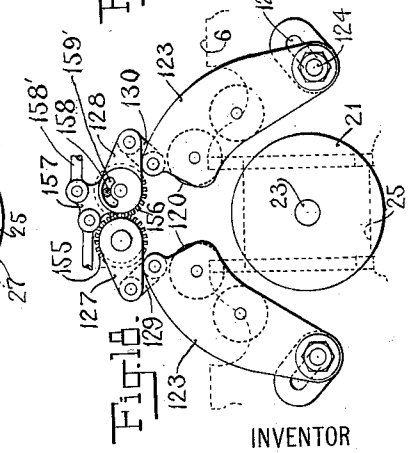

Fig. 18.

WITNESSES:

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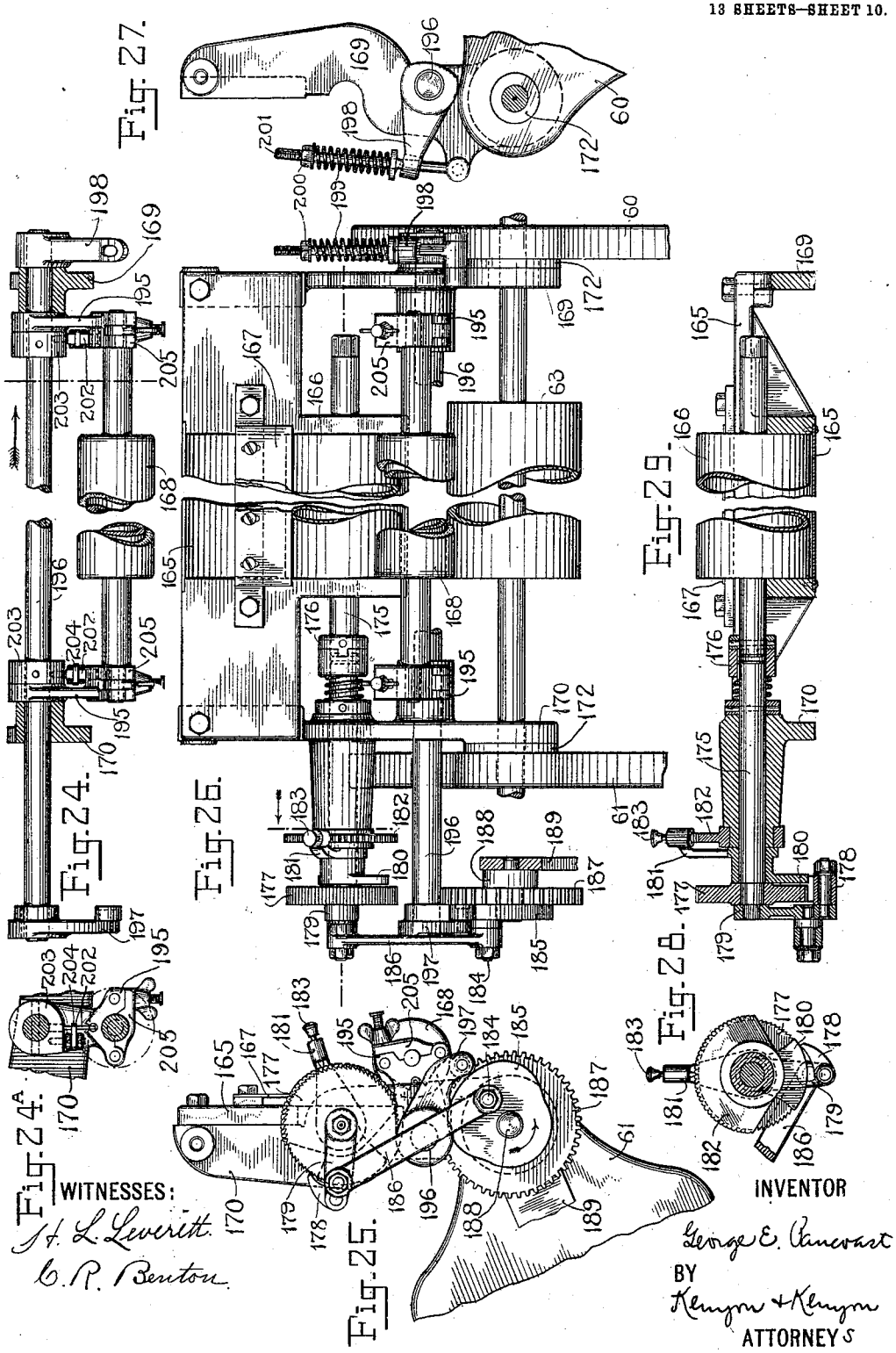
APPLICATION FILED JAN. 29, 1900.

979,791. **Patented Dec. 27, 1910.**

13 SHEETS—SHEET 10.



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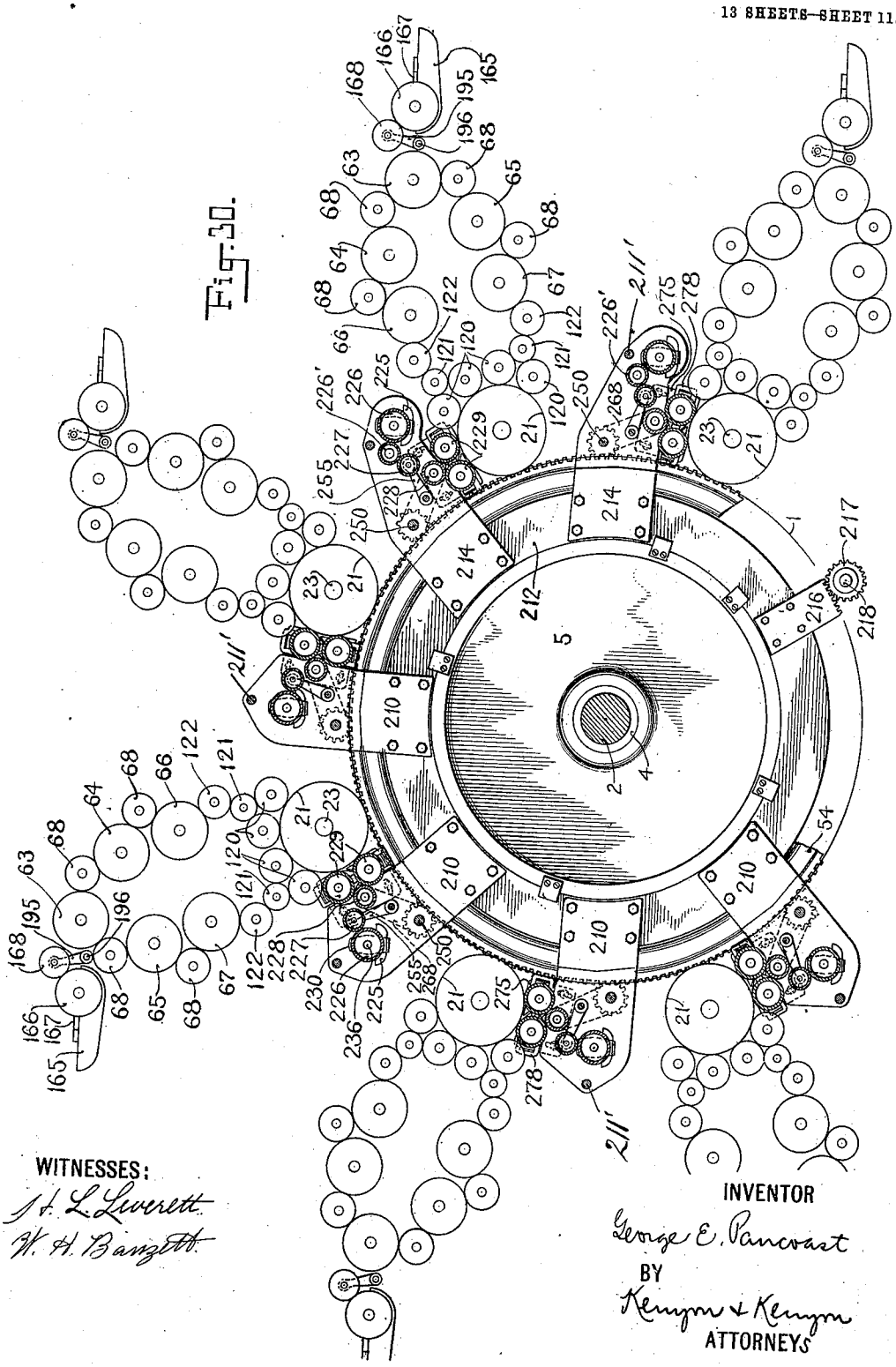
APPLICATION FILED JAN. 29, 1900.

979,791.

Patented Dec. 27, 1910.

13 SHEETS—SHEET 11.

Fig. 30.



WITNESSES:

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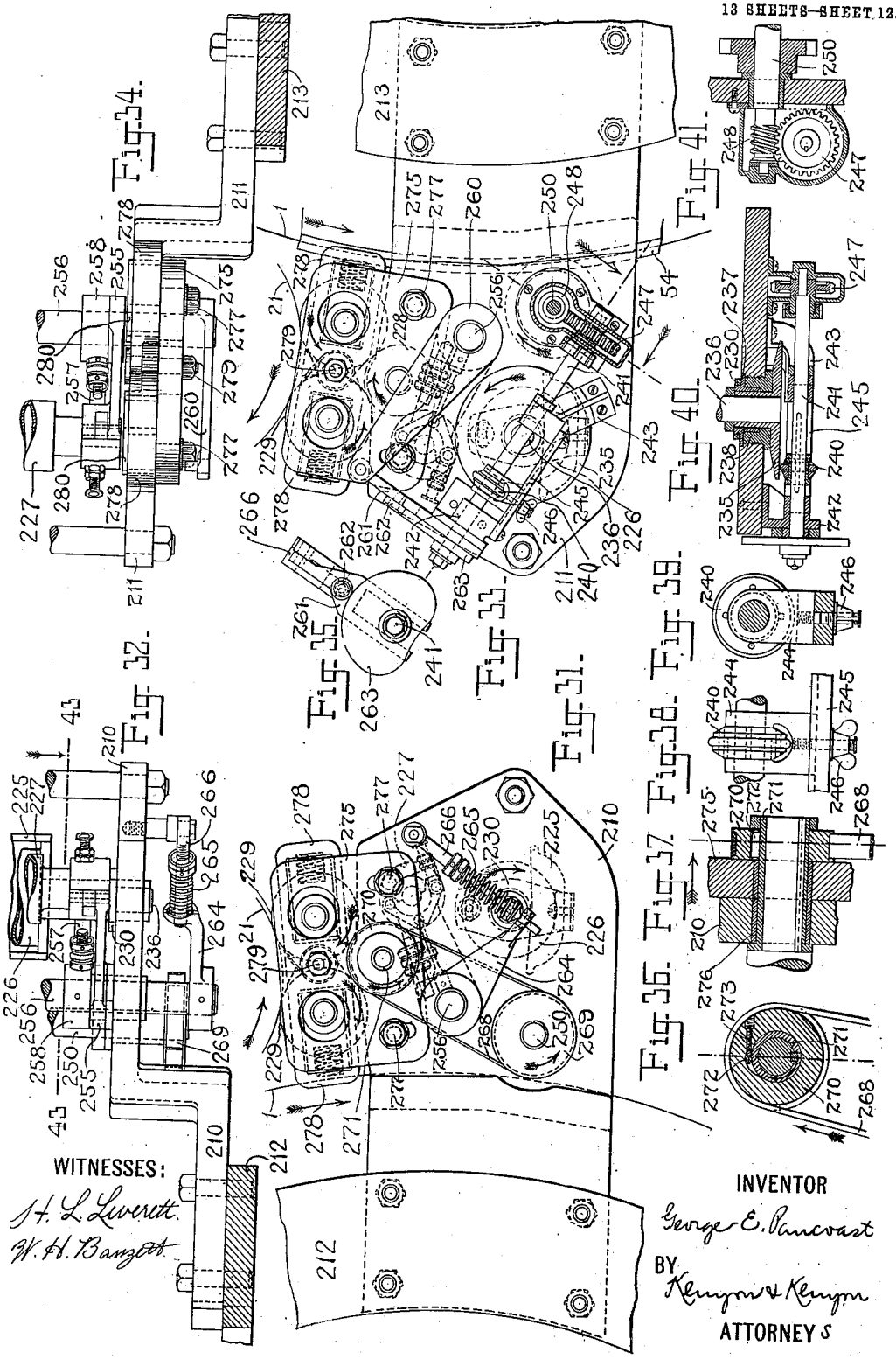
APPLICATION FILED JAN. 29, 1900.

979,791.

Patented Dec. 27, 1910.

13 SHEETS—SHEET 12.



WITNESSES:

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PRINTING PRESS.

APPLICATION FILED JAN. 29, 1900.

979,791.

Patented Dec. 27, 1910.

13 SHEETS—SHEET 13.

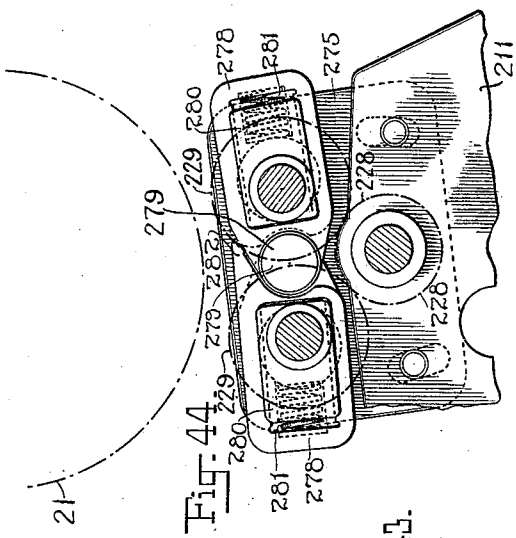

Fig. 44.

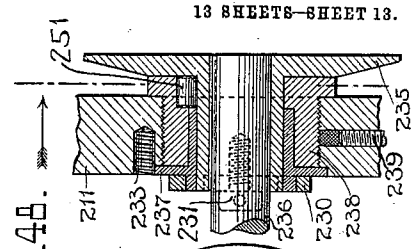

Fig. 48.

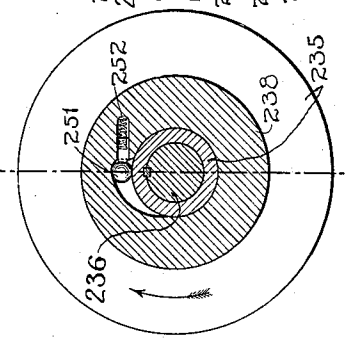

Fig. 47.

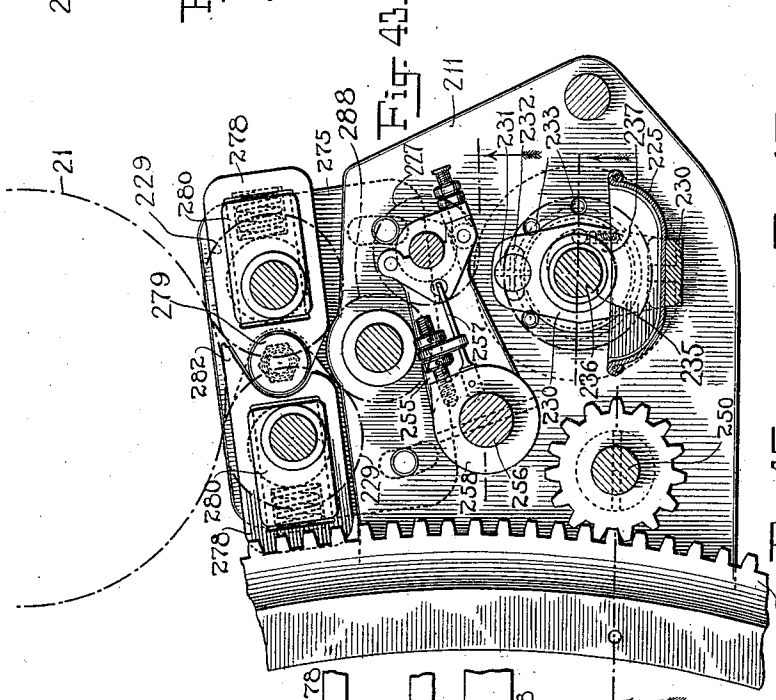

Fig. 43.

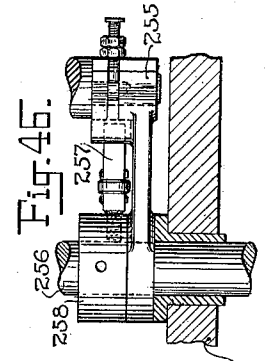

Fig. 45.

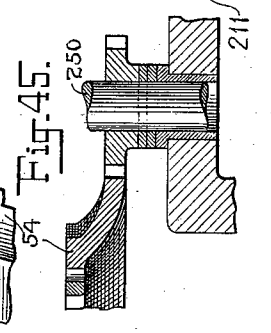

Fig. 45.

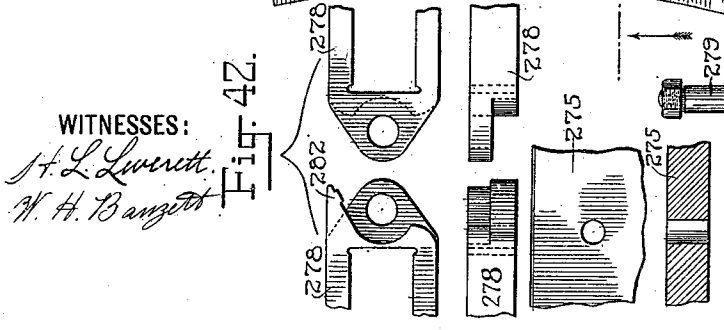

Fig. 42.

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UNITED STATES PATENT OFFICE.

GEORGE E. PANCOAST, OF BROOKLYN, NEW YORK, ASSIGNOR TO AMERICAN LITHOGRAPHIC COMPANY, A CORPORATION OF NEW YORK.

PRINTING-PRESS.

979,791. Specification of Letters Patent. **Patented Dec. 27, 1910.**

Application filed January 29, 1900. Serial No. 3,170.

To all whom it may concern:

Be it known that I, GEORGE E. PANCOAST, a citizen of the United States, and a resident of Brooklyn, in the county of Kings, State of New York, have invented certain new and useful Improvements in Printing-Presses, of which the following is a specification.

My invention relates to printing presses; and, while in some of its features it is not limited to any particular class of printing or to any particular type of press, it more especially relates to rotary multicolor presses and particularly to that type of such presses in which a plurality of curved printing surfaces are used, one for each color to be printed, said printing surfaces being arranged to print multicolor designs upon a web of paper or similar material in substantially instantaneous succession.

An object of my invention is to provide a machine in which different sizes of printing surfaces may be used, thereby rendering the machine universal in regard to the sizes of the printed sheets that may be produced.

Another object of my invention is to provide an inking mechanism which will insure thorough distribution of the ink and thorough application thereof to the printing surface and in which the ink-applying part may be separated or brought into contact with a printing surface without disturbing the mechanism as a whole and which is adjustable for printing surfaces of different sizes or curvatures and without adjusting the inking mechanisms as a whole, and which will permit the removal of a printing surface without removing or moving the inking mechanisms as a whole.

It is also an object of my invention to provide a damping mechanism which is self-contained, and simple in construction, and reliable in operation, and which does not require frequent and fine adjustment, and which may be readily adjusted for printing surfaces of different curvatures, and in which the supply of water can be accurately adjusted and reliably maintained; also, when a plurality of damping mechanisms are combined in the same press, to provide simple and efficient operating means common to all of them for moving them into or out of operative position, and which will enable them to be adjusted for different sizes or curvatures of printing surfaces.

It is also an object of my invention to provide efficient means under easy control to move the printing surfaces into or out of operative position.

Further objects of my invention are to provide an improved construction, permitting the printing surfaces to be readily removed from the machine and replaced therein, to render the means for moving the printing surfaces into or out of operative position adjustable for different sizes of printing surfaces, and to otherwise improve and simplify and cheapen and render more practical the use of multicolor printing presses, especially those of the type above specified, for the finer classes of printing and particularly lithographic or planographic printing.

With these objects in view, my invention consists in the novel parts, improvements and combinations herein shown and described.

The accompanying drawings, which form a part hereof, show a printing press embodying my improvements in their preferred form, the press illustrated being a multicolor machine capable of printing six colors continuously and simultaneously upon a web of paper or similar material, and by the lithographic or planographic methods of printing.

Figure 1 is an elevation of what I term the off side of the machine. Fig. 2 is a longitudinal central section of the machine on line 2—2 of Fig. 3. Fig. 3 is a central transverse section of the same on the line 3—3, Fig. 2. Figs. 4 and 5 are broken elevations together illustrating what I term the driving side of the machine which is the side opposite to that shown in Fig. 1, and showing certain of the parts in different positions. Fig. 5^a is a sectional detail view taken on line 5^a—5^a in Fig. 5. Fig. 6 is a sectional side elevation of the off side of the machine, with the driving gears omitted, being taken on the line 6—6 in Fig. 3. Fig. 7 is a detailed sectional view of the support for one end of the printing cylinders, taken on the line 7—7 Fig. 6. Fig. 7^a is a section on line 7^a—7^a, Fig. 7. Fig. 8 is an elevation on an enlarged scale of the off side of a single inking mechanism. Fig. 9 is a broken sectional view of the same on line 9—9, Fig. 8. Fig. 10 is an elevation on an enlarged scale of the opposite end of a single inking mechanism. Fig. 11 is a broken sectional view of the

same on line 11—11, Fig. 10. Figs. 12 and 13 are sectional elevations on a still larger scale taken through the inking mechanism on line 12—12, Fig. 9, looking in the direction of the arrow and illustrating the parts of the inking mechanism in different positions. Figs. 14 and 15 are sectional details taken on the lines 14—14, and 15—15 of Figs. 12 and 13 respectively. Fig. 16 is a sectional view in detail of the controlling devices for the inking mechanism. Figs. 17 to 22 inclusive are diagrammatic views illustrating the various positions and adjustments of the applying part of the inking mechanism. Fig. 23 is a perspective view of one of the applying parts of an inking mechanism detached. Figs. 24 and 24ª are respectively a side elevation and transverse section of the means for supporting the ductor roller. Fig. 25 is an end view of the ink fountain and ductor. Fig. 26 is a plan view of the same. Fig. 27 is a view of the opposite end of the same. Figs. 28 and 29 are detail sectional views of the means for operating the fountain roller. Fig. 30 is a sectional elevation illustrating the means for supporting and operating a plurality of damping mechanisms. Fig. 31 is an end eletion of one damping mechanism. Fig. 32 is a broken side elevation of the same. Fig. 33 is an elevation of the opposite end of the damping mechanism. Fig. 34 is a broken side elevation of the same. Figs. 35 to 42 inclusive, and Figs. 45 to 48 inclusive, are detailed views illustrating various features of the damping mechanism. Fig. 43 is a transverse sectional elevation taken on line 43—43 of Fig. 32, looking in the direction of the arrow. Fig. 44 is a similar view of the applying part of the damping mechanism shown in a different position.

Like numerals of reference indicate the same parts wherever they occur throughout the various views.

The machine illustrated belongs to that type of multicolor presses in which a plurality of printing cylinders are arranged concentrically with a large central impression drum by means of which a continuous length or web of paper or similar material is brought successively into contact with the printing cylinders, thereby receiving a plurality of designs. In many of its features the invention is not limited to the form of press shown, as instead of a single impression drum, for instance, any suitable form of impression mechanism may be used, or instead of printing tubes any suitable form of printing surface may be employed. The inking and damping mechanisms, also, are adapted to be used in various forms of presses, as are also the controlling means for the same. The controlling means for the printing surfaces, and the means permitting their removal from the press and substitution of printing surfaces of different sizes or curvatures are also applicable to other forms of presses.

Referring now in detail to the particular embodiment of the invention illustrated in the drawings, 1 represents an impression cylinder, which is mounted upon a shaft 2 journaled in suitable bearings 3 and 4 carried by the main side frames 5 and 6. Any suitable impression mechanism may be employed as far as some features are concerned. The cylinder shown has an impression surface 7 of suitably yielding material, as rubber or paper or both, and is driven by any suitable means, those shown consisting of a ring gear 8 secured to one end thereof which is engaged by a train of driving gears 9. The longitudinal position of the drum is fixed by the bushings 3 and 4, which bear against the hubs 10, bushing 3 being longitudinally adjustable by means of a screw 11 to compensate for wear. The web of paper 12 is led from a supply roll around a tension device which as shown consists of the roller 13 yieldingly and adjustably supported by the springs 14 mounted upon the guiding and adjusting rods 15. From the tension device the paper is led to a guiding and smoothing roller 16, then around the drum and away therefrom around the disks 17 to a cutter 18, consisting of a pair of blades mounted upon rotary supports as shown. The sheets pass from the cutter to a delivery device 19, consisting of a pair of endless chains 20, which, by means of suitable grippers, carry the sheets to a suitable receiver not shown. These devices for manipulating the paper form no part of my present invention and need not be further described.

A plurality of printing surfaces 21 are arranged concentrically with the drum as shown. They are curved and are preferably circumferentially continuous and cylindrical and lithographic in nature. They are also preferably shell-like and tubular and removably and replaceably mounted upon cylindrical supports. My invention is not limited to this character or construction of printing surfaces, however, as many of the features thereof are equally useful with other classes of printing surfaces. The printing surfaces, especially where lithographic in nature, are preferably movable into or out of contact or coöperative relation with the impression cylinder; and, while any suitable means may be employed for this purpose, as far as some features of the invention are concerned, the means herein disclosed for so moving them constitute one of the features of my invention. In the construction shown, the supporting cylinders 22 are carried by shafts 23 journaled in boxes 24 and 25 slidably mounted in radial guide ways 26 and 27 formed in the frame of the machine. The boxes 24 and 25 are

connected by suitable means to the radially arranged sliding bars 28 and 29 mounted in radial guide-ways in the frame, and operated and controlled by a pair of cam rings 30 carried by the segment disks 31 and 32. Each of the bars 28 and 29 is provided with a stud 33 which engages an eccentric cam slot or groove 34 in the corresponding ring 30. In the embodiment of the invention shown, the cam slots are of the same length and inclined in the same direction, and uniformly spaced at angular distances corresponding to the spacing of the printing cylinders. Each bar is provided with a strong spring 33′, which springs press the bars outwardly to avoid lost motion between the pins and the grooves. It follows from this construction that when the cam rings 30 are operated in unison, the printing surfaces will be simultaneously and uniformly lowered into or raised out of contact with the impression drum. For the purpose of operating the rings 30 in unison, the segment disks 31 and 32 are geared to a cross shaft 35 which is driven through a train of gears 36 operated by any suitable means, the particular form of which devised by me not being a part of the present invention, are not shown or described herein. In order that the amount of pressure between the printing surfaces and the impression cylinder may be independently adjusted, the connections 37 and 38 between the bars 28 and 29 and the boxes 24 and 25 are adjustable in length. In the construction shown, the connections 37 on the driving side of the machine are provided with threaded ends carrying adjusting nuts 39 and 40 which engage opposite sides of projections formed on the boxes 24. The connections at the opposite side are formed by internally threaded sleeves 38 engaging at one end the threaded ends of the bars 29 and at the other end with studs carried by the boxes 25, said studs having threads of the opposite pitch to that of the threaded ends of the bars 29.

To render the machine universal as to the size of the printing surfaces used, which constitutes one feature of my invention, it is essential that the means for moving the printing surfaces into or out of operative position be adjustable to receive printing surfaces of different diameters. This adjustment may be accomplished in any suitable way. In the construction shown, it is accomplished by manipulating the threaded sleeves 38 at one side of the machine, and by using connections 37 of different lengths at the other side of the machine.

The printing surfaces are removable and replaceable in the machine and the means permitting this to be done forms one feature of my invention. The object of this feature of my invention is to enable the printing surface, with or without its support, to be removed from the machine and a new one to be placed therein, with the least possible disturbance or derangement of other parts of the press. To this end, I provide for removing the printing surface laterally of the machine and without first removing the same from the machine radially with relation to the drum, the only radial movement necessary being that produced by the means above described. This consists in making the supports and guides for the printing cylinders at one side of the machine displaceable, thus leaving an opening in the side of the machine through which the printing surface, or its support or both, may be removed or replaced in the machine. As shown the connections 37 between the raising and lowering means and the boxes 24 are hinged at 41 to the bars 28 and engage the boxes through open slots. By loosening the nuts 40 the connections 37 may be thrown down into the position shown in Figs. 5 and 5ª. In addition to this the frame sections 42 in which are formed the guides 26 for the boxes 24 are pivoted or hinged at 43 to the side frame and may be thrown downwardly or outwardly into the position shown in Figs. 5 and 5ª, each frame being provided with one or more projections 44 for the purpose of limiting its outward movement. Each frame section 42 is preferably provided with shoulders 45 which accurately fit corresponding shoulders on the side frame, thus accurately fixing and firmly supporting the frame sections, and with them the printing cylinders, in position circumferentially of the impression cylinder. Of course the parts 37 and 42 may be otherwise displaceably supported or they may be entirely removed when it is desired to remove the printing surface.

When it is desired to place in the machine a printing surface of a different diameter or curvature from that of the previous one, it is preferred to replace the mandrel or support with one of a diameter corresponding to the new printing surface, since it is desirable to have the printing forms as thin and as light as is compatible with safety and convenience in constructing and handling them. When, however, it is only desired to replace a printing surface by a new one of the same diameter, it is desirable to remove the old printing form and insert the new one in the press without removing the mandrel. To enable this to be done with facility, I so support the mandrel at the end opposite the removable sections 37 and 42, that the mandrel will be sustained free of the impression drum and the inking and damping mechanisms when the supports 37 and 42 are removed or displaced. In the embodiment of this feature of my invention shown, the boxes 25 are firmly guided in the guideways

27 by the flanges thereof engaging on opposite sides of the side frame, and the mandrels 22 and their shafts 23 have such an engagement with the boxes as to tend to support their free ends independent of any other support. This engagement consists of a flange or collar 50 keyed to a hub or extension of each mandrel 22, which collars 50 are provided with steel bearing faces or rings 51 constructed to accurately fit and work against the rings 51′ which constitute the inner faces and flanges of the boxes 25. The shafts 23 are extended beyond the boxes 25 and are provided with threaded ends bearing adjusting and jam nuts 52, which act to firmly hold the collars 50 against the boxes 25, but are preferably so adjusted as not to cause any binding of the parts when the opposite ends of the shafts are supported in working position. When the supports 37 and 42 are removed, the free ends of the shafts 23 may be engaged and partially supported by a receiving shaft such, for instance, as that shown and described in the patent granted to Edward Hett November 21, 1899, No. 637570.

The printing cylinders are each provided with a gear 53, secured to the collar 50 by means permitting circumferential adjustment as shown (see Figs. 7 and 7[a]) and said gears are preferably split and provided with adjusting means to take up back-lash. As shown the gears 53 are engaged and driven by a circular rack or ring gear 54 bolted or otherwise secured to the drum 1. By this means, the printing surfaces are driven in unison with each other and with the impression drum.

Each printing surface is provided with an inking mechanism and in the machine shown each printing surface is also provided with a damping mechanism. When printing surfaces which do not require damping are employed, the damping mechanism may be omitted or thrown out of action, and I desire it to be understood that many of the features of my invention are in no wise limited to the use of any particular kind of printing surface and are not affected by the presence or absence of the damping mechanism.

The inking mechanism in its preferred form is composed primarily of four parts, viz.—a supplying part for supplying ink in regulated quantities; a distributing part for thoroughly breaking up or distributing the ink; an applying part for applying the distributed ink to the form; and as shown, a conveying part for carrying the ink from the distributing part to the applying part. The last part practically forms a branch or continuation of the distributing part and is only termed a conveying part for the sake of clearness in the description and in the claims including this feature. The inking mechanisms for the several surfaces, are similar in construction and are preferably identical, as shown, and are preferably also, interchangeable either as a whole or in their various parts, and are adapted to occupy various positions in the press. They are also self contained, that is to say, the various parts are so associated or connected together and so driven that each inking mechanism is independent of the others as well as the other parts of the press as, for example, the printing surfaces and the damping mechanisms. This self-contained feature resides principally in the fact that all parts of each inking mechanism, not driven frictionally by the printing surface when in contact therewith, are connected to a common actuating part of the press by an independent driving part or power-center associated with the inking mechanism and forming a part thereof.

Referring now to the drawings, it will be sufficient to describe one of the inking mechanisms in detail since in the machine shown they are identical.

The distributing part of the inking mechanism is mounted in an auxiliary frame consisting of the side pieces 60, 61, preferably bolted or otherwise permanently secured to the main frame of the machine and is thus rigidly fixed in position. In the construction shown, this part of the inking mechanism consists of a plurality of hard rollers 63, 64, 65, 66 and 67, preferably of metal, mounted in fixed bearings in the frames 60, 61. A soft roller 68 is yieldingly held in contact with each two adjacent hard rollers 63 and 64, 64 and 66, 63 and 65, and 67 as shown, there being formed by this arrangement a double series of hard and soft rollers arranged alternately with all contacts between the rollers yieldingly maintained. The means for yieldingly supporting the rollers 68 (see Figs. 12 and 13) consists of journal boxes 69, one at each end of each roller, said boxes being loosely guided between the frames and the heads of the bolts or pins 70, the shanks of which pass through suitable enlarged perforations in the boxes. Each box is further guided by a rod or bolt 71 pivoted at one end to the frame and passing through a guide extension 72 of the box 69 and terminating in a guide opening near the other end of the box. The outer end of each bolt is threaded and provided with an adjusting nut 73 and between the nut and the inner end of the guide extension 72 is confined a compression spring 74 which thus tends to draw the box 69 inwardly and with it the roller carried thereby. Owing to the universal manner in which boxes 69 are guided the tension of the spring 74 tends to keep the rollers 68 constantly in contact with the adjacent hard rollers, and this contact will be maintained irrespective of the

position of the inking mechanism in the press. This construction also possesses the further advantage that inaccuracies or irregularities in the settings or adjustments, and in the surfaces, and in the dimensions of the rollers are largely compensated for. In other words the rollers do not have to be individually adjusted for inaccuracies or irregularities in the size or surface of the rollers whether they occur through faulty construction or through use or wear in the machine, and the term "wear" is meant to include any shrinkage or change in shape or size which occurs through the age or use of the rollers or changes in the surrounding conditions or from other causes. The described construction also obviates the necessity for fine adjustment or setting of the rollers, and overcomes slight inaccuracies in the original setting which consists merely in adjusting the tension of the springs 74. To enable the rollers to be readily removed and replaced, the boxes 69 are provided with hinged sections 75 which are held in place by thumb screws 76 carried by pivoted bolts 77 having headed ends to prevent the thumb screws 76 from being removed and lost.

The shafts of the rollers 63, 64, 65, 66 and 67, are extended through the frame 61 on the off side of the machine, and are provided with gears 83, 84, 85, 86 and 87 respectively, by means of which these rollers are driven. These gears are driven from a shaft 88 which is the main driving shaft of the inking mechanism from which all parts of the same, not driven frictionally by the printing surface, are driven. The shaft 88 is driven from a gear 89 mounted on a pin 90 carried by a bracket 91 fixed to the side frame 6, motion being conveyed from the gear 89 by a train of gears 92, 93 and 94, the last of which is fixed on the end of the shaft 88. The intermediates 92 and 93 are preferably carried by pairs of links 95 and 96, as shown, since this construction avoids the use of long studs projecting from the side frames and affords ready access to the outer part of the printing surfaces besides forming a rigid and efficient support for the gears. The gears 89 for all the inking mechanisms mesh with and are driven by a large gear 97 mounted concentrically with the impression drum, preferably by being fixed to and driven by the shaft 2. The gear 97 thus constitutes a common actuating part for all the inking mechanisms and acts to drive them independently of the printing surfaces and the damping mechanism. The shaft 88 carries a gear 100 which meshes with the gears 84, 85, 86 and 87, and drives the gear 83 through the gear 84 and pinion 101. The gear 100 and pinion 101 are made wider than the gears with which they mesh to allow for the endwise reciprocation or vibration of the rollers to which the latter gears are fixed. The means for vibrating the rollers is shown on an enlarged scale in Figs. 10 and 11. The shaft 88 is extended through the frame 60 and is provided on its end with a pinion 102. The pinion 102 meshes with and drives a gear 103, fixed to a beveled pinion 104, which in turn drives a beveled gear 105, carried at one end of a transverse shaft 106, journaled in brackets 107 and 108. The shaft 106 is provided with a pair of oppositely arranged cranks 109, 110, between the brackets 107, 108, and on the outer end of the shaft is formed a third crank 111 which is arranged opposite to the intermediate crank 110. The crank 109 engages a slot in a cross head 112 carried by and located between fixed collars on the shafts of rollers 66 and 67, and thus causes these two rollers to reciprocate or vibrate in unison, which rollers it will be noted are located in different series of contacting rollers. The crank 110 is similarly connected with the rollers 64 and 65 by a cross-head 113, which rollers are also in different series. The crank 111 is connected by a pitman 114 to a sliding head 115 confined between collars on the end of the shaft of roller 63. This construction it will be seen affords a simple, strong and compact mechanism for vibrating the various rollers of the distributing part of the inking mechanism. By the arrangement of the rollers in a plurality of series, and the vibration in opposite directions of the alternate rollers of each series, the flow of ink is divided into a plurality of streams, and each stream is independently and thoroughly distributed, thus insuring a very even and uniform application of the ink to the printing surface.

Ink is applied to the printing surfaces by a plurality of soft rollers 120. These applying rollers, together with the other soft rollers, should be covered with a material adapted to be used with the particular class of printing surface and with the character of ink employed. For instance, when a lithographic or planographic printing surface is used, these rollers should consist of a soft body as rubber or fiber covered with leather or felt or other suitable fabric. If a relief surface is used, the applying rollers at least should be covered with the ordinary roller composition. The applying rollers receive the ink from the distributing rollers, preferably and as shown, through intermediate conveying rollers 121 and 122 yieldingly held in contact with both the applying rollers and the distributing rollers. It is desirable to separate the ink-applying rollers and the printing surfaces when the machine is not in operation and it is an object of my invention to provide for this separation without disturbing the inking mechanism as a whole. To that end I move the applying rollers into

or out of contact with the printing surfaces without disturbing any more of the other parts of the inking mechanism than enough to conveniently maintain continuous connection between the distributing and applying parts. In the construction shown this is accomplished by mounting the applying rollers 120 for each printing surface on a pair of oppositely arranged pivoted frames 123, pivoted to the main frame of the machine by bolts 124 which are adjustably secured in slots 124′, the free ends of the frames 123 being connected to and controlled by a pair of rock shafts 125, 126, which are connected to the frames 123 by arms 127, 128, and links 129, 130. The shafts 125, 126 are operated in unison by means presently described to move the applying rollers into or out of operative position. For the purpose of yieldingly holding the applying rollers 120 in contact with the printing surfaces the journal boxes 131, in which they are mounted, are slidably supported in the frames 123 and the boxes 131 are pressed toward the printing surfaces by springs 132 mounted on studs 133 which are threaded and provided with adjusting nuts 134 for varying the tension of the springs. The riders or conveying rollers 121, which are preferably hard rollers, are yieldingly held in contact with the two adjacent applying rollers 120 by means of the following construction:—The bearings 135 are pivoted on bolts 137 at one end by means of elongated openings. Rods 138 are also pivoted on the bolts 137 and pass through guide openings in the lugs 139 formed on parts 135. The outer ends of the rods 138 are threaded and are provided with adjusting and jam nuts 140, between which and the lugs 139 are confined compression springs 141, which act to press the bearings 135 inward, thus keeping the rollers 121 in close contact with the adjacent applying rollers. The soft rollers 122 are preferably constantly held in contact with the rollers 121 and also with the distributing rollers 66 and 67. As shown the rollers 122 are mounted in bearings 145 slidably mounted and guided on rods 146, which are pivoted concentrically with the rollers 66, and 67. The outer ends of the rods 146 are threaded and provided with adjusting nuts 147, between which and the inner ends of the bearings 145 are confined compression springs 148. The springs, it will be noted, always tend to hold the rollers 122 yieldingly in contact with the rollers 66 and 67. Rollers 122 are maintained in yielding contact with the riders 121, whatever the position of the applying rollers 120, by means of compression springs 150 engaging the bearings 145 through pivot pieces 151 and supported at the outer ends by pivot pieces 152. The bearings 135 and 145 are provided with pivoted caps 136 and 153 respectively to enable the rollers 121 and 122 to be readily removed.

In the embodiment of my invention illustrated in the drawings the applying part of the inking mechanism is manipulated and adjusted for different diameters or curvatures of printing surfaces by the mechanism next described.

The shafts 125, 126 are geared together by pinions 155, 156, so as to operate in unison and are controlled by an arm 157 carried by the shaft 126 and adjustably secured thereto by a bolt 158 passing through an elongated opening 159′ in the arm 157 and entering a threaded opening in the pinion 156. The arms 157 of the various inking mechanisms are connected together by rods 158′, which are preferably adjustable in length as shown, and the arms 157′ of the two lower inking mechanisms (see Fig. 6) are connected to a common operating lever 159 by the rods 160 and slotted block 161, the rods 160 being adjustably connected to the block 161 as shown. The lever 159 is pivoted near the base of the machine and is operated by the segment disk 32, being connected therewith by pin 162 on the segment 32, engaging a slot 163 in the lever. It follows from this construction that when the segment disk 32 is operated the pairs of applying roller frames 123 will be simultaneously moved more or less toward or away from the printing surfaces as desired and that the operative positions of the applying rollers with relation to the printing surfaces may be adjusted either to vary the pressure of the rollers upon the printing surfaces or to enable printing surfaces of different curvatures to be used in the press. In the diagrammatic views, Figs. 17 to 22 inclusive, are illustrated several of the various positions the parts may assume. Fig. 17 illustrates the applying rollers in operative position with relation to a printing surface of the smallest diameter that the machine shown is designed to use. When the parts are thus adjusted it will be noted that the links 129, 130 are arranged to point inwardly with relation to the arms 127, 128, and that the bolt 158 is located in the center of the slot 159. It will be noted also that the pivot bolts 124 for the frames 123 are located at the inner ends of the slots 124′ in the side frames. Fig. 18 illustrates the parts in the same adjustment but with the applying rollers in an inoperative position. Fig. 19 illustrates the parts adjusted for cooperation with printing surfaces of a size intermediate of the largest and smallest that the machine shown is designed to use. When the parts are thus adjusted, it will be noted that the bolt 158 is at one extremity of the slot 159, and that the pivot bolts 124 are in an intermeditae position in the slots 124′.

The adjustment of the pivots 124 in the slots 124′ is desirable to keep the pressure of the applying rollers 120 upon the printing surface equalized when the diameter or curvature of the printing surface is changed. If only one applying roller were carried by each frame 123 this adjustment would not be necessary. Fig. 20 shows the parts in the same adjustment as in Fig. 19, but with the applying rollers in an inoperative position. Fig. 21 shows the parts adjusted for the largest diameter of printing surface that the machine shown is designed to use. When the parts are thus adjusted the bolt 158 is at the lower end of the slot 159, the bolts 124 are at the outer extremes of the slots 124′ and the links 129, 130 are turned in an outward direction with relation to the arms 127, 128 instead of an inward direction as shown in the previous figures. Fig. 22 shows the parts in the same adjustment but with the applying rollers in an inoperative position. It will be seen that any one or more of the inking mechanisms may be separated from the operating and controlling means by simply loosening the bolt 158.

In the particular construction illustrated, the ink-supplying part comprises a fountain 165, in which is mounted for rotation a fountain or doctor roller 166. Arranged above the fountain and in contact with the doctor roller is a doctor blade 167, provided with means for varying the pressure of the edge of the blade against the roller as usual. Ink is taken up from the fountain roller by the ductor roller 168, which is preferably a soft roller. By this roller the ink is conveyed to the first roller 63 of the distributing part of the inking mechanism. To provide for keeping the fountain level and to accomplish that without deranging the operative relation between the fountain roller 166 and the ductor roller 168 and between the ductor 168 and the distributing roller 63, irrespective of the position of the inking mechanism in the press, the fountain and the ductor are made adjustable together as a unit with relation to the rest of the inking mechanism. This is done by mounting the ductor and fountain, together with their operating mechanism, on an auxiliary frame consisting of the side pieces 169, 170, which are tied together by the fountain 165 as shown, (see Fig. 26) and pivoting this auxiliary frame concentrically with the distributing roller 63. This is done without putting the weight of the fountain frame on the shaft of the roller 63 by mounting the fountain frame on extensions of the bushings 172 which form the bearings for the shaft of roller 63, see Figs. 9 and 11.

The fountain roller 166 is operated by a short shaft 175 mounted in an elongated boss of the side piece 170, which is connected to the fountain by the spring held clutch 176, as shown, whereby the fountain may be readily disconnected from its operating mechanism and removed. The shaft 175 carries a ratchet 177, near its outer end, which ratchet is engaged by a pawl 178 carried by an arm 179 loosely pivoted on the end of the shaft 175. The pawl receives a constant throw, the number of teeth of the ratchet engaged thereby being regulated by a guard arm 180 loosely pivoted on the shaft 175 and adjustably held by the arm 181 which engages the fixed segment 182 by a spring detent 183. The arm receives an oscillating motion from the crank pin 184 carried by the cam disk 185 through a connecting rod 186. The cam 185 is carried by a gear 187, which is loosely mounted on a stud 188 fixed in a bracket 189 secured to the side frame 61 of the inking mechanism. The gear 187 is driven from the power shaft 88 of the inking mechanism by a compound gear train consisting of the pinion 190 mounted on a shaft 191 and carrying the gear 192, which receives motion from the pinion 193 fixed on the shaft 88. The stud 188 is preferably mounted concentrically with the shaft of roller 63, or substantially so, in order that the throw of the pawl 178 will be the same for all positions of the supplying part with reference to the rest of the inking mechanism.

The ductor roller 168 is mounted in a pair of arms 195 loosely pivoted on the shaft 196 which is journaled in the frames 169, 170 and is provided with an arm 197 at one end which arm engages the cam 185. The other end of the shaft 196 is provided with an arm 198 which is engaged by a compression spring 199 adjustably held in confinement by a nut 200, threaded on the free end of the guide rod 201 which is pivoted to the frame and passes through an opening in the arm 198. The spring 199 acts to keep the arm 197 constantly in contact with the cam 185, which is thus caused to rock the shaft 196. The arms 195 are yieldingly confined to rock or oscillate with the shaft 169 by means of the plate springs 202 carried by fixed collars 203, and loosely engaging the arms 195, as shown. The tension of the springs 202 is adjusted by the rigidly supported plates 204 which may be adjusted to engage and support the springs 202 nearer to or farther from their free ends by means of the adjusting nuts, as shown. The function of the springs is to hold the ductor roller in yielding contact with both the fountain roller 166 and the distributing roller 63 thus insuring contact between these rollers throughout their length. Any other form of spring connection between the ductor roller 168 and the shaft 196 may be used. The bearings on the arms 195 are provided with hinged sections 205 to enable the roller 168 to be readily removed. It will be noted that since

the cam 185 is mounted concentrically with the pivot of the fountain frame and with the roller 63, the roller 168 will always cooperate with the rollers 166 and 168 irrespective of the position of the fountain with relation to the other parts of the inking mechanism. As shown in Fig. 2 the fountains for the two upper inking mechanisms are supported in a level position by brackets 206 secured to the inking frames 60. The fountains of the lower two inking mechanisms at each end of the machine are supported in the desired position by the tie rods 207, 208, which connect them with the upper fountains and brackets 206. Any other means for securing the fountains in the desired position may be adopted.

The damping mechanism in the embodiment of my invention illustrated consists of supplying, distributing and applying parts. The various rollers of the damping mechanism are yieldingly held in contact by means which will maintain the rollers in operative position irrespective of the location of the damping mechanism in the press, said means also obviating individual adjustment of the rollers for slight irregularities in their surfaces or diameters, whether the irregularities arise from the use or wear of the rollers or from defects in the material or workmanship employed in their construction or from other causes. The damping mechanisms are, like the inking mechanisms, self contained in that they are provided with independent driving means from which all parts of the damping mechanisms, not frictionally driven by the printing surfaces, are operated, said driving means being associated with said damping mechanisms and forming a part thereof. The damping mechanisms are located between the printing surfaces and are movable as a unit into or out of operative position with relation to the printing surfaces, preferably in a circumferential direction with reference to the impression drum. In detail each damping mechanism for the two top printing surfaces and the two lower printing surfaces to the left, see Fig. 30, is mounted in a pair of side frames 210, 211, which are respectively secured to a pair of rings 212, 213, one on each side of the machine. The damping mechanisms for the two lower printing surfaces to the right are mounted in side frames 214, 215, of a slightly different shape from that of the frames of the other damping mechanisms for reasons which will presently appear. Each pair of frames 210, 211 and 214, 215 are tied together and braced by a rod 211′. The frames 214, 215 are also respectively secured to the rings 212, 213, which are loosely mounted in the side frames 5 and 6 concentrically with the impression drum. The rings are connected to move in unison by means of short gear segments 216, which mesh with pinions 217, on a transverse shaft 218. The shaft 218 is controlled by a lever 219 (see Figs. 1 and 6) which is yieldingly pressed in the proper direction to bring the damping mechanism into contact with the printing surfaces by a compression spring 220, which is confined on a rod 221 between a shoulder thereon and a fixed guide 222, the movement of the lever in the said direction being adjustably limited by stop and jam nuts 223 carried by the threaded end of the rod 221. The lever 219 is positively operated in the opposite direction to separate the damping mechanism from the printing surfaces by a pin roller 224, carried by the segment disk 32. Returning now to the construction of the damping mechanisms, and referring more particularly to Figs. 30 to 48 inclusive, 225 indicates the fountain, 226 the fountain roller, and 227 the ductor roller, which parts constitute the supplying part of the damping mechanism. The distributing part consists of a roller 228, which is preferably made of brass or other suitable non-corrosive material, receives the damping fluid from the ductor 227 and distributes it upon the applying rollers 229. The ductor 227 and applying rollers 229 are preferably soft rollers and may be made of any material suitable for use in connection with the damping solution employed. For instance they may be made of rubber covered with a fabric that preferably used being known to the trade as mole skin. The fountain roller 226, which is preferably made of brass covered with a suitable fabric, such as muslin, is journaled in the side frames 210, 211, and the fountain 225 is adjustably mounted with relation thereto by any suitable means enabling the fountain to be maintained in a level position irrespective of the location of the damping mechanism in the press. As shown, the fountain is carried by a frame 230, adjustably mounted concentrically with the fountain roller 226, and secured in the adjusted position by means of bolts 231 passing loosely through slots 232 therein and entering certain of the threaded holes 233 in the frames 210, 211.

The fountain roller is driven by a disk 235, the sleeve of which is splined to the shaft 236 of the fountain roller and is journaled in the bushings 237, 238, the latter of which is threaded in the frame piece 211 and may be adjusted therein to fix the position of the disk, and adjust the same for wear, the bushing being fixed in its adjusted position by a set screw 239. The bushing 237 slips inside the bushing 238 and has a flange engaging the inside of the frame 211, being held in place by the fountain frame 230 which is supported concentrically with the shaft 236 by said bushing as shown. The friction disk 235 is driven by a friction

wheel 240 which is splined on a shaft 241 mounted in brackets 242, 243, and arranged transversely of the disk 235 as shown. The wheel 240 may be adjusted to engage the disk 235 at various distances from its center by means of the guide bracket 244 which may be secured at various positions along the slotted bar 245 by the clamp nut 246. The shaft 241 is driven by a worm wheel 247, secured to one end thereof and engaging a worm 248, formed on one end of the drive shaft 250, of the damping mechanism. Backward rotation of the fountain roller by the momentum of the ductor roller 227 is prevented by the roller detent 251 mounted in a recess in the bushing 238 in position to engage the sleeve of the disk 235, and made constantly active by the spring 252. The ductor roller 227 is mounted in a pair of arms 255 pivoted on a rock shaft 256 journaled in the frames 210, 211, the arms 255 being yieldingly confined to rock with the shaft 256 by means of the plate springs 257 carried by the fixed collars 258, all as shown and previously described in connection with the ink ductor. The shaft 256 is provided at one end with an arm 260 to which is pivoted a forked bar 261 bearing a friction roller 262 which is engaged by and operated by a cam 263 fixed on the outer end of shaft 241. The opposite end of shaft 256 is provided with an arm 264 which is pressed in the proper direction to keep the roller 262 in contact with the cam 263, by a spring 265 adjustably mounted upon a guide rod 266, which passes through an opening in the arm 264, and is pivoted to the frame piece 210 as shown.

The distributing roller 228 is driven from the shaft 250 when the damping mechanism is not in operative position by a belt 268, passing around a pulley 269 on the shaft 250 and a pulley 270 mounted on a sleeve 271 keyed to the shaft of the roller 228. The pulley 270 is connected to the sleeve 271 through a friction clutch roller 272 which is held in operative position by a spring 273. This driving mechanism for the roller 228 drives the same and the applying rollers 229 at a slightly less speed than that of the printing surface when the applying rollers are not in contact with the printing surface, but allows the rollers to race ahead of the driving mechanism when they are driven by the printing surface.

For the purpose of adjusting the applying rollers 229 to bear equally on printing surfaces of different diameters, they are supported by auxiliary frames 275 pivotally mounted concentrically with roller 228 on bushings 276, which form also the bearings for the shaft of said roller. These frames 275 are secured in their adjusted positions by the bolts 277 passing through slots in the frames and into the frames 210, 211.

To enable the applying rollers 229 to be yieldingly held in contact with both the distributing roller 228, and the printing surface, they are independently mounted in oppositely arranged supports 278 pivoted at 279 to the frames 275 as shown. The rollers 229 are journaled in boxes 280 slidably mounted in slots in the supports 278 and are pressed inwardly by the compression springs 281. One of the supports 278 is provided with a stop arm 282, which acts to limit the movement of the rollers away from the roller 228 and toward the printing surface. The stop 282 comes into operation before the boxes 280 reach the bottom of the slots in the supports 278, thus causing the rollers 229 to be yieldingly held in contact with the distributing roller 228 when the damping mechanism is out of contact with the printing surface. When the damping mechanism is brought into contact with a printing surface the rollers 229 are pushed back with relation to the distributing roller 228, and the stop 282 on one arm 278 is separated from the other arm as shown in Fig. 43. When the parts are in this position the rollers 229 are yieldingly held in contact with both the roller 228 and the printing surface by the springs 281.

The shafts 250 which independently drive all parts of the damping mechanisms not frictionally driven from the printing surfaces when the damping mechanisms are in operative position, receive motion from the ring gear 54 carried by the impression drum, which gear 54 thus becomes a common actuating part for the independent driving means of the damping mechanisms.

The damping mechanisms for the two lower printing mechanisms shown to the right in Figs. 2 and 30 are each provided with an extra roller 226′ to enable the ductor 227 to receive water from the fountain roller 226 without interfering with the leveling adjustment of the fountain 225. To insert the extra roller 226′ without unduly widening the damping mechanisms between the printing surfaces it is desirable to place the fountain 225 and fountain roller 226 farther away from the drum. This necessitates a little variation in the shape of the frames 214, 215 from that of the frames 210, 211, as shown. With these exceptions the damping mechanisms are alike.

The operation of the machine as a whole will be clear from the above description, in which the operation of the various parts has been set forth in connection with the description of the construction. It only remains to set forth the operation of the controlling means for the printing, inking and damping mechanisms, when those mechanisms are brought into or out of operative or printing position. In Fig. 1 the parts are shown in inoperative position. Supposing

now that a series of printing surfaces are in place, that the press has been set in motion, and that the inking and damping mechanisms are supplied with ink and water respectively, to start the printing operation the segment disks 31, 32 are moved in the direction indicated by the arrow in Fig. 1. This simultaneously moves the printing, inking and damping mechanisms toward their operative positions, the connections between all the said mechanisms and the disks 32 being in operative engagement with said disks as illustrated in Fig. 1. The parts are so constructed and timed, however, that when the damping mechanisms are used, they will be brought into contact with the printing surfaces before the inking mechanisms are, and before the printing surfaces are brought into contact with the paper on the impression drum. The inking mechanisms are next brought into contact with the printing surfaces and then the latter are brought into contact with the paper, whereupon the printing operation will proceed until the controlling mechanism is moved in the opposite direction. This predetermined sequence in which the parts are brought into operation is accomplished in the construction illustrated as follows:—The cam slots in the rings 30 are shaped so as to move the printing surfaces toward the impression drum very slowly at first or the cams might be shaped so as not to move the printing surfaces at all until the damping and inking rollers were in contact therewith. The inking and damping mechanisms move toward their operative positions comparatively rapidly. When the damping mechanisms arrive in contact with the printing surfaces their movement ceases, which action is permitted by the loose connection between the pin roller 224 and lever 219, the damping mechanisms being yieldingly held in operative position by the spring 220. When the inking mechanisms arrive in contact with the printing surface, these two parts move together until the printing surfaces are brought in contact with the impression drum, whereupon the movement of the segment disks is stopped. Any slight inequality in the movements of the printing surfaces and inking mechanisms after they are brought into contact is equalized by the spring mountings for the applying rollers. In fact it is preferable to so time the movements of these parts that the applying rollers will be yieldingly held in contact with the printing surfaces before they reach the printing position to insure a thorough application of ink and consequently good impressions from the very beginning of the printing operation. To stop the printing operation the sequence of which the parts are separated should be the reverse of that in which they are brought into operation, and that sequence is secured by merely reversing the movement of the controlling means. The printing surfaces are first separated from the paper, then the inking mechanisms are separated from the printing surfaces, and lastly, the damping mechanisms are separated from the printing surfaces. While it is desirable to preserve the above sequences principally to avoid injury to the parts and especially to the printing surfaces, the intervals between the times when the parts are brought into or out of operation may be very short or practically instantaneous, so that little if any paper is destroyed in starting or stopping the printing operations.

It it not necessary to move the controlling mechanism and with it the inking and damping mechanism to the limit of their movement in the outward direction shown in Figs. 1, 5, 13, 18, 20, 22 and 44, when it is only desired to stop the printing operation, the extreme outward position of the inking and damping mechanisms being desirable only when the printing surfaces are to be removed. To stop the printing operation the controlling mechanism is moved only about one half the distance of its travel in the outward direction or toward the right as viewed in Fig. 1.

It will be noted that the connections between the printing surfaces and the inking mechanisms and the common actuating means are positive connections, while the connection between the damping mechanisms and the actuating means is not positive and does not connect said parts at all times. It is to be observed, however, that the form of any of these connections is immaterial as long as they are arranged in position to move the various parts into or out of operative position whenever the actuating mechanism is operated; *i. e.* as long as they are normally in operative position.

Among the advantages of my invention not previously referred to is the accessibility of all the parts of the mechanism, and particularly the inking and damping mechanisms, and also the controlling mechanisms for the various parts of the press. Each mechanism being independent of the others the parts of the machine may be readily assembled and any particular part may be removed and replaced without disturbing any mechanism but the one to which such part belongs. In respect to the inking mechanisms, it will be noted that they are free from all obstructions, are in the full view of the operator, are accessible for cleaning, and, owing to the fact that they are fixed and extend outwardly or radially from the main center of the machine, the distributing surfaces or areas may be made as large as desired, and without an undue multiplication and complication of parts. Open ink fountains of simple construction may also be employed and they can be

readily kept supplied with ink. By this construction, also, the flow of the ink through the distributing mechanism may be divided into a plurality of independent streams, which are independently distributed and independently applied to the printing surfaces. It will be observed, also, that the damping mechanisms are simple and compact and effective. Open water fountains of simple construction are used, thus rendering the damping operations reliable and easily regulated, which virtues are also largely contributed to by the yieldingly made contacts between the various rollers and especially those between the ductor roller and the fountain and distributing rollers. It is to be observed, also, that the controlling mechanism is simple and positive and reliable, and that it renders impossible the bringing of the parts of the press into or out of operation in the wrong sequence, which feature together with others renders the operation of the machine safe in the hands of careless or incompetent workmen. Many other advantages of my invention will readily appear to those skilled in the art.

The invention is not to be limited to the particular mechanism illustrated and described, nor to the particular mechanism employed for carrying it into effect. Numerous changes may be made in this mechanism, many of which will readily suggest themselves to skilled press builders. My invention, therefore, is to be regarded as covering all forms of mechanism which may serve to carry the improvements and combinations herein described into practical effect.

What I claim as new and desire to secure by Letters Patent is:—

1. In a printing press, the combination with an impression mechanism, of means for supporting successive sets of curved printing surfaces of the same or of different curvatures in coöperative relation with the impression mechanism, and means for simultaneously separating or bringing together said printing surfaces and impression mechanism, substantially as described.

2. In a printing press, the combination with an impression surface, of means for supporting successive sets of curved printing surfaces of the same or of different curvatures in coöperative relation with the impression surface, and means for simultaneously separating or bringing together said printing and impression surfaces, substantially as described.

3. In a printing press, the combination with an impression drum, of means for supporting successive sets of curved printing surfaces of the same or of different curvatures in coöperative relation with the impression drum, and means for simultaneously moving the printing surfaces into or out of contact with the impression drum, substantially as described.

4. In a printing press, the combination with an impression drum, of means for supporting successive sets of curved printing surfaces of the same or of different curvatures in coöperative relation with the impression drum, and means consisting of cams mounted concentrically with the impression drum for simultaneously moving the printing surfaces into or out of contact with the impression drum, substantially as described.

5. In a printing press, the combination with an impression drum, of means for supporting successive sets of curved printing surfaces of the same or of different curvatures in coöperative relation with the impression drum, means consisting of cam disks, one at each end of the impression drum for moving the printing surfaces into or out of contact with the impression drum, and means for operating the cam disks in unison, substantially as described.

6. In a printing press, the combination with an impression drum, of a plurality of printing surfaces arranged concentrically therewith, and means consisting of an individual cam for each printing surface mounted concentrically with the impression drum for simultaneously moving the printing surfaces into or out of contact with the impression drum, substantially as described.

7. In a printing press, the combination with an impression drum, of a plurality of printing surfaces arranged concentrically therewith, means consisting of cam disks, one at each end of the impression drum for moving the printing surfaces into or out of contact with the impression drum, and means for operating the cam disks in unison, substantially as described.

8. In a printing press, the combination with an impression drum, of a plurality of printing surfaces arranged concentrically therewith, and means for moving the printing surfaces into or out of contact with the impression drum, said means including a disk at each end of the drum, each disk having a cam groove for each printing surface, and means for operating the cam disks in unison, substantially as described.

9. In a printing press, the combination with an impression surface, of a printing surface, and means for moving the printing surface into or out of contact with the impression surface, said means including devices for yieldingly holding the printing surface away from the impression surface, and means for positively moving the printing surface toward the impression surface, substantially as described.

10. In a printing press, the combination with an impression mechanism, of a plurality of printing surfaces, and means for moving the printing surfaces into or out of con-

tact with the impression mechanism, said means including devices for yieldingly holding the printing surfaces away from the impression mechanism, and means for positively moving the printing surfaces toward the impression mechanism, substantially as described.

11. In a printing press, the combination with an impression drum, of a plurality of printing surfaces arranged concentrically therewith, and means for moving the printing surfaces into or out of contact with the impression drum, said means including a pressure bar for each printing surface, means for yieldingly holding the printing surfaces away from the impression drum, and means engaging the pressure bars for positively moving the printing surfaces toward the impression drum, substantially as described.

12. In a printing press, the combination with an impression drum, of a plurality of printing surfaces arranged concentrically therewith, and means for moving the printing surfaces into or out of contact with the impression drum, said means including a pressure bar for each printing surface, means for yieldingly holding the printing surfaces away from their impression drum, and a disk provided with a cam groove for each pressure bar, for positively moving the printing surfaces toward the impression drum, substantially as described.

13. An inking mechanism for a printing press comprising distributing and applying parts, means operable as a unit whereby the applying part independently of the distributing part may be readily moved at will into and out of operative position with relation to a form irrespective of variations in the curvature thereof, and means for driving the inking mechanism in unison with successive forms of different curvatures.

14. In a printing press, the combination with an impression surface of means for removably and replaceably supporting curved printing surfaces of different curvatures in coöperative relation with the impression surface, an inking mechanism and means independent of the printing surfaces and of said supporting means for driving the inking mechanism in unison with successive printing surfaces of different curvatures, substantially as described.

15. In a printing press, the combination with an impression surface of means for supporting curved printing surfaces of different curvatures in coöperating relation with the impression surface, an inking mechanism, means for driving the inking mechanism in unison with successive printing surfaces of different curvatures, and means operable as a unit for separating the inking mechanism for printing surfaces.

16. In a printing press, the combination with an impression surface of means for removably and replaceably supporting curved printing surfaces of different curvatures in coöperating relation with the impression surface, an inking mechanism, means for separating the inking mechanism and printing surface, and means independent of the printing surfaces and of said supporting means for driving the inking mechanism in unison with successive printing surfaces of different curvatures.

17. A printing press including in combination, an impression surface, means for supporting curved printing surfaces of different curvatures in coöperative relation with the impression surface, a fixed inking mechanism having a section adjustable for different curvatures of printing surfaces, means for adjusting said section means for moving the adjustable section into and out of contact with the printing surfaces irrespective of their curvatures, and means for driving the inking mechanism in unison with successive printing surfaces of different curvatures.

18. In a printing press, the combination with an impression surface of means for removably and replaceably supporting curved printing surfaces of different curvatures in coöperating relation with the impression surface, an inking mechanism having a section adjustable for different sizes of printing surfaces and means independent of the printing surfaces and of said supporting means for driving the inking mechanism in unison with successive printing surfaces of different curvatures.

19. In a printing press, the combination with an impression surface of means for supporting curved printing surfaces of different curvatures in coöperative relation with the impression surface, an inking mechanism comprising a fixed ink-distributing part and an ink-applying part adjustable for different curvatures of printing surfaces, means for adjusting said ink-applying part means for moving the applying part into and out of contact with the printing surfaces irrespective of their curvatures, and means for driving the inking mechanism in unison with successive printing surfaces of different curvatures.

20. In a printing press, the combination with an impression surface of means for removably and replaceably supporting curved printing surfaces of different curvatures in coöperative relation with the impression surface, an inking mechanism comprising a fixed ink distributing part and an ink applying part adjustable for different curvatures of printing surfaces and means independent of the printing surfaces and of their supports for driving the inking mechanism in unison with successive printing surfaces of different curvatures.

21. In a printing press, the combination with an impression surface of means for supporting curved printing surfaces of different curvatures in coöperating relation with the impression surface, an inking mechanism comprising a fixed ink-distributing part and an ink-applying part adjustable for different curvatures of printing surfaces, means for adjusting said ink-applying part means for driving the inking mechanism in unison with successive printing surfaces of different curvatures, and means for separating or bringing together the ink-applying part and a printing surface.

22. In a printing press, the combination with an impression surface of means for removably and replaceably supporting curved printing surfaces of different curvatures in coöperating relation with the impression surface, an inking mechanism comprising a fixed ink distributing part, and an ink applying part adjustable for different curvatures of printing surfaces, means for separating or bringing together the ink applying part and a printing surface, and means independent of the printing surfaces and of said supporting means for driving the inking mechanism in unison with successive printing surfaces of different curvatures.

23. In a printing press, the combination with an impression surface, of means for supporting curved printing surfaces of different curvatures in coöperative relation with the impression surface, an inking mechanism and permanent or non-adjustable means for driving the inking mechanism in unison with successive printing surfaces of different curvatures, substantially as described.

24. In a printing press, the combination with an impression mechanism, of means for removably and replaceably supporting successive sets of curved printing surfaces of the same or of different curvatures in cooperative relation with the impression mechanism, a plurality of inking mechanisms, one for each printing surface in a set, and means independent of the printing surfaces and of said supporting means for driving each inking mechanism in unison with a corresponding printing surface irrespective of the curvature of the latter, substantially as described.

25. In a printing press, the combination with an impression mechanism, of means for supporting successive sets of curved printing surfaces of the same or of different curvatures in coöperative relation with the impression mechanism, a plurality of inking mechanisms, one for each printing surface, in a set, and permanent or non-adjustable means for driving each inking mechanism in unison with a corresponding printing surface irrespective of the curvature of the latter, substantially as described.

26. In a printing press, the combination with an impression mechanism, of means for supporting successive sets of curved printing surfaces of the same or of different curvatures in coöperating relation with the impression mechanism, a plurality of inking mechanisms, one for each printing surface in a set, each comprising a fixed ink distributing part and an ink applying part adjustable for different curvatures of printing surfaces, means whereby the ink-applying parts of the several inking mechanisms may be simultaneously moved into and out of operative position with the printing surfaces, and means for driving each inking mechanism in unison with a corresponding printing surface irrespective of the curvature of the latter, substantially as described.

27. In a printing press, the combination with an impression mechanism, of means for supporting successive sets of curved printing surfaces of the same or of different curvatures in coöperative relation with the impression mechanism, a plurality of inking mechanisms, one for each printing surface, each comprising a fixed ink distributing part and an ink applying part adjustable for different curvatures of printing surfaces, means for separating or bringing together said ink applying parts and the printing surfaces, and means for driving each inking mechanism in unison with a corresponding printing surface irrespective of the curvature of the latter, substantially as described.

28. In a printing press, the combination with an impression mechanism, of means for supporting successive sets of curved printing surfaces of the same or of different curvatures in coöperative relation with the impression mechanism, a plurality of inking mechanisms, one for each printing surface in a set, and means for driving each inking mechanism in unison with a corresponding printing surface irrespective of the curvature of the latter, said means comprising an independent driving part or power center from which all parts of the inking mechanism are driven, substantially as set forth.

29. In a printing press, the combination with an impression surface, of means for removably and replaceably supporting curved printing surfaces of different curvatures in coöperative relation with the impression surface, means for separating or bringing together said printing and impression surfaces, an inking mechanism, and means independent of the printing surfaces and of said supporting means for driving the inking mechanism in unison with successive printing surfaces of different curvatures, substantially as described.

30. In a printing press, the combination

with an impression mechanism, of means for removably and replaceably supporting successive sets of curved printing surfaces of the same or of different curvatures in cooperative relation with the impression mechanism, means for separating or bringing together said printing surfaces and impression mechanism, a plurality of inking mechanisms, one for each printing surface in a set, and means independent of the printing surfaces and of said supporting means for driving each inking mechanism in unison with a corresponding printing surface irrespective of the curvature of the latter, substantially as described.

31. In a printing press, the combination with an impression mechanism, of means for supporting successive sets of curved printing surfaces of the same or of different curvatures in coöperative relation with the impression mechanism, means for separating or bringing together said printing surfaces and impression mechanism, a plurality of inking mechanisms, one for each printing surface in a set, each comprising a fixed ink distributing part and an ink applying part adjustable for different curvatures of printing surfaces, means for separating or bringing together said ink applying part and the printing surfaces, and means for driving each inking mechanism in unison with a corresponding printing surface irrespective of the curvature of the latter, substantially as described.

32. In a printing press, the combination with an impression drum, of means for removably and replaceably supporting successive sets of curved printing surfaces of the same or of different curvatures concentrically with the drum, a series of inking mechanisms, one for each printing surface in a set, and means independent of the printing surfaces and of said supporting means for driving each inking mechanism in unison with a corresponding printing surface irrespective of the curvature of the latter, substantially as described.

33. In a printing press, the combination with an impression drum, of means for removably and replaceably supporting successive sets of curved printing surfaces of the same or of different curvatures concentrically with the drum, a plurality of inking mechanisms, one for each printing surface in a set, and means independent of the printing surfaces and of said supporting means for driving each inking mechanism in unison with a corresponding printing surface irrespective of the curvature of the latter, substantially as described.

34. In a printing press, the combination with an impression drum, of means for supporting successive sets of curved printing surfaces of the same or of different curvatures concentrically with the drum, means for moving the printing surfaces into or out of coöperative relation with the drum, a plurality of inking mechanisms, one for each printing surface in a set, each comprising a fixed ink distributing part and an ink applying part adjustable for different curvatures of printing surfaces, means for separating or bringing together said ink applying part and the printing surfaces and means for driving each inking mechanism in unison with a corresponding printing surface irrespective of the curvature of the latter, substantially as described.

35. In a printing press, the combination with an inking mechanism, of means for moving the inking mechanism into or out of operative position with relation to a printing surface, means for adjusting the inking mechanism for coöperation with printing surfaces of different curvatures, and means for driving the inking mechanism in unison with the printing surfaces irrespective of the curvature thereof, substantially as described.

36. In a printing press, the combination with a printing surface, of an inking mechanism therefor, means for separating or bringing together the printing surface and inking mechanism, means for adjusting the inking mechanism for coöperation with printing surfaces of different curvatures, and means for driving the inking mechanism in unison with the printing surfaces irrespective of the curvatures thereof, substantially as described.

37. An inking mechanism for a printing press comprising a distributing part and an applying part, means for moving the applying part into or out of operative position with relation to a printing surface, means for adjusting the applying part for printing surfaces of different curvatures, and means for driving the inking mechanism in unison with the printing surfaces irrespective of the curvature thereof, substantially as desribed.

38. An inking mechanism for a printing press comprising a distributing part and an applying part, means for moving the applying part into or out of operative position with relation to a printing surface without moving the distributing part, means for adjusting the applying part for printing surfaces of different curvatures, and means for driving the inking mechanism in unison with the printing surfaces irrespective of the curvatures thereof, substantially as described.

39. An inking mechanism for a printing press comprising a distributing part and an applying part, means for moving the applying part into or out of operative position with relation to the printing surface

without moving the distributing part and without interrupting the connection between said parts, means for adjusting the applying part for printing surfaces of different curvatures, and means for driving the inking mechanism in unison with the printing surfaces irrespective of the curvatures thereof, substantially as described.

40. In a printing press, the combination with an impression surface, of a curved printing surface, means for separating or bringing together the impression and printing surfaces, an inking mechanism for the printing surface, means for separating or bringing together the printing surface and inking mechanism, means for adjusting the inking mechanism for coöperation with printing surfaces of different curvatures, and means for drving the inking mechanism in unison with the printing surfaces irrespective of the curvatures thereof, substantially as described.

41. In a printing press, the combination with an impression surface, of a curved printing surface, means for separating or bringing together the impression and printing surfaces, an inking mechanism for the printing surface comprising a distributing part and an applying part, means for moving the applying part into or out of operative position with relation to the printing surface, means for adjusting the applying part for printing surfaces of different curvatures, and means for driving the inking mechanism in unison with the printing surfaces irrespective of the curvature thereof, substantially as described.

42. In a printing press the combination with an impression cylinder, of means for supporting a plurality of printing cylinders of different diameters in coöperative relation with the impression cylinder, inking and damping mechanisms for the printing cylinders, and means for driving said inking and damping mechanisms in coöperative relation with successive printing cylinders of different diameters, substantially as described.

43. In a planographic press the combination with an impression surface of means for removably and replaceably supporting curved planographic printing surfaces of different curvatures in coöperating relation with the impression surface, an inking mechanism comprising a fixed ink distributing part and an ink applying part adjustable for different curvatures of printing surfaces, and means for separating or bringing together the applying portion and a printing surface.

44. In a multicolor planographic printing press the combination with an impression mechanism of means for removably and replaceably supporting successive series of curved planographic printing surfaces of the same or of different curvatures in coöperating relation with the impression mechanism, a series of inking mechanism, one for each printing surface, each comprising a fixed ink distributing part and an ink applying part adjustable for different curvatures of printing surfaces, means for separating or bringing together said ink applying part and the printing surfaces and means for driving such inking mechanism in unison with a corresponding printing surface irrespective of the curvature of the latter, substantially as described.

45. In a printing press, the combination with a printing surface, of means having a displaceable section for moving the printing surface into or out of position for printing, and a displaceable frame section, whereby the printing surface may be removed from the press, substantially as described.

46. In a printing press, the combination with a printing surface, of means having a hinged section for moving the printing surface into or out of position for printing, and a hinged frame section, whereby the printing surface may be removed from the press, substantially as described.

47. In a printing press, the combination with impression mechanism, of a plurality of printing surfaces, means for moving the printing surfaces into or out of coöperative relation with the impression mechanism, said means having a displaceable section for each printing surface and a displaceable frame section for each printing surface, whereby the printing surfaces may be removed from the press, substantially as described.

48. In a printing press, the combination with an impression drum of a plurality of printing surfaces arranged concentrically with the drum, means for moving the printing surfaces into or out of coöperative relation with the drum, said means having a displaceable section for each printing surface and a displaceable frame section for each printing surface, whereby the printing surfaces may be removed from the press, substantially as described.

49. In a printing press, the combination with a support and a printing form removably and replaceably mounted thereon, of displaceable means for supporting one end of the form support in the press, and supporting means for the other end of the form support so constructed as to sustain the form support when said displaceable means is inactive, substantially as described.

50. In a printing press, the combination with a support and a printing form removably and replaceably mounted thereon, of means for moving the printing form into or out of position for printing, said means having a member removably engaging the form

support at one end and a second member constructed to so engage the other end of the form support as to sustain the same when the first member is disengaged, substantially as described.

51. In a printing press, the combination of an impression mechanism, and means for supporting successive sets of curved printing surfaces of the same or of different curvatures in coöperative relation with the impression drum, and means common to two or more of said printing surfaces for separating or bringing together said surfaces and said impression mechanism, substantially as described.

52. In a printing press, the combination of an impression drum, and means for supporting successive sets of curved printing surfaces of the same or of different curvatures in coöperative relation with the impression drum, and means common to two or more of said printing surfaces for moving said surfaces into or out of contact with the impression drum, substantially as described.

53. A printing press including in combination, an impression cylinder, means for supporting printing cylinders of different diameters in coöperative relation with the impression cylinder, an inking mechanism having a plurality of applying rollers independently adjustable for different diameters of printing cylinders, and means for moving said rollers into and out of contact with the printing surfaces.

54. A printing press including in combination, an impression cylinder, means for supporting printing cylinders of different diameters in coöperative relation with the impression cylinder, an inking mechanism having a plurality of applying rollers adjustable for different diameters of printing cylinders, and means for simultaneously moving the applying rollers into and out of contact with the printing surfaces.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

GEORGE E. PANCOAST.

Witnesses:

JOSEPH P. KNAPF,

GUSTAV H. BURK.