May 3, 1927.

1,627,182

C. A. KELLOGG

PRINTING MACHINE

Filed April 11, 1922

3 Sheets-Sheet 1

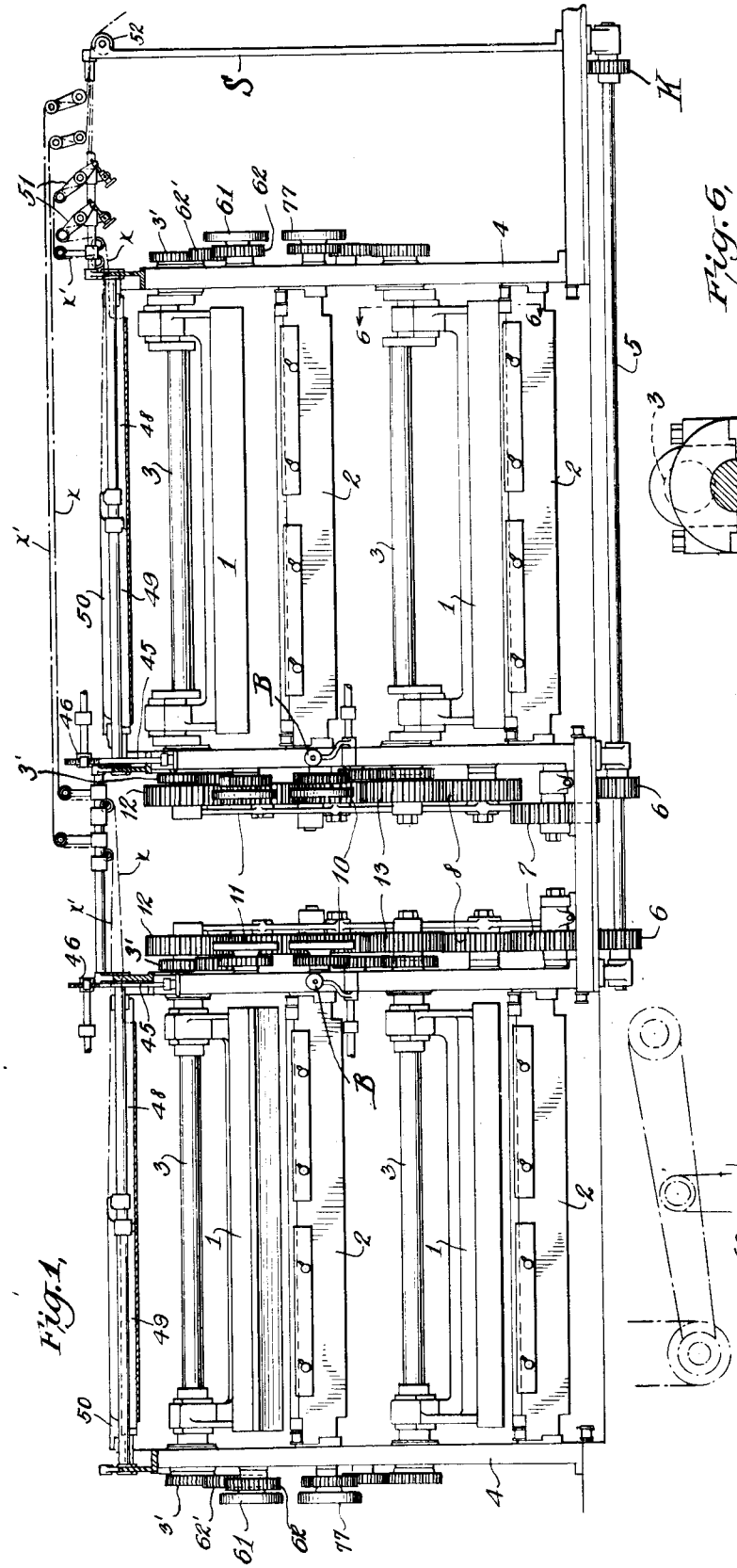

Fig. 1.

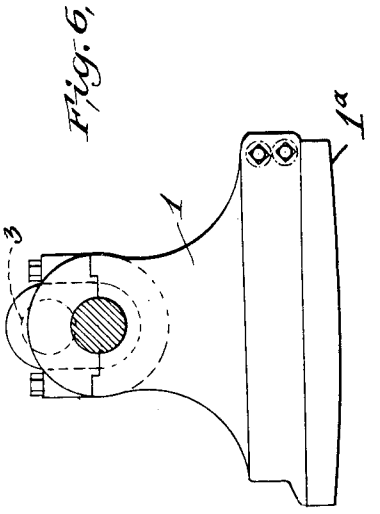

Fig. 6.

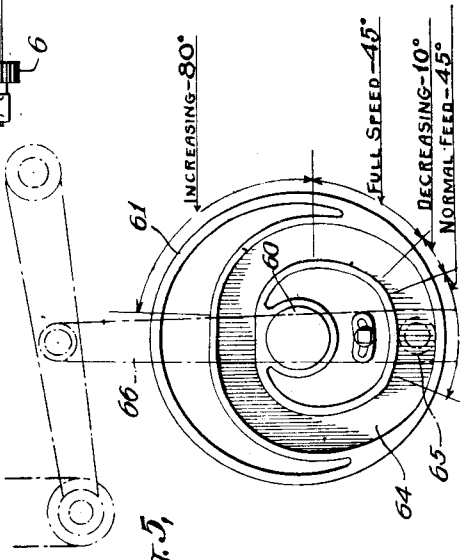

Fig. 5.

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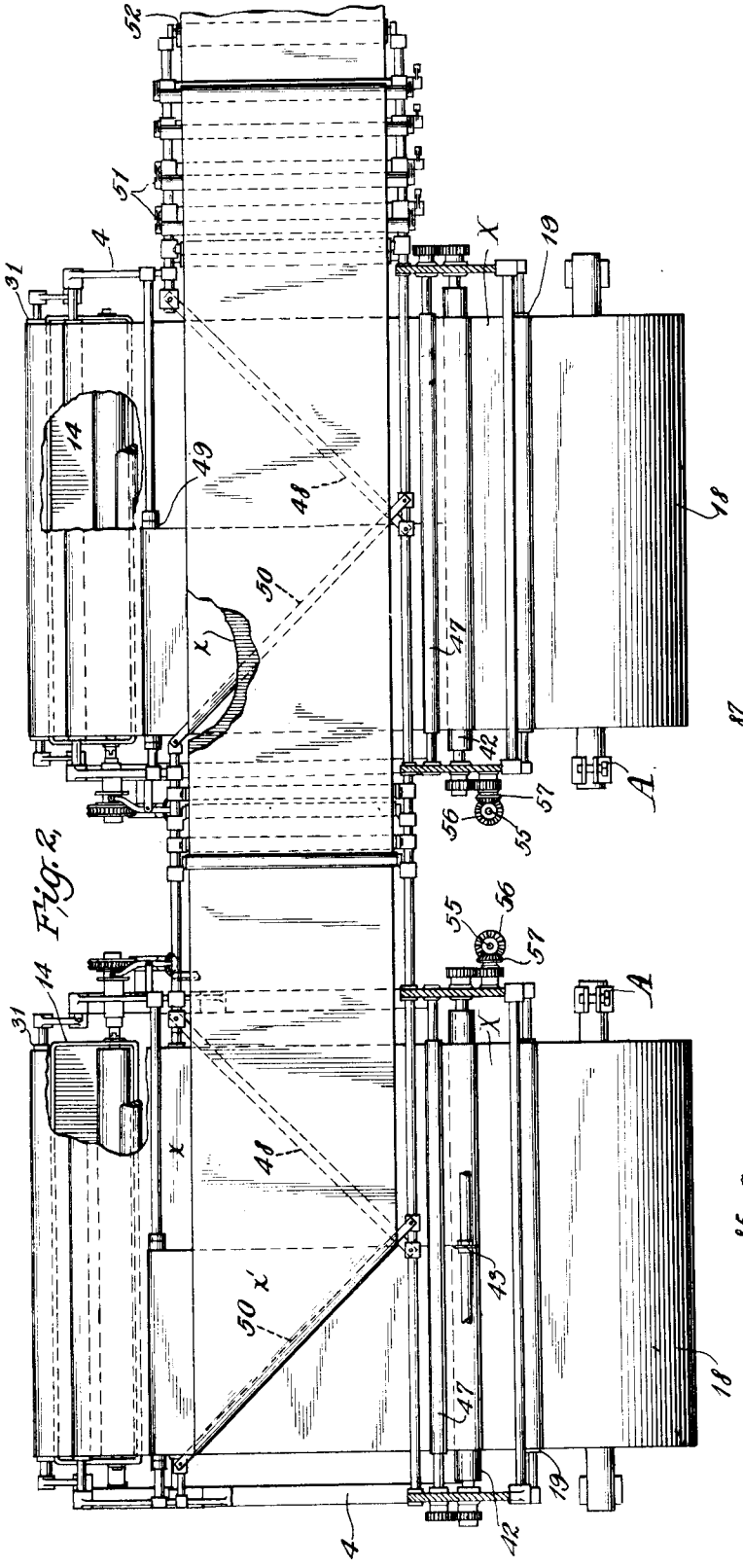

Fig. 2.

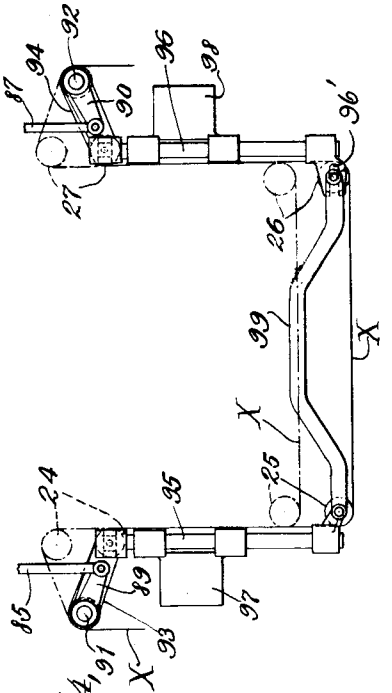

Fig. 4.

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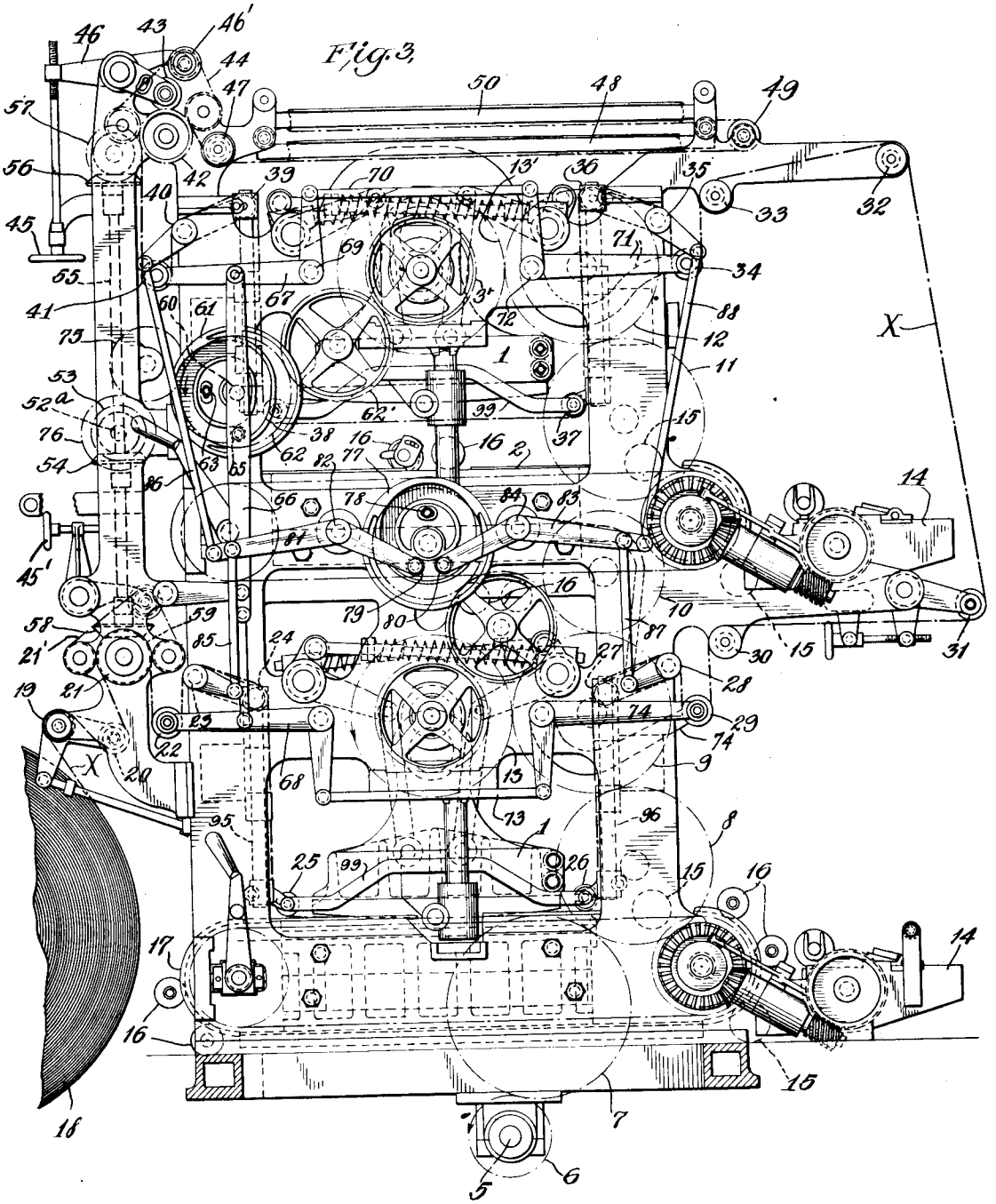
Fig. 3.



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Patented May 3, 1927. 1,627,182

UNITED STATES PATENT OFFICE.

CARL A. KELLOGG, OF BROOKLYN, NEW YORK.

PRINTING MACHINE.

Application filed April 11, 1922. Serial No. 551,526.

This invention is a printing machine and the object of the invention is to provide a printing machine embodying a plurality of printing units or couples associated with one another in a unitary machine in an efficient assemblage which will operate with maximum efficiency through the employment of a minimum number of parts. Another object of the invention is to permit of accessibility to the machine from all sides and allow the leading of the web of paper from above the floor level.

The present invention is particularly directed to the provision of such a machine which would employ printing couples embodying flat form beds and impression members, and the several couples of the machine are so set that but one couple is on impression at a time, thereby balancing the operation of the members and minimizing the power required to operate the machine. In assembling four or more printing couples in a single machine, they are preferably arranged in pairs, placed end to end, i. e., as regards the axis of oscillation or rotation of the platens or impression members, or placed side by side, and said pairs may be spaced apart to permit positioning of practically all of the actuating gearing between the pairs. Moreover, by this arrangement, all sides of all the couples are readily accessible. Also positioned between said respective pairs are all of the main web adjustment devices as well as certain other of the chief manually controlled devices of the machine, so that an operator may, while standing in substantially the same position, have easy access to these adjustments.

Each of the printing couples is preferably provided with its individual ink fountain, all of said fountains being positioned at one side of the machine so that easy access thereto may be had and the paper rolls are positioned at the opposite side of the machine. The paper is fed into the side of the machine and angle bars are provided above the machine to turn the web at right angles, said paper being finally led from the machine to a folder or folders, of the usual or any preferred type, which may be spaced therefrom. The web is preferably, but not necessarily, fed into and out of the machine continuously and means within the machine serves to shift the web alternately through each couple. Moreover, further means is provided for lifting the web from the form between impressions, which means is preferably so arranged that the length of the web is not changed.

A highly advantageous feature of the present invention consists in the provision of equalizing or looping mechanism, so constructed and operated that the web is very slowly brought to a stop for impression and very slowly speeded up during the shift between impressions. It is preferred that this mechanism be controlled through a novel arrangement of adjustable cams, wherein a single set of cams serves to operate each pair of looping rollers for each printing couple.

Another feature of the invention is that either one of the units may be thrown out of operation if desired so that either unit may be operated singly.

Features of the invention, other than those specified, will be apparent from the hereinafter detailed description taken in conjunction with the accompanying drawings and appended claims.

In the accompanying drawings, I have illustrated one practical embodiment of the invention, but the construction therein shown is to be understood as illustrative only, and not as defining the limits of the invention.

Figure 1 is a front elevation of a printing machine embodying the present invention, certain parts of the machine positioned on the near side thereof being omitted in the interest of clearness. This view shows one platen down on dead center and one up on dead center in one unit and one half way down and one half way up in the other unit.

Figure 2 is a plan view of the machine.

Figure 3 is an end elevation thereof.

Figure 4 is a detailed showing of certain web lifting mechanism employed in the construction.

Figure 5 is a detailed elevation of a cam for operating the looping mechanism of each couple, certain parts of the operating connections being shown in dot and dash lines; and,

Figure 6 is a section on the line 6—6 of Figure 1, showing one of the platens in elevation.

In the machine shown in the accompanying drawings, four printing couples are employed, one printing and perfecting couple for each unit, each of which couples embodies a platen 1 and a form bed 2. In the preferred embodiment of the invention, each platen employed is of the character described and claimed in my co-pending application, Serial No. 518,641, filed November 29, 1921, whereas the form bed 2 is of the flat stationary type. Each platen is mounted for operation on a crank shaft 3 and these shafts are journalled for rotation in a frame 4 of the machine, in which the beds 2 are also mounted. Extending lengthwise under the machine is a shaft 5, which forms the main drive shaft of the machine. Upon the shaft 5 are two gears 6, each of which is the main drive gear for one unit. Each gear 6 drives a gear train composed of gears 7, 8, 9, 10, 11 and 12, and by throwing either gear 7 out of mesh either unit can be operated at will. The crank shaft 3 of the lower platen of each pair is driven from the gear 9, through a gear 13, meshing with gear 9 and mounted on shaft 3 and the crank shaft 3 of each of the upper platens is driven from a gear 13′ associated with said shaft and meshing with gear 12. By these connections, all the platens are operated from a common shaft 5 but the gearing is preferably so associated that the platens will be set quartering. That is to say, they will operate in succession. This construction manifestly serves to balance the operations of the machine as well as minimize vibration and jar, and also minimizes in the power required to operate the machine. To further minimize vibration of the platens individually, I have shown the platens as cushioned against shock through the employment of cushioning mechanism shown in my co-pending application Ser. No. 285,339, filed March 26, 1919.

With each printing couple is associated suitable inking mechanism of the character described and claimed in my co-pending application Ser. No. 285,340, filed March 26, 1919. The ink in this mechanism is contained in a fountain 14, and from there conveyed to an ink drum with which is associated vibrator or distributor rolls 15, and from this ink drum form rollers 16 are supplied and are operated by chains 17 which cause them to travel over the form and properly ink the same.

The printing couples of each printing and perfecting unit are fed from separate rolls of paper 18, as shown in Figure 2, and as the passage of the web from these rolls through both units of the machine is the same, the description of one will suffice for both. Referring now particularly to Figure 3, the web X, which is shown in dot and dash lines in this figure, is fed from the roll of paper 18 over a directional roll 19 to a tension roll 20, thence over a feed roll 21, with which are associated in-feed tapes 21′, to a looping roll 22. The tapes 21′ may be adjusted by the hand wheel 45′. From the looping roll 22, the web passes over a guide roll 23, and thence over and under a pair of lifting rolls 24 and 25 (see Figure 4), after which it is passed between the members of the lower printing couple. At the opposite side of said couple, the web passes about a lifting roll 26 and thence upwardly over another lifting roll 27, the lifting rolls 26 and 27 corresponding to the rolls 24 and 25, whence it passes over a guide roll 28 and to a second looping roll 29. From the looping roll 29, the web extends to and over a directional roll 30 to an adjustable roll 31. Having completed its travel through the mechanism associated with the lower printing couple, the web passes upwardly from roller 31 about two directional rolls 32 and 33, and to the first looping roll 34 of the upper couple, thence over a guide roll 35 to two lifting rolls 36 and 37, and after passing under the roll 37, extends directly between the members of the upper printing couple. At the opposite side of said couple, the web passes about lifting rolls 38 and 39, which correspond to 37 and 36, thence over a directional roll 40 to the second looping roll 41 of the upper printing couple. From the looping roll 41, the web extends over an out feed roller 42 with which co-operates a rotary slitter 43, the function of which is to slit the web longitudinally and divide it into two webs. With the out-feed roller 42 co-operates the usual feeding tapes or belt 44, common to web printing machines.

The tapes 44 may be regulated by manipulating the hand wheel 45, the threaded stem of which passes through a rocker arm 46 on which the pulleys 46′ are mounted. Leaving the slitter, the web sections pass under a directional roll 47 and one of said web sections x passes directly to and over an angle bar 48 which changes the direction of said web section, as shown in Figure 2, so that it now extends longitudinally of the machine. The other web section x' extends to a directional roll 49 and thence to and around an angle bar 50, mounted on a folder frame S, whence it is led in the same direction as the web section x. The folder associated with the frame S is driven from a gear K fixed on the shaft 5.

The web sections x and x' of all of the printing couples are led longitudinally of the machine to one end thereof where there are positioned a plurality of compensators 51 about which the web sections are passed and are thereafter led over a drag roll 52 to suitable cutting and folding mechanism, not shown.

In order that the webs leaving the rolls

18 may be properly tensioned, I preferably associate with the rolls 18 suitable means for this purpose. This means is shown in Figure 2 as embodying adjustable sleeves A for applying friction to the spindles of said rolls, though any other suitable means may be used. The webs may be further tensioned by means of adjustments 45′ shown in Figure 1.

Associated with each printing couple is means for controlling the passage of the web therethrough and this means embodies means for feeding the web, at a uniform speed, to the couple, looping rolls for controlling the movements of the web between the members of each couple before, during, and after impression, and means for raising and lowering the web relative to the form to maintain it free from the form and platen between impressions so that it may be readily shifted during this period. A further function of this raising and lowering means is to maintain the same length of web between two given points, as between rollers 23 and 28, at all times.

The feeding mechanism of each unit is preferably driven at a constant speed by a shaft 55, through a bevel gear 53. This gear 53 meshes with a bevel gear 54 mounted on the upright shaft 55. To the upper end of each shaft 55 is fixed a bevel gear 56 meshing with a bevel gear 57 on a stud on which another gear is mounted which drives the out-feed roll 42. On the lower end of each shaft 55 is fixed a bevel gear 58 which meshes with a bevel gear 59 having a similar connection with the in-feed and out-feed rolls of its respective unit at a constant speed.

It is desirable, in a printing machine of this character, that the web be fed into and out of the machine at a constant speed but that the particular portions of the web to be printed on be caused to pause with periods of rest or dwell while the printing is taking place upon such portions. In other words, it is desirable that substantially only those portions whereon any particular couple is printing, while on impression, remain stationary during such impression, and immediately after impression be shifted to present an unprinted portion of the web for the next operation of the printing couple. It is desirable, moreover, that these portions of the web be shifted at a relatively slow speed in order that the web will not become torn. To this end, the looping rolls 22 and 29 are associated with each of the lower printing couples and the looping rolls 41 and 34 are associated with each of the upper printing couples. This causes a very short part of the web to be shifted at any one time. An important practical feature of the machine of this invention is that the looping rolls of both the upper and lower couples may be operated from a single set of cams which are designated in the drawings by the reference numeral 61. Upon the studs 60, which support the cams, and at either side of each unit of the machine is mounted the cam 61 which is shown in detail in Figure 5. The cam 61 is loose on the stud 60 and is fast to a gear 62 which is mounted on the cam stud 60. Cams 61 are driven by gears 3′ and 62′ and are each slotted to receive a screw or bolt 63 which passes through the slot and into the gear 62. By tightening up this bolt or screw, the cam may be locked lightly to its adjacent gear, although when loosened, the slot in the cam allows of circumferential adjustment thereof to permit of very close adjustment with one another.

The gears 62 which serve to operate the cams 61 are driven through an idler 62′ from a gear 3′ fixed on the crank shaft 3 of the upper platen and on which the driving gear 13′ is fixed. The stud 52^a carries thereon a gear 76 which is driven through an idler 75 meshing with the gear 62.

The cam 61 is provided with a cam track 64 in which operates a roller 65, which is mounted on a push rod 66. The upper end of the push rod 66 is secured to a bell crank 67 and the lower end thereof has connection with a bell crank 68. The arm of the bell crank 67 to which the push rod 66 is secured carries one end of the upper looping roll 41, while the arm of the bell crank 68 to which the lower end of said rod is connected carries one end of the lower looping roll 22. It will be understood that the parts described are duplicated at the opposite side of each unit of the machine, so that both ends of the looping rolls may be simultaneously moved.

The bell crank 67 is fulcrumed at 69 and its other arm is secured by a link 70 to the corresponding arm of a bell crank 71, fulcrumed at 72 and carrying one end of the other upper looping roll 34. In like manner, the lower bell crank lever 68 is connected by a link 73 to a bell crank 74 which carries one end of the other lower looping roll 29. By connecting the looping rolls at the opposite sides of each printing couple through the link and lever connections specified both looping rolls of each pair will operate in synchronism in opposite directions so that when one roll ascends the other descends at the same speed for the same distance, and vice versa. This means allows of the feeding of the web at a constant speed into and out of the machine, the looping rolls serving to arrest the movement of the web between the members of each printing couple during impression and produce the aforesaid period of rest or dwell. As soon as the impression is completed, however, the looping rolls do not reverse their directions of move-

ment but continue in the same direction but at decreasing speed to a stop and then reverse.

Figure 5 shows the operation of the looping rollers and in this view one of the looping rollers is shown fully down or at the point where the feed of the web would be normal, that is, the web would be moving at the speed of the infeed and out-feed rollers. During the movement of the looping rollers in the direction to take up the web as it is fed in by the in-feed roller the web would only be caused to dwell or stop during the time that the roller 65 would travel that part of the cam marked full speed. By thus shaping this cam the web will not be stopped during the movement of the looping roller in a direction to take up the web as it is fed in by the infeed roller except during that part of its travel which is marked full speed which will take up the web as fast as it is fed in by the infeed roller. The other looping roller 29 will pay out the web as fast as the out-feed roller takes the web up thus causing the web to stop at the impression surface of the impression member during impression. While the roller 65 is traveling the parts of the cam marked increasing and decreasing the web will be brought slowly to a stop and slowly speed up again to normal, although the looping roller is moving in a direction to take up the web.

As shown in Figure 5, it will be clearly noted that the web will be held still for about 45 degrees or one-eighth of the total movement of the cam or only at that part marked full speed. In other words, the web will be held without movement for approximately one-eighth of the total travel of the platen thereby allowing seven-eighths of such movement in which to shift the web, thereby permitting the looping rollers to be moved from raised position to their full speed and back again to rest very gradually. Heretofore in presses in which looping rollers have been used, it has been necessary to hold the web still, as soon as the looping rollers started to move, whereas in this construction, the looping rollers start down slowly and the web is very gradually brought to a stop and subsequently gradually speeded up again. When the construction of this invention is employed, the web may be run at a much higher speed than would be the case if the web was suddenly stopped and speeded up again.

During impression, that part of the web between the couple will dwell, but between impressions it is adapted to be lifted free from the form bed and platen to allow of its ready shifting without drag or smutting. This lifting is accomplished through the association with each of the upper couples of lifting rollers 36, 37, 38 and 39 and through the association with each of the lower couples of rolls 24, 25, 26 and 27. In accordance with this invention, the lifting rolls of both upper and lower couples of each unit of the machine may be operated from a common prime mover in the form of a cam 77. The cam 77 is mounted in substantially the same way as the cam 61, upon a gear which is positioned immediately against the back of the cam and to which the cam is secured for adjustment by means of a belt or screw 78. With the cam 77 are associated two rollers 79 and 80 and by this arrangement the web lifting rollers are caused to follow the rolling movement of the platen while on impression. The roller 79 is secured to one arm of a bell crank 81 fulcrumed at 82, whereas the roller 80 is mounted on one arm of a bell crank 83 fulcrumed at 84. From one arm of bell crank 81 links 85 and 86 extend in downwardly and upwardly directions respectively and from the corresponding end of the bell crank 83 extend links 87 and 88. These links 85 to 88 inclusive serve to operate the web lifting rollers and for clearness in illustration, Figure 4 diagrammatically shows the manner in which the set of rollers of one lower couple may be operated and from the description of the construction of Figure 4, the operation of the lifting rollers of each upper couple will be manifest to those skilled in the art.

Referring now to Figure 4, the lower end of the rods 85 and 87 are connected to arms 89 and 90 fixed on rock shafts 91 and 92. On these rock shafts are rollers 23 and 28, also fixed arms 93 and 94 which are secured at their free ends to rods 95 and 96. The rods 95 and 96 are mounted for vertical reciprocation in guides 97 and 98 and each rod supports, at its lower end, one end of one of the lower lifting rolls 25 and 26, while the upper end of each carrier supports one end of each of the upper lifting rollers 24 and 27. As the cam 77 operates the links 85 to 88 inclusive, the rock shafts 91 and 92 are rocked and the rods 95 and 96 are operated to raise them from the lower full line position of Figure 4, which corresponds to the impression period, to the upper or dotted line position, which corresponds to the period between impressions.

In Figure 4 I have illustrated in a more or less diagrammatic manner the web lifting means for one of the couples and from this figure it will be apparent that the web lifting mechanism is such that the length of web is maintained constant between the rollers 91 and 92. Thus it will be noted that in the full line position of this figure the web is shown as wrapped around an appreciable portion of the rollers 91 and 92 while the rollers 25 and 26 are in lowered position. But when the rollers 25 and 26

are raised the web is wrapped to a greater extent about the rollers 24 and 27, but to a lesser extent about the rollers 91 and 92. This operation maintains the same length of web between rollers 91 and 92 at all times during the operation of these web lifting rollers and prevents uneven strains upon the web which would be caused if the length of web were changed. The rollers 25 and 26 are connected by rod 99 thereby maintaining said rollers at spaced distances apart and at the lower end of the rod 96 a slot 96′ is provided to permit of this.

I have hereinbefore referred to platen 1 as constructed in accordance with my invention described and claimed in my co-pending application Serial No. 518,641, filed November 29, 1921. The important feature of such platen is that it is provided with a curved impression surface in the form of an uneven or irregular curve which, instead of being struck from a single center as has heretofore been the case, is struck from a moving center. Figure 6 illustrates this platen clearly, the surface 1^a constituting the curved impression surface. By employing a platen having an impression surface struck from a moving center, I am able to obtain perfect impressions.

In the foregoing detailed description I have set forth the preferred practical embodiment of the invention. I wish it understood, however, that structural details may be modified, as by the substitution of equivalents, without departing from this invention, which is to be understood as broadly novel as is commensurate with the appended claims.

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

1. A printing press embodying four printing couples, each of which comprises a flat form bed and an impression platen, said couples being arranged in tiers positioned end to end and means for actuating the several couples in predetermined timed sequence.

2. A platen press embodying four printing couples, each of which comprises a flat form bed and a platen, said couples being arranged in tiers of two positioned end to end, and means for actuating said couples, the actuating means for the several couples being set quartering to one another, whereby the press is balanced during operation.

3. A printing machine embodying a plurality of printing couples having substantially flat beds and platens, and arranged in tiers positioned end to end, ink fountains for the respective couples positioned at one side of the machine and means for delivering a paper web to the other side thereof.

4. A printing mechanism embodying a plurality of printing couples having substantially flat beds and platens, and arranged in tiers positioned end to end, and means for feeding a web to each tier of couples, the feeding means for all of the tiers being at the same side of the machine.

5. A printing machine embodying a pair of printing couples one of which is arranged above the other, and each of which embodies form and impression members, means for moving the impression members of the respective couples off impression alternately, and means for guiding a web first between the members of one couple and then between the members of the other couple, said means embodying web looping rolls and web lifting rolls co-acting with the members of each couple and adjustable means for controlling the operations of said rolls.

6. A printing machine embodying a plurality of printing couples, web lifting and looping mechanism associated with each couple, a single set of cams for operating the web lifting rolls of a plurality of couples, and means for operating said cams.

7. A printing machine embodying a printing couple and a perfecting couple, web lifting mechanism associated with each couple and means for operating the web lifting mechanism of the respective couples alternately.

8. A web printing machine embodying a plurality of printing couples arranged in tiers positioned end to end and each of which printing couples include a bed adapted to support a flat form, and a platen having a curved impression surface pivotally supported at a point between said surface and its center of curvature, and looping mechanism embodying means associated with each couple for bringing the web slowly to a stop to receive impressions and slowly speeding up the web between impressions.

9. A web printing machine having a plurality of printing couples tiered one above another, each embodying a bed adapted to support a flat form and a co-acting segmental impression member, and vertically directed driving means at the ends of said couples having connection with the movable members of the respective couples to drive the same.

10. A web printing machine having a plurality of printing couples tiered one above the other, each embodying a bed adapted to support a flat form and a co-acting segmental impression member, a driving shaft extended beneath said couples in vertical alinement with the members thereof, and vertically directed means at the ends of said couples, driven from said shaft and having connection with the movable members of the respective couples to drive the same.

11. A web printing machine having a plurality of printing couples tiered one above another, each embodying a bed adapted to

support a flat form and a co-acting segmental impression platen, a drive shaft, and toothed gearing at the ends of the machine, driven from said shaft and having connection with the movable members of the respective couples to drive the same.

12. A web printing machine having a plurality of printing couples tiered one above another, each embodying a bed adapted to support a flat form and a substantially flat impression member mounted for rocking movement in printing relation to its companion bed, and vertically directed driving means at the end of the machine, having connection with the impression members of the respective couples to drive the same.

13. A web printing machine having a plurality of printing couples, tiered one above another, each embodying a bed adapted to support a flat form and an impression member having a curved impression surface in printing relation to its companion bed, supports for said impression members eccentric to the curved surfaces thereof, and positioned between their curved surfaces and the centers of curvature thereof, and vertically directed driving means at the end of the machine having connection with the impression members of the respective couples to rock them upon their respective eccentric supports.

14. A web printing machine having a plurality of printing couples tiered one above another, each embodying a bed adapted to support a flat form, and an impression member having a curved impression surface in printing relation to its companion bed, supports for said impression members eccentric to the curved surfaces thereof, and toothed gearing at the end of the machine having connection with the impression members of the respective couples to rock them upon their eccentric supports.

15. A web printing machine embodying a plurality of printing couples arranged in tiers positioned end to end and each of which printing couples include a form bed and a platen having a curved impression surface, and web manipulating mechanism for feeding a web between the members of each couple with intervals of dwell during impression and including means for withdrawing the web from the curved surface of the platen between impressions and operable to compensate for variations in the path of the web due to its withdrawal from such curved platen surface.

16. A web printing machine having a printing couple including a bed adapted to support a flat form and a platen having a curved impression surface pivotally supported at a point between said surface and its center of curvature, and looping mechanism operable, while moving in one direction, to cause the web to dwell for impression during only a part of such movement.

17. In a printing machine, a plurality of printing couples arranged in tiers positioned end to end and each of which embodies a flat form bed, and a platen mounted for rocking movement on an axis extending longitudinally of the machine.

18. In a printing machine, a printing couple, one member of which is a bed adapted to support a flat form and the other member of which is a rocking segmental platen, means operable to bring one member of the couple on and off impression, means for guiding a web between the members of the couple, said guiding means being operable for movement in a substantially vertical path to free the web from said couple when off impression and to position it for impression.

19. In a printing machine, printing and perfecting couples positioned one above the other and each of which embodies a bed adapted to support a flat form and an impression member, means to actuate the impression members of said couples to cause them to cooperate with their respective beds for the purpose of impression, and a shaft beneath the couples for operating the actuating means.

20. A printing machine embodying a plurality of printing couples, each of which comprises a flat form bed and a segmental impression platen, said couples being arranged one above the other, and angle bars above the top couple to turn a web at right angles to the direction from which it is received from the lower couple.

21. A printing press embodying a plurality of printing couples, positioned one above the other and each of which comprises a bed adapted to support a flat form, an oscillating segmental impression member, means for feeding a web into and out of the press, means to guide the web between the members of the respective couples, and means positioned above the uppermost couple for turning the web longitudinally of the couple.

22. A printing press embodying a plurality of printing couples, positioned one above the other and each of which comprises a bed adapted to support a flat form, an oscillating segmental impression member, means for feeding a web into and out of the press, means to guide the web between the members of the respective couples, and angle bars positioned above the uppermost couple.

23. In a printing press, the combination of printing and perfecting couples positioned one above the other and each of which embodies a bed adapted to support a flat form and a segmental impression member,

means to actuate one member of each of said couples to cause them to cooperate with their respective companion members for the purpose of impression, means for guiding a web between the couples, and a web guide above the upper couple for turning the web longitudinally of said couple.

24. In a printing press, a printing couple embodying a flat form member and an impression member, mechanism for moving one of said members on and off impression, spaced apart devices for guiding a web between said members, web manipulating mechanism, means for moving said manipulating mechanism in a path substantially at a right angle to and from the face of said form member to position the web for impression and to free it from said couple, said mechanism operating to maintain a substantially uniform length of web between said guiding devices when the couple is on and off impression.

25. In a printing machine, a printing couple having periods of impression and non-impression, a web manipulating mechanism embodying a take-up looper and a pay-out looper, mechanism for moving the loopers to and fro and operating to stop the web during the full period of impression and said impression period taking place during only a part of the movement of loopers in one direction.

26. In a printing machine, a printing couple having periods of impression and non-impression, a take-up looper and a pay-out looper, mechanism for moving the loopers to and fro and operating them to coinpel stoppage of the web during the full period of impression and to move the web forward during the non-impression period to compensate for such stoppage, said stoppage taking place during only a part of the movement of said loopers in one direction.

27. In a printing press, a couple having periods of impression and non-impression, a take-up looper and a pay-out looper, mechanism for moving said loopers in a direction to compel the web to stop during the full impression period, and said impression period taking place during only a part of the movement of the loopers in said direction.

28. In a printing machine, a couple having periods of impression and non-impression, web manipulating mechanism embodying a take-up looper and a pay-out looper, means for imparting movement to said loopers for a greater distance than is requisite for stopping the web for impression, said loopers operating to stop the web during the full period of impression and to move it during said period of non-impression to compensate for such stoppage.

29. In a web printing press, a couple having alternate periods of impression and non-impression, means for feeding the web in and out of the press, web manipulating mechanism embodying loopers engaging the web to compel the web to have periods of movement and dwell, mechanism for moving said loopers through a greater distance than is requisite to stop said web during the period of impression.

30. In a web printing press, a printing couple having alternate periods of impression and non-impression, means for feeding the web into and out of the press, web manipulating mechanism embodying a take-up looper and a pay-out looper, mechanism for moving the loopers in a direction to stop the web, said mechanism operating the loopers at a speed to stop the web during impression and at a different speed in said direction to slowly accelerate the web after the conclusion of the impression period.

31. In a web printing press, a printing couple having impression and non-impression periods, means for feeding a web into and out of the press, a take-up looper and a pay-out looper engaging the web for purpose of compelling the web to have periods of movement and dwell, mechanism for moving said loopers in a direction to cause the web to dwell, said mechanism operating the loopers at different speeds while moving the loopers in said direction and said mechanism also moving the loopers a greater distance than is requisite for stopping the web.

32. In a web manipulating mechanism, a take-up looper and a paying-out looper, mechanism for moving said loopers forward and back, said loopers operating to compel the web to stop during the full impression period and during only a part of the forward movement of said loopers.

33. In a printing press having periods of impression and non-impression, a web manipulating mechanism, a take-up looper and a pay-out looper, means for imparting movement to said loopers for a greater distance than is requisite for stopping the web for impression, said loopers operating to bring the web to a stop during the full impression period and to shift it during said non-impression period to compensate for such stoppage.

34. In a web printing press having alternate periods of impression and non-impression, the combination of means for feeding the web into and out of the press, loopers engaging the web and mounted for movement in directions to stop a portion of the web during the full impression period, and to speed it up above the speed of said feeding means during the non-impression period, mechanism for moving said loopers in the direction and at speeds to compel the web to stop during the full period of impression and for only a part of the movement of the loopers in said direction.

35. In a printing machine, a printing cou-

ple, one member of which is a bed adapted to support a flat form and the other member of which is an impression member, means operable to bring one member of the couple on and off impression, means for guiding a web between the members of the couple, said guiding means being operable for movement in a substantially vertical path to free the web from said couple when off impression and to position it for impression to maintain substantially the same length of web between the guiding means when the web is off and on impression.

In testimony whereof, I have signed my name to this specification.

CARL A. KELLOGG.