R. T. JOHNSTON.

PRINTING PRESS.

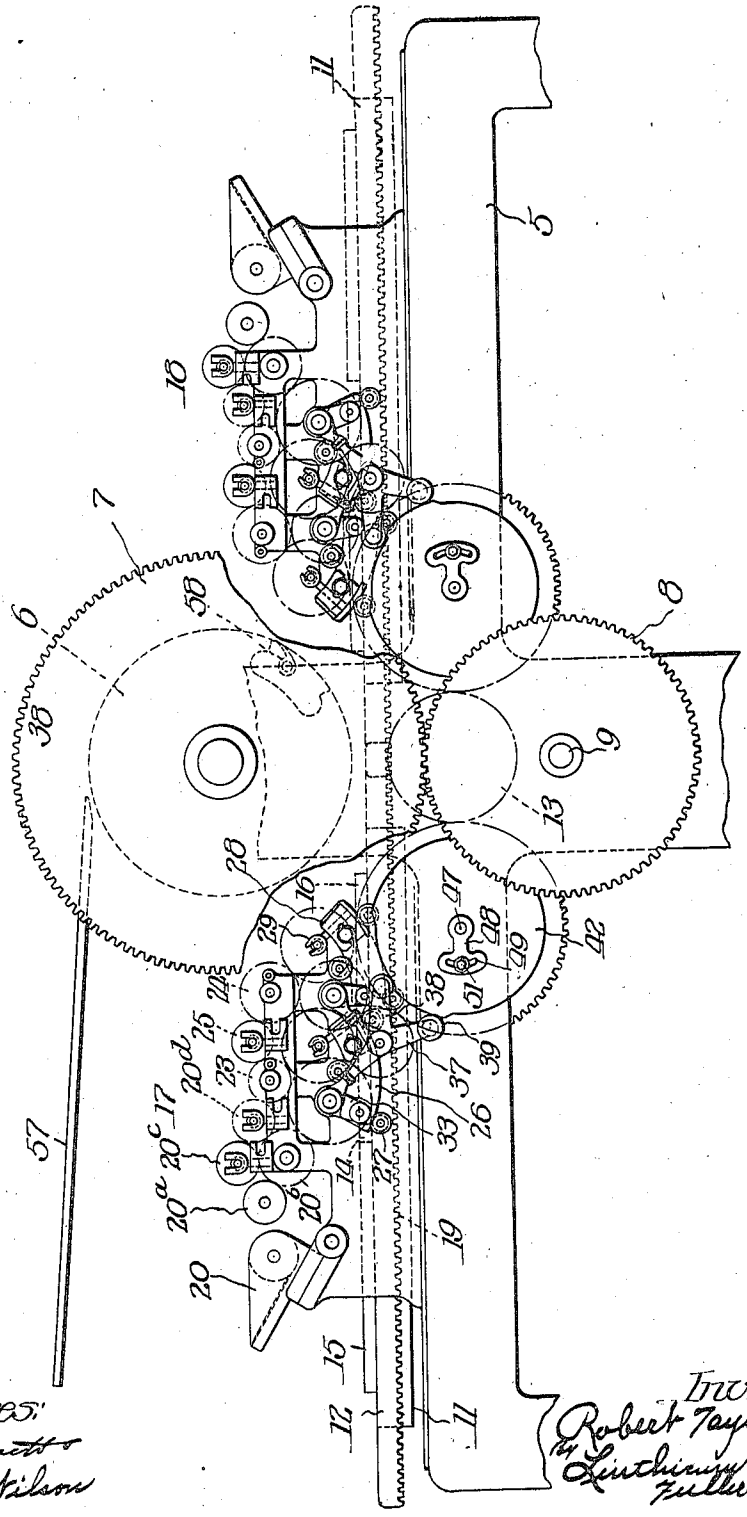
APPLICATION FILED DEC. 4, 1911.

1,069,654.

Patented Aug. 5, 1913.

4 SHEETS—SHEET 1.

Fig. 1



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4 SHEETS—SHEET 2.

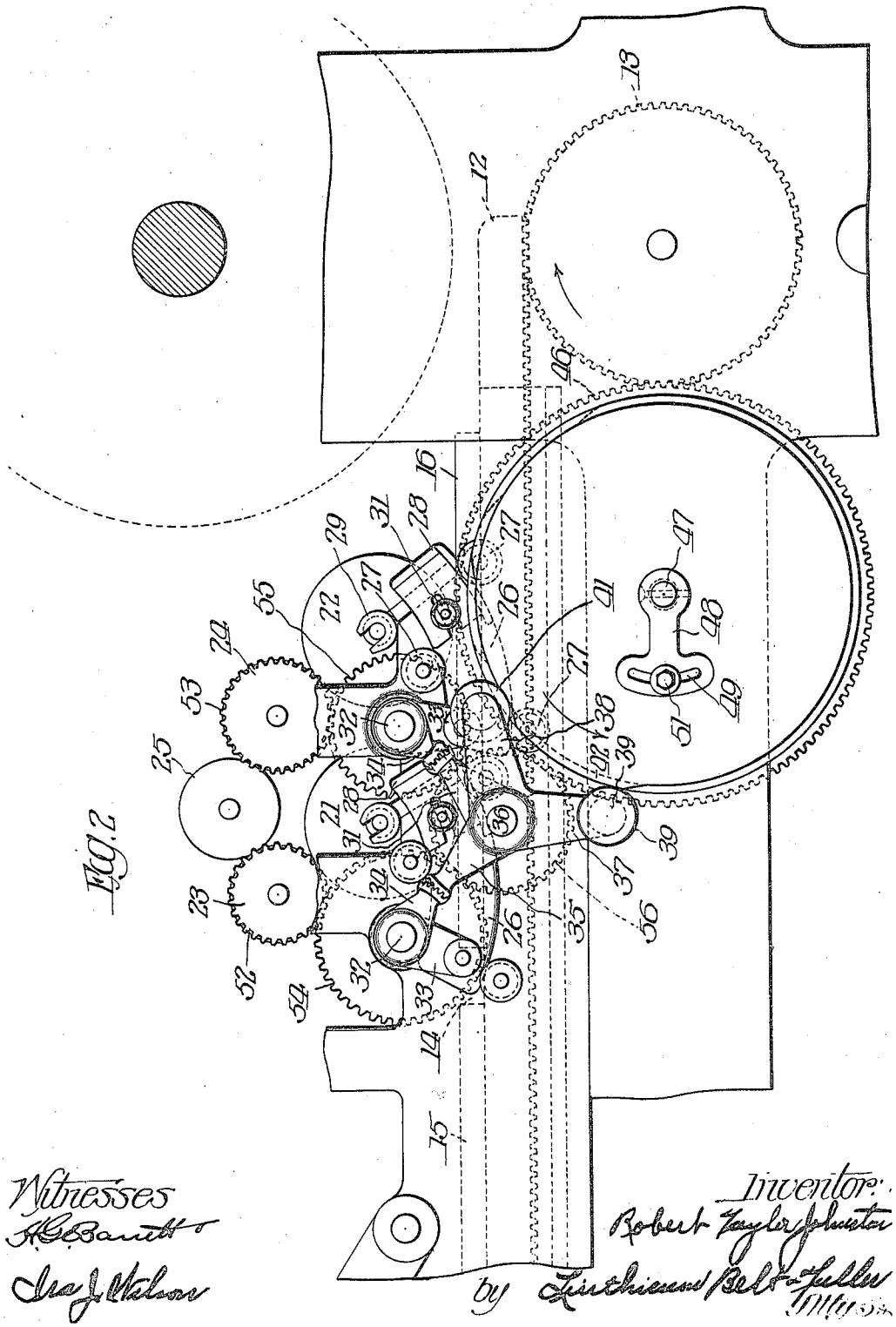

Fig. 2.

Witnesses

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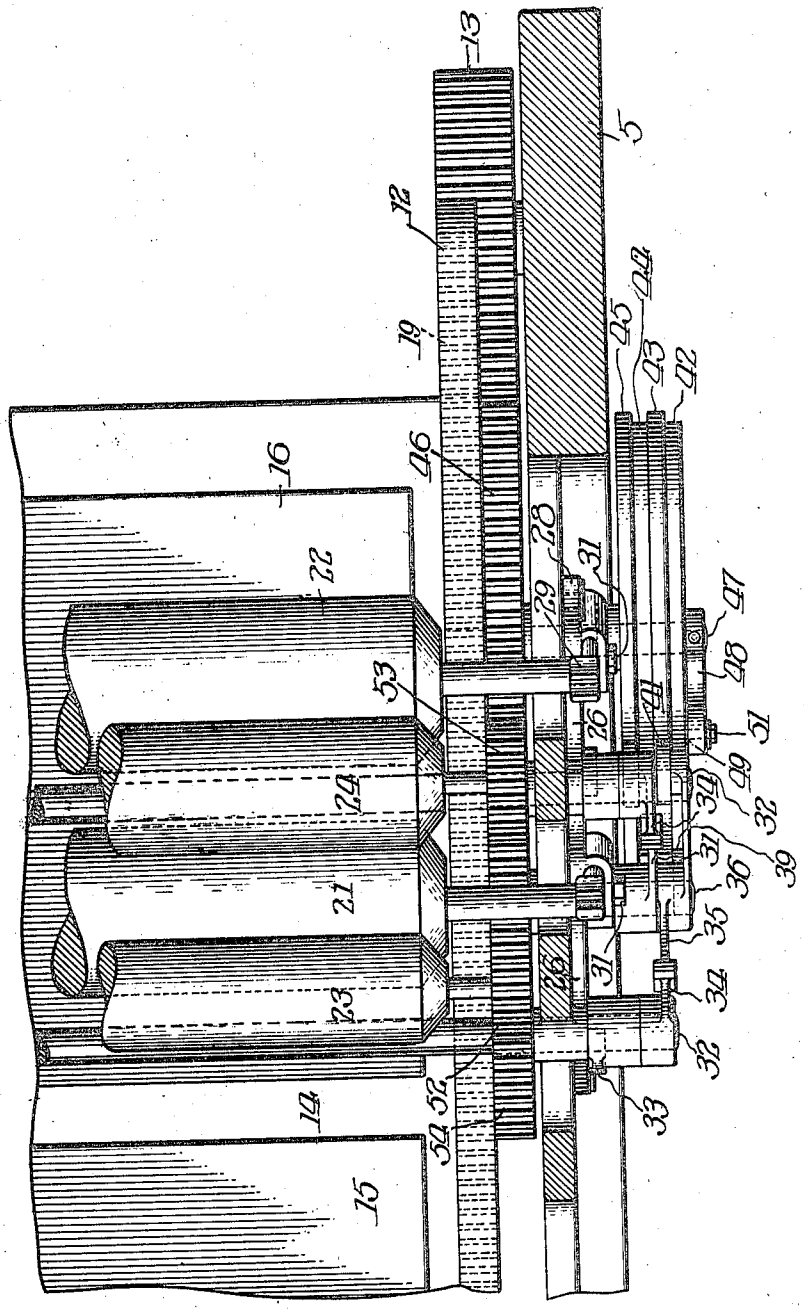
4 SHEETS—SHEET 3.

Fig. 3



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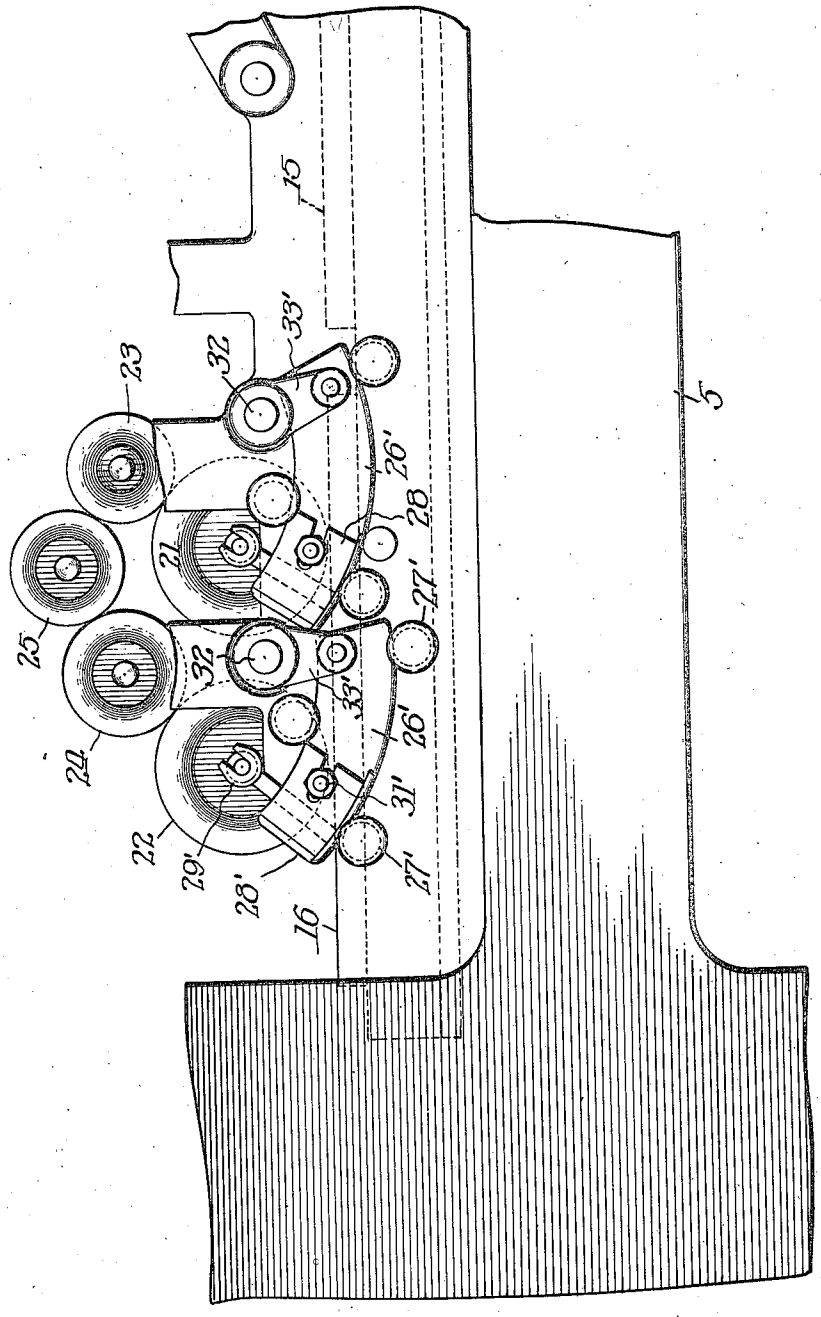

Fig. 4

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UNITED STATES PATENT OFFICE.

ROBERT TAYLOR JOHNSTON, OF SCOTCH PLAINS, NEW JERSEY.

PRINTING-PRESS.

1,069,654. Specification of Letters Patent. Patented Aug. 5, 1913.

Application filed December 4, 1911. Serial No. 663,826.

To all whom it may concern:

Be it known that I, ROBERT TAYLOR JOHNSTON, a citizen of the United States, residing at Scotch Plains, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Printing-Presses, of which the following is a specification.

This invention relates in general to printing presses, and more particularly to presses of the type commonly known as bed and cylinder presses in which the entire form is printed at one operation. Prior to my invention, two distinct types of machines of this general character have been employed. In the one type the inking rolls are all mounted at one side of the printing cylinder with the result that the travel of the printing form must be continued a considerable distance beyond printing position in order to pass the form under the rolls. Since the diameter of the impression cylinder is determined by the length of the stroke of the form-carrying bed, it is obvious that this excess or surplus movement of the form beyond its printing travel necessitates a larger cylinder and correspondingly larger and heavier machine parts than would be required if the stroke could be shortened to the actual printing travel, and the output is also less than that of a shorter stroke machine running at the same linear speed. Furthermore, in this type of machine the ink is applied to the printing form in the shape of a wedge gradually tapering in thickness from the end first brought into contact with the inking rolls to the opposite end, and in order to obtain the required thickness of ink at the thin edge of the wedge, a surplus must necessarily be applied at the opposite end. Notwithstanding the fact, however, that a considerable quantity of ink is thus wasted, an even and uniform distribution over the form cannot be procured. In the other type of machine, the inking rolls are arranged in sets, and mounted at each side of the impression cylinder, each set being designed to ink a part of the form only. In order to obviate reversing the rolls on the form, mechanism has been employed to lift all of the rolls of each set simultaneously from the form previous to the reversal of the bed, but this operation produces objectionable streaking of the form at the point where the rolls leave and reëngage therewith. A further and very prominent disadvantage of this second type of machine resides in the fact that a greater quantity of ink is applied to the center of the form where the rolls of the sets overlap than at any other point on the form. Manifestly this type of machine is also incapable of evenly and uniformly distributing the ink over the printing form. My present invention however aims to provide a printing press which will overcome all of the objectionable features heretofore mentioned, and in order to accomplish this result I have provided various novel mechanisms, each designed with the object in view of improving the construction and operation, and increasing the efficiency of the press.

One of the objects of the invention is to shorten the stroke of the press, or, in other words, to reduce the amount of travel of the bed to a minimum, this desideratum being attained by mounting the inking rolls so that the entire printing form will be inked within the limits of the stroke required for the actual printing operation.

Another object of the invention is to secure an even and uniform distribution of the ink over the printing form. This result is accomplished by inking the portions of the form on opposite sides of the central margin separately and independently by individual inking mechanisms, constructed to apply uniform layers of ink evenly over the entire surface of each portion from one end to the other, thereby obviating the objectionable overlapping and tapering distributions heretofore unavoidable.

A further object is the provision of adjusting means whereby the inking mechanisms may be adjusted to printing forms of various sizes and proportions and the operation of said mechanisms timed and graduated to the particular form being used.

Other objects and advantages of my present invention will be apparent from the following description when considered in connection with the accompanying drawings illustrating one preferred embodiment thereof.

Referring to the drawings:—Figure 1 is a side elevation of a printing press embodying

my invention, Fig. 2 is a similar view on an enlarged scale showing one set of inking mechanisms, Fig. 3 is a fragmentary plan view of the inking mechanism shown in Fig. 2; and Fig. 4 is a view substantially similar to Fig. 2, but looking at the opposite side of the machine.

On the drawings, 5 designates generally the main frame of the machine which may be of any usual or preferred construction. Upon the frame is mounted the impression cylinder 6 equipped with the gear 7, meshing with and driven by the gear 8 mounted on the main shaft 9 to the inner end of which is connected any well-known or preferred mechanism (not shown) for reciprocating the form bed 11. The rack 12 carried by the bed 11 is adapted to operate the driving gear 13 meshing therewith from which motion is transmitted to the inking mechanisms as will be hereinafter described more in detail.

It is well-known that practically all or at least a very large percentage of the work done on flat bed presses requires that the printing form be divided transversely by a central margin. On the drawings I have shown such a form mounted on the bed 11 and divided by the margin 14 into a head portion 15 and a tail portion 16 respectively. These portions may be of any preferred construction, but are customarily composed of a number of individual sections. In order that the movement or stroke of the form carrying bed may be confined within the limits of the stroke required for the actual printing operation, I have provided mechanism for inking the form before it reaches the limits of its printing travel. In the particular embodiment of my invention disclosed on the drawings, two sets of inking mechanisms designated generally by reference characters 17 and 18 are employed, these sets being mounted on opposite sides of the impression cylinder 6. The inking mechanism 17, which will hereafter be referred to as the head mechanism, is adapted to apply ink evenly and uniformly over the head portion 15 of the printing form while the inking mechanism 18 hereafter referred to as the tail mechanism is adapted to apply ink evenly and uniformly on the tail portion 16 of the form. Each inking roll of the head mechanism is designed to contact with the head portion of the form throughout its entire length, mechanism being provided to prevent contact of these rolls with the tail portion of the form, and likewise the individual rolls of the tail mechanism are each designed to contact with the tail portion of the form throughout its entire length, similar mechanism being provided to prevent contact of these rolls with the head portion of the form. Since the head and tail inking mechanisms are substantially similar in all respects, a detail explanation of one of these mechanisms will be sufficient for the purposes of the present application.

Considering the head mechanism 17 as illustrative of both the head and tail inking mechanisms it will be observed, by referring to the drawings, that this mechanism is carried on a frame 19 which is slidably mounted on the main frame 5 of the machine, so that the mechanism can be moved bodily away from the printing cylinder to permit access to the printing form when desired.

The inking mechanism comprises one or more inking rolls, two being shown for purposes of illustration on the drawings and designated by reference numerals 21 and 22 respectively. It will be apparent, however, as the invention is better understood that the number of inking rolls in each set of mechanism may be increased or diminished if desired. The ink is supplied to these inking rolls from the individual distributing rolls 23 and 24, respectively, each contacting with the intermediate distributing roll 25, the roll 23 being adapted to receive its supply of ink from the ink fountain 20 in the usual manner through the ductor roll 20^a and the intermediate distributing rolls 20^b, 20^c and 20^d.

In order that each of the inking rolls 21 and 22 may be prevented from contacting with the tail portion 16 of the printing form, and may be positively held with unvarying pressure in contact with the head portion 15 of the form throughout its entire length, I have provided mechanism for positively holding the rolls in contact with the head portion of the form during the forward travel of this portion thereunder, then lifting these rolls successively at the margin 14 and subsequently lowering them in succession and positively holding them in contact with the head portion to re-roll the same upon reverse movement of the bed. To insure an uninterrupted distribution of ink from the distributing rolls 23 and 24 to the inking rolls 21 and 22 in both raised and lowered positions, the inking rolls are so mounted that they are raised and lowered in arcs concentric with the centers of the distributing rolls, uniform contact between the rolls and the distributers being thereby maintained at all times. With this end in view I have provided sector plates 26 and 26′ mounted in pairs on opposite sides of the machine frame between guides which, in the present instance, are shown in the form of flanged rolls 27 so positioned that said plates when reciprocated longitudinally are guided thereby in arcs concentric with the distributers 23 and 24, respectively. Upon the outer end of the plates are adjustably mounted socket holders 28 carrying the sockets 29 in which the opposite ends of the inking rolls are supported. A slot and bolt connection 31 enables the inking rolls to be

adjusted on the plates toward and from the printing form. The sockets 29 have open tops so that the inking rolls can be readily lifted out of the sockets after the distributers have been removed and the sockets are preferably adjustably mounted on the socket holders to enable the rolls to be adjusted toward and from the distributers. For the purpose of simultaneously actuating the individual plates of each pair to raise and lower both ends of each roll in unison there are provided cross shafts 32 extending across the machine adjacent to each inking roll, and the sector plates are operatively connected with said shafts through arms 33, 33′ fixed on opposite ends of the shafts and pivoted at their extremities to the plates. It will be manifest that oscillatory movements of the shafts 32 will cause the plates 26 and 26′ of each pair to be equally reciprocated, and that by reason of the curved shape of the plates and the position of the guiding means therefor, the inking rolls are thereby raised and lowered without breaking contact with their respective distributers. Each shaft 32 has fixed thereon a radially projecting segment 34 meshing with a similar segment 35 forming part of a casting pivotally mounted on a stub shaft 36, which casting has also the radially projecting arms 37 and 38, carrying at their extremities the cam followers 39 and 41, respectively.

Since it is essential in order to avoid streaking of the printing form that each inking roll contact with the portion of the printing form to be inked thereby throughout its entire length, and also be prevented from contacting with the other portion of the form, I have provided mechanisms for positively lowering each of the rolls in succession at the central margin of the form. The mechanism for effecting this result includes in the present instance, a set of cams designated 42, 43, 44 and 45, respectively (Fig. 3), mounted on the shaft 47, and adapted to operatively engage the pairs of cam followers 39 and 41, and thereby oscillate the shafts 32. The cams 42 and 43 are complements of each other, and coöperate respectively with one pair of the followers 39 and 41 to positively raise and positively lower the inking roll 21 and the cams 44 and 45 are likewise complements of each other and coöperate with the other pair of followers to positively raise and lower the roll 22. All of these cams are rigidly connected, and are rotated simultaneously and alternately in oppcsite directions by the gear wheel 46 fixed on the inner end of the cam shaft 47, this gear being in turn operated by the driving gear 13 meshing with the rack 12 carried by the form bed as previously stated. The cams and the driving mechanism therefore are preferably so proportioned that the lifting and lowering portions of the cams will be brought into operative relation with the followers to raise and lower each inking roll but once at each complete cycle of the bed.

Since the position of the head line of the printing form is fixed and unchangeable, any variation in the size of the form portions will necessarily alter the position of the central margin 14. The timing of the raising and lowering movements of the inking rolls must consequently be varied to correspond with the variations in position of the margin and to effect this variation in the timing of the rolls I have provided mechanism for adjusting the set of cams about the shaft 47 upon which they are rotatably mounted. To this end, an arm 48 fixed to the outer end of the shaft 47 is provided with a curved slot 49 through which an adjusting bolt 51 is threaded into the cams to lock the cams to the shaft. Upon loosening this bolt the cams can be adjusted angularly on the shaft to correspond to the position of the central margin on the particular printing form being used, thereby hastening or retarding the times at which the rolls are raised and lowered proportionately to the change in position of the margin.

The inking rolls are rotated by frictional engagement with their respective distributers in the usual manner, and the distributers are provided with gear wheels 52 and 53 adapted to be driven by gear wheels 54 and 55, respectively, mounted concentrically with the cross-shafts 32 and in turn driven from the idler 56 meshing with the gear 46 fixed to the inner end of the cam shaft 47. It will thus be obvious that the driving mechanism for rotating the rolls is located entirely within the frame of the machine, while the mechanism for raising and lowering the rolls is mounted outside the frame in easily accessible position for adjustment.

In the operation of the printing presses employed prior to my present invention, the inking rolls each make more than one revolution while in contact with the printing form, and lose of course a portion of their ink at each revolution. The result is an application of ink to the printing form in the shape of a wedge gradually tapering in thickness from the end of the form first brought into contact with the inking rolls to the opposite end. To obviate this defect and insure a uniform distribution of ink over the entire printing form, I have divided the form and constructed the inking rolls so that the circumference of each roll is equal to or greater than the length of that portion of the form to be inked thereby. Thus the inking rolls are never permitted to make more than one revolution while in contact with the form, and the result is that a uniform film of ink is evenly distributed

over the entire surface of the form from one end to the other. For the purpose of re-distributing the ink over the inking rolls before re-rolling the form in the opposite direction the various mechanisms are so timed and arranged that, after the initial inking operation and before the return or re-rolling operation, the inking rolls are further rotated in contact with their distributers, to re-distribute the ink on the rolls, thus insuring a uniform distribution of ink over the form upon the return stroke as well.

The operation of my invention briefly is as follows:—The paper is fed from the feed board 57 to the grippers 58, carried around by the cylinder, printed from the printing form and delivered to any suitable delivery mechanism, in the usual way. The inking rolls 21 and 22 of the head inking mechanism remain in lowered or operative position while the head portion 15 of the printing form is passing thereunder, and this portion of the form is inked thereby before the bed reaches the limit of its stroke, as shown in full lines in Fig. 1. Since the circumference of each of the inking rolls is equal to or greater than the length of the form portion being inked, fresh surfaces of the roll are presented to the portion throughout its entire area, and an even and uniform distribution of the ink is insured. The printing rolls 21 and 22 are raised in succession as the central margin 14 passes under them and are held in raised position above the tail portion 16 until the return of the margin, whereupon the rolls are successively and positively lowered and held in lowered position in operative relation to the form to re-roll the head portion upon return movement of the bed. The rotation of the inking rolls is continued after they leave the form for the purpose of bringing the exhausted portions of the rolls into contact with their respective distributers so that a fresh supply of ink is acquired by the rolls, which insures an even and uniform distribution of ink over the head portion upon the re-rolling operation. Upon the idle or return stroke of the bed the tail portion 16 of the form is inked in a similar manner by the inking rolls of the tail inking mechanism 18, these rolls being likewise elevated in succession as the central margin passes under them, and provided with a fresh supply of ink for application to the tail portion of the form at the re-rolling operation after the bed is again started in the forward direction. The lifting and lowering cams are positively connected with the bed as previously described, and are operated thereby and co-incidently therewith. By means of the cam adjusting mechanism the raising and lowering movements of the rolls can be varied and timed to correspond to the position of the central margin on forms of various sizes and constructions. It will be obvious that the driving mechanism for the inking rolls is located inside the machine frame, while the raising and lowering mechanism and adjusting means therefor are located outside the frame where they are easily accessible for purposes of adjustment. The rack 12 is mounted on the bed 11, and meshing with the gear 13 is of sufficient length to remain in mesh with the gear when the bed reaches the limit of its stroke in both directions as shown in full and dotted lines at the left and right respectively in Fig. 1. The inking rolls are positively raised and lowered by the raising and lowering cams, but the followers are mounted on slidable frames so that the inking mechanisms may be moved outwardly to permit access to the form without uncoupling any connecting links or devices between the inking mechanisms and the driving mechanism. Upon the return of the inking mechanisms to operative position the cam followers will be automatically returned to operative relation with the cams, and the parts will automatically adjust themselves so that the machine may be started without any manual coupling or adjustment of any of the parts.

While I have shown and described a preferred embodiment of my invention, it will be apparent that various changes in the size, shape, proportion and arrangement of the various parts may be resorted to without departing from the spirit of the invention, or sacrificing any of the material advantages thereof.

I claim—

1. In a printing press, the combination of a reciprocatory bed, a form mounted on said bed divided transversely by a margin, a single impression cylinder adapted to effect a complete impression from the entire form at one revolution, a plurality of sets of inking rolls, mechanism for raising each roll of said sets individually as the form margin passes beneath the said rolls, and means for regulating the time at which the rolls will be raised to correspond to variations in position of the margin on said bed.

2. In a printing press, the combination of a reciprocatory bed, a form mounted on said bed and divided transversely by a central margin, a single impression cylinder adapted to effect an impression from the entire form at one revolution, a plurality of sets of inking rolls, and means for raising and lowering each roll of said sets individually and consecutively as said margin on the form reaches a position beneath the individual rolls during the operation of the bed.

3. In a printing press, the combination of a reciprocatory bed, a form mounted on said bed and divided transversely by a central margin, a single impression cylinder adapted to effect an impression from the en-

tire form at one revolution, a plurality of sets of inking rolls, means for raising and lowering each roll of said sets individually and consecutively as said margin on the form reaches a position beneath the individual rolls during the operation of the bed, and means for controlling the timing of said rolls to correspond with variations in position of said margin on the bed.

4. In a printing press, the combination of a reciprocatory bed, a form divided by a transverse margin mounted on said bed, a single impression cylinder adapted to effect an impression from the entire form at one revolution, a plurality of sets of inking rolls, and means for raising the rolls of each set individually when said transverse margin reaches a predetermined position with respect to each roll, said means being adjustable to compensate for variations in position of said predetermined point on the bed.

5. In a printing press, the combination of a distributing roll, an inking roll coöperating therewith, a pair of reciprocatory plates mounted to slide longitudinally and concentrically with the distributing roll, means for adjustably mounting the inking roll on said plates, a cross-shaft, arms fixed at each end thereof, pivotal connections between said arms and said plate, a plurality of cams mounted at one side of the machine, and connections between said cams and said cross-shaft whereby upon actuation of the cams the cross-shaft is positively oscillated in opposite directions to positively raise and lower said inking roll relatively to said distributing roll.

6. In a printing press, the combination of a reciprocatory bed, cams positively driven from said bed, a plurality of inking rolls, means actuated from said cams for positively raising and positively lowering said rolls at predetermined positions of the bed, and means for adjusting the positions of said cams relatively to the bed whereby to vary the time of raising and lowering of the rolls relatively to the bed.

7. In a printing press, the combination of a reciprocatory bed, a gear meshing therewith and driven thereby, cam mechanism mounted on the machine bed in position to be driven by said gear, a plurality of inking rolls adapted to be positively raised and lowered in succession by said cam mechanism, and means whereby the position of said cam mechanism may be varied relatively to said gear to vary the times of raising and lowering said inking rolls relatively to the bed.

8. In a printing press, the combination of a reciprocatory bed, a rack mounted thereon, a driving gear meshing with and driven by said rack, a driven gear meshing with said driving gear, a plurality of cams connected with said driven gear, inking rolls, a cam follower for each of said cams, operative connections between said followers and said rolls whereby the rolls are positively raised and positively lowered in succession from said cams, and means for adjusting the position of said cams relatively to the driven gear whereby to vary the times of raising and lowering said inking rolls relatively to the bed.

9. In a printing press, the combination of a main frame of a machine, a bed mounted to reciprocate within said frame, a shaft, driving connections mounted inside said frame for connecting said bed with said shaft whereby the shaft is operated from said bed, a plurality of inking rolls, and mechanism connecting said rolls with said shaft outside the frame whereby the rolls are raised and lowered upon reciprocation of the bed.

10. In a printing press, the combination of a main frame, a bed mounted to reciprocate within said frame, a cam shaft, mechanism connecting said shaft with said bed inside the frame whereby the shaft is operated from said bed, cam mechanism mounted on said shaft outside the frame, a plurality of inking rolls, and connections between said rolls and said cam mechanism whereby the rolls are positively raised and positively lowered upon reciprocation of the bed.

11. In a printing press, the combination of a plurality of inking rolls, individual distributing rolls for each of said inking rolls, a cross-shaft for each of said inking rolls, connections between said shaft and said inking rolls for raising and lowering said rolls upon actuation of the shafts, a driving gear, and intermediate gears mounted concentric with said cross-shafts and connecting said driving gear with each of said individual distributing rolls.

12. In a printing press, the combination of a printing form comprising head and tail portions divided by a margin, individual inking rolls for each of said form portions adapted to apply a uniform layer of ink to one portion of the form only throughout its entire length, individual distributing rolls for each of said inking rolls, means for rotating each of said distributing rolls, cam mechanism mounted outside the main frame of the machine, means for operating said mechanism co-incidently with the reciprocation of said printing form, and means adapted to be operated by said cam mechanism whereby the individual inking rolls of each set of inking mechanisms are positively raised and positively lowered in succession when said printing form reaches a predetermined position in its travel.

13. In a printing press, the combination of a reciprocatory bed, a form mounted on said bed divided transversely by a margin,

a single impression cylinder adapted to effect a complete impression from the entire form at one revolution, a plurality of sets of inking rolls, mechanism for lowering each roll of said sets individually as the form margin passes beneath the said rolls, and means for regulating the time at which the rolls will be lowered to correspond to variations in position of the margin on said bed.

14. In a printing press, the combination of a reciprocatory bed, a form divided by a transverse margin mounted on said bed, a single impression cylinder adapted to effect an impression from the entire form at one revolution, a plurality of sets of inking rolls, means for lowering the rolls of each set individually when said transverse margin reaches a predetermined position with respect to each roll, said means being adjustable to compensate for variations in position of said predetermined point on the bed.

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