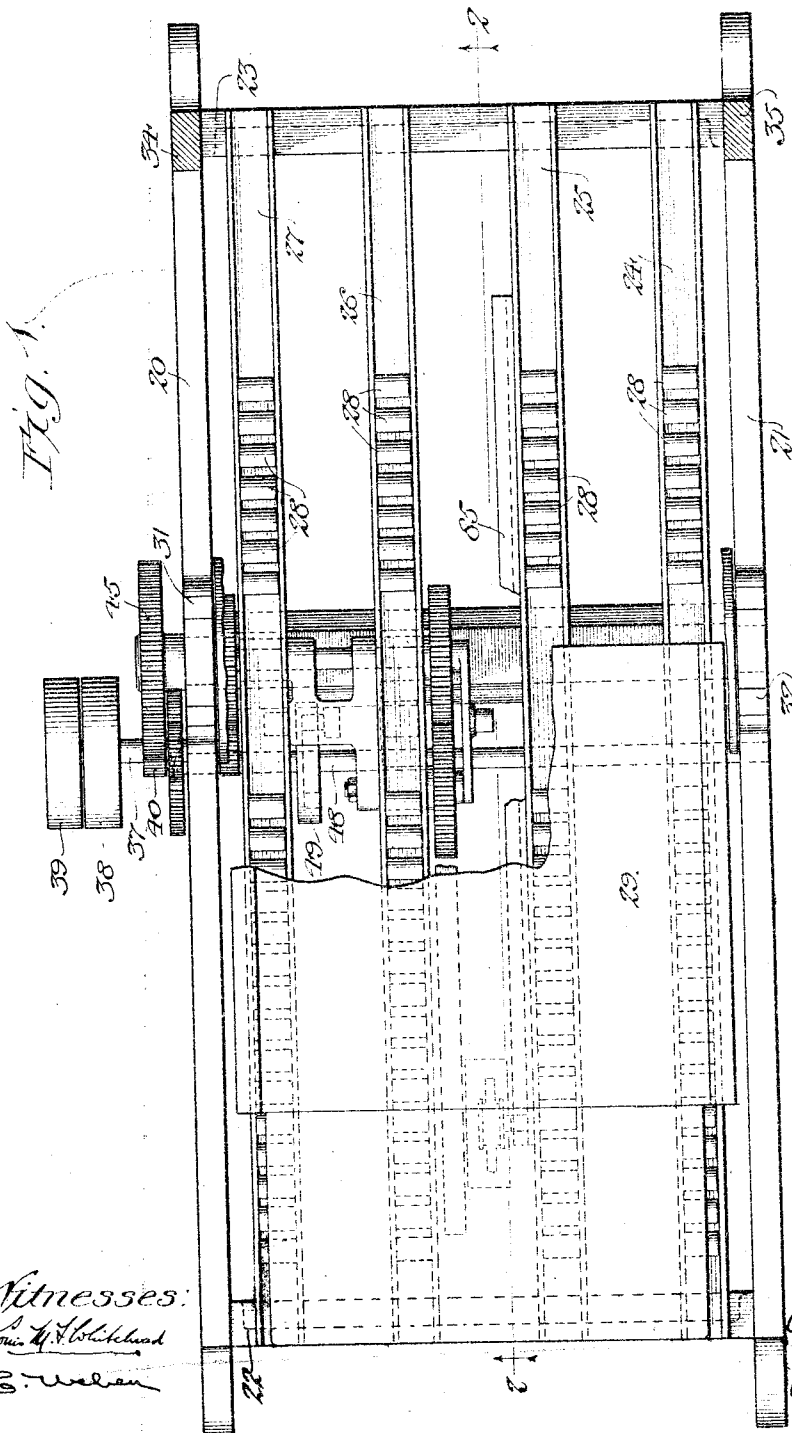


C. A. McCAIN.
 RECIPROCATING MECHANISM FOR PRINTING PRESSES AND THE LIKE.
 APPLICATION FILED MAR. 11, 1912.

Patented June 3, 1913.

5 SHEETS-SHEET 1

1,063,273.



Witnesses:
 Louis H. Whithead
 G. W. W. W.

Inventor:
 Cyrus A. McCain
 Thomas H. Ferguson
 Atty.

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Inventor
Cyrus A. McLean
Thomas H. Ferguson
Att'y

C. A. McCain.
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Fig. 5.

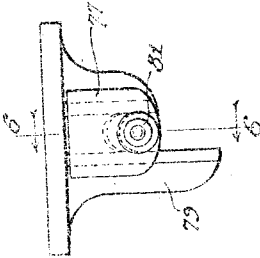


Fig. 6.

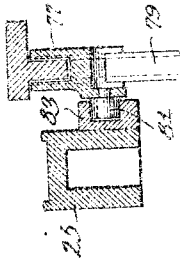
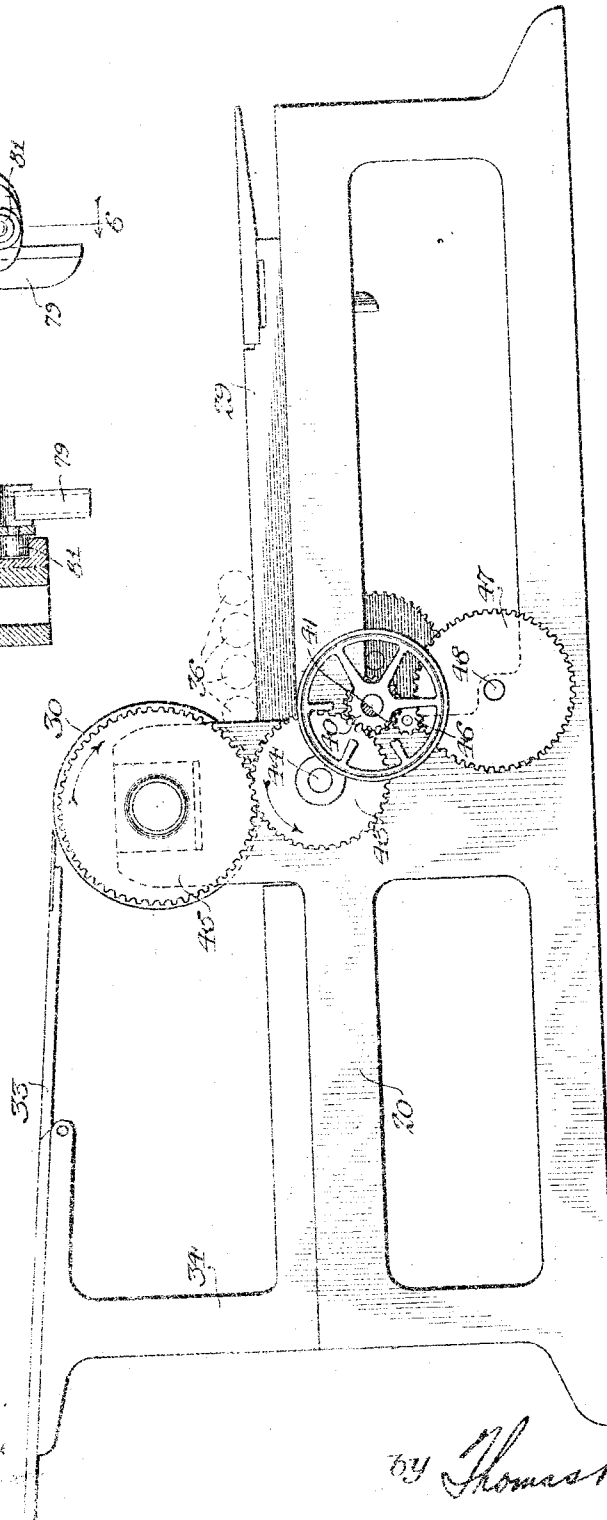


Fig. 4.



Witnesses:
Charles H. Whitehead
Carroll

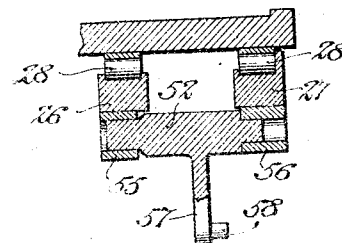
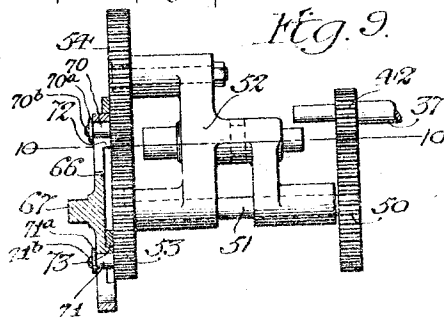
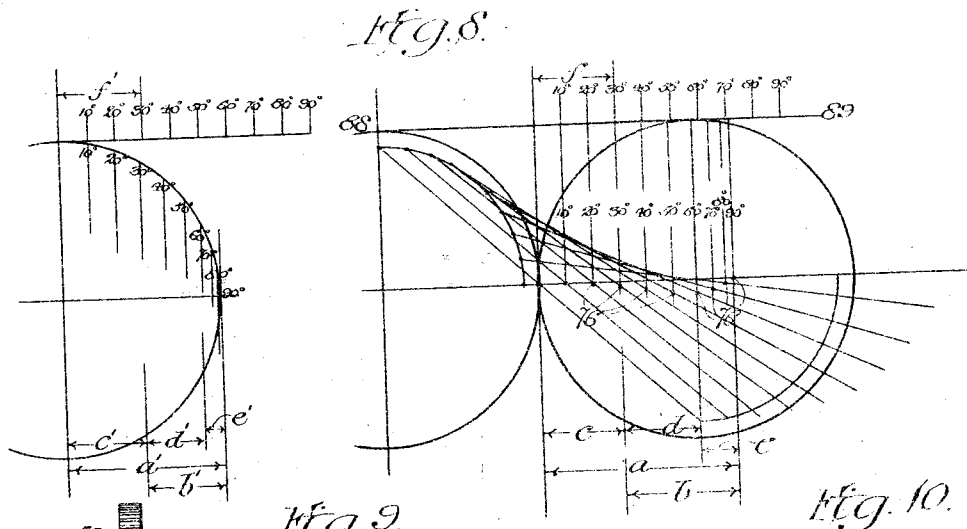
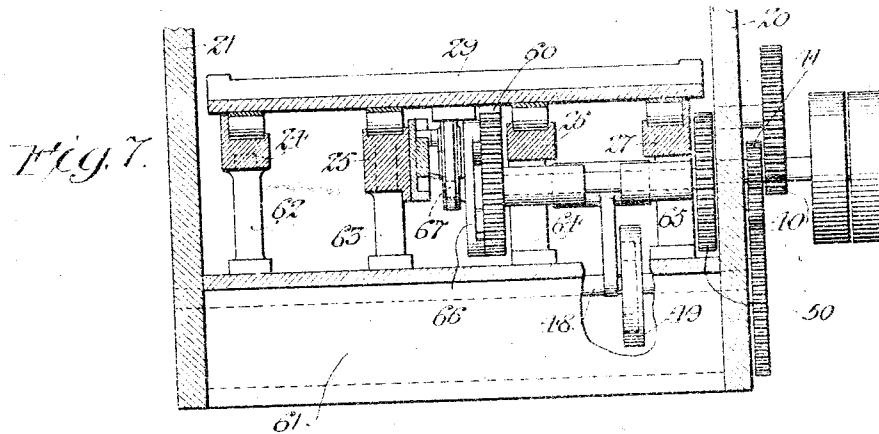
Inventor:
Cyrus A. McCain
 by *Thomas H. Ferguson*
Atty

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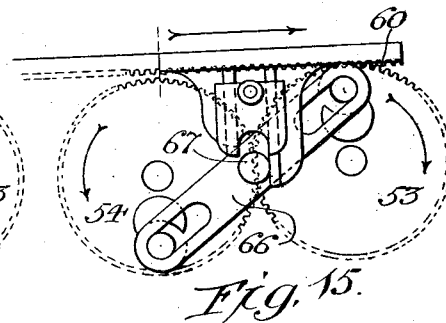
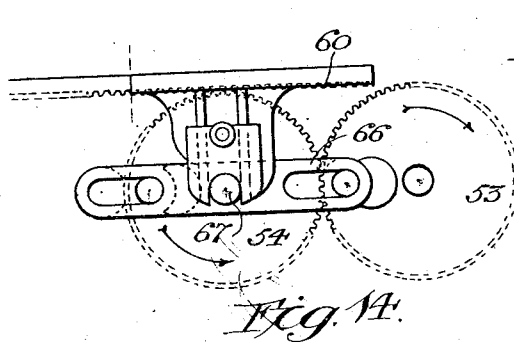
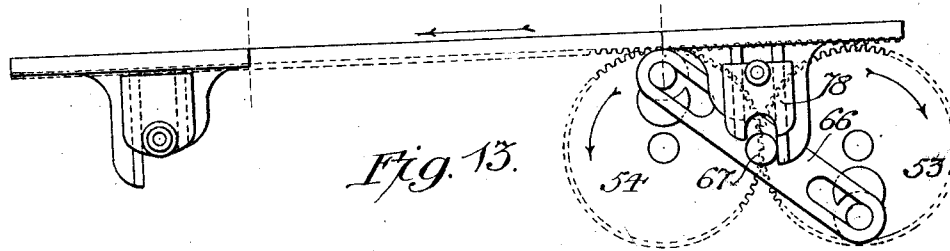
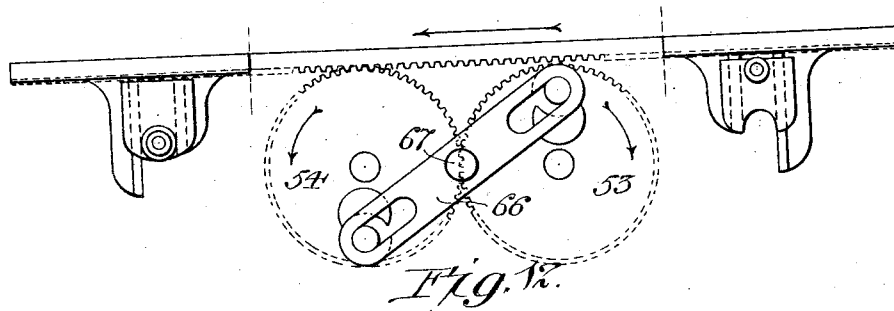
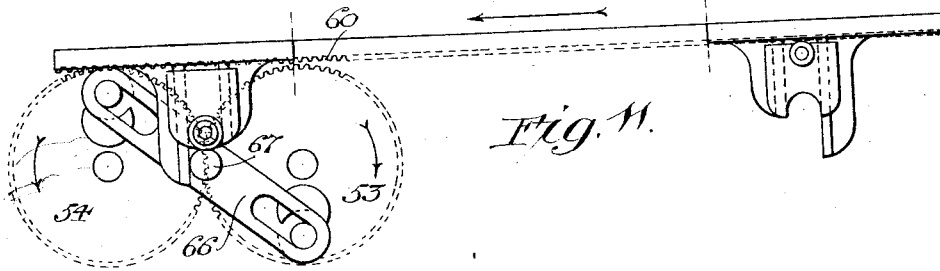
5 SHEETS-SHEET 4.



Witnesses:
 Chas. H. Whitehead
 G. W. W.

Inventor
 Cyrus A. McCain
 by Thomas H. Ferguson, Atty

C. A. McCAIN.
 RECIPROCATING MECHANISM FOR PRINTING PRESSES AND THE LIKE.
 APPLICATION FILED MAR. 11, 1912. Patented June 3, 1913
 1,063,273. 5 SHEETS—SHEET 5.



Witnesses:
 John M. Whitehead
 Green

Inventor
 Cyrus A. McCain
 by Thomas H. Ferguson
 Atty.

UNITED STATES PATENT OFFICE.

CYRUS A. MCCAIN, OF OAK PARK, ILLINOIS.

RECIPROCATING MECHANISM FOR PRINTING-PRESSES AND THE LIKE.

1,063,273.

Specification of Letters Patent.

Patented June 3, 1913.

Application filed March 11, 1912. Serial No. 683,023.

To all whom it may concern:

Be it known that I, CYRUS A. MCCAIN, a citizen of the United States, and residing at Oak Park, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Reciprocating Mechanisms for Printing-Presses and the Like, of which the following is a specification.

In certain classes of machines, large masses have to be reciprocated at a considerable speed and retarded, stopped and oppositely accelerated at the ends of the reciprocatory movement in a short space. This is the case with printing presses of the reciprocating type; the type bed is moved rapidly through the greater portion of each to-and-fro movement, preferably at a uniform speed, and is retarded, stopped and oppositely accelerated within a short space at its ends.

My invention consists in novel mechanism for bringing about such a movement in machines of this class. It is especially applicable to printing presses, although not limited thereto, and I have chosen to disclose it in that connection in the present application.

One object of the invention is to increase the distance through which the reciprocating member will travel at high, preferably uniform, speed while maintaining the parts of substantially the same dimensions as heretofore, or, conversely, to obtain the same distance with parts of materially less dimensions.

Another object is to apply the driving, retarding and accelerating forces more nearly in line with the center of inertia of the moving parts than heretofore, thereby greatly reducing the weight of the parts.

Another object is to graduate the retarding and accelerating forces differently than heretofore with a view to reducing the strain and shock to which they are subjected, especially at the ends of the reciprocating movement, and thus allowing for a reduction in size and weight of the parts.

Another object is to provide novel mechanism for disconnecting the reciprocating member from one driving member and connecting it to another as it approaches and recedes from the ends of its reciprocating movement.

Another object is to reciprocate one of these driving members, or any member, in

fact, from a crank pin with a reciprocation in excess of the throw of the pin.

In carrying out these general objects in the construction of a printing press of the reciprocating type, I am enabled to produce a press which is simpler and lighter than presses in common use while maintaining the same capacity of output, or conversely, to produce a simpler press of the same size and weight capable of a considerably larger output. In the former case, sheets of the same length as are usual on the presses in common use may be printed, while in the latter case the sheets may be considerably larger. These several objects and advantages, as well as others hereinafter pointed out, will be best understood upon reference to the following detailed description taken in connection with the accompanying drawings, and the scope of the invention will be particularly pointed out in the appended claims.

In said drawings, Figure 1 is a plan view of the printing press embodying my invention; Fig. 2 is a sectional elevation of the same taken on a longitudinal plane indicated by the line 2—2 of Fig. 1; Fig. 3 is a section illustrating a cam track forming part of the reciprocating mechanism; Fig. 4 is a side elevation of the press viewed from the top in Fig. 1; Fig. 5 is an elevation of the guide bracket and latch by which the bed is connected to the retarding, stopping and accelerating portion of the mechanism; Fig. 6 is a partial sectional view of the same and an associated cam track, the section being taken on a plane indicated by the line 6—6 of Fig. 5; Fig. 7 is a transverse section, with parts removed, taken on a plane indicated by the line 7—7 of Fig. 2; Fig. 8 is a comparative diagram illustrating the range and character of movement of the retarding, stopping and accelerating portion of the mechanism; Fig. 9 is a plan view of a detached portion of this latter mechanism; Fig. 10 is a vertical section of the same and the associated bed and guideways, the plane of section being indicated by the line 10—10 of Fig. 9; and Figs. 11 to 15, inclusive, are diagrammatic views illustrating different positions of the mechanism. Throughout these figures, like characters refer to like parts.

In the drawing, 20, 21, 22 and 23 designate side and end frame members of the press. Guideways 24, 25, 26 and 27 extend from end to end of the press between

the end frames 22 and 23 and contain the usual slider rolls 28 upon which the bed 29 is adapted to travel in its to-and-fro movement under the impression cylinder 30. This latter is journaled in suitable bearings in upright extensions 31 and 32 of the side frames 20 and 21, respectively. A feeding table 33 is also mounted upon the upright extensions 34 and 35 of the side frames 20 and 21, respectively. The position of the inking rolls is indicated by the dotted circles 36. As the bed 29 moves to and fro, the paper is fed from the table 33 to the cylinder 30, the impression is made from the type upon the bed 29, and the printed sheet is delivered from the machine. This much of the mechanism is old and, of itself, constitutes no part of the present invention.

Motion is transmitted to the several parts of the machine through a main driving shaft 37 journaled in the side frame 20 and having a fixed driving pulley 38 and a loose idle pulley 39. Upon this shaft, there are three pinions 40, 41 and 42. Pinion 40 meshes with an intermediate gear wheel 43 mounted upon a stud shaft 44 extending from the side frame 20. The gear wheel 43, in turn, meshes with the gear wheel 45 upon the shaft of the impression cylinder 30. By this train of gears, motion is transmitted from the driving shaft to the impression cylinder. Pinion 41 meshes with a pinion 46 likewise journaled upon a stud shaft extending from the side frame 20, and the latter pinion meshes with a gear wheel 47 keyed to a shaft 48 extending between the side frames 20 and 21 and carrying the cam 49. This latter member cooperates with other parts in the reciprocation of the bed 29, as will be pointed out more fully hereinafter. Pinion 42 meshes with gear wheel 50 mounted upon one end of the shaft 51 journaled in the rocking hanger 52. A gear wheel 53 is mounted upon the opposite end of the shaft 51 and meshes with a gear wheel 54 also journaled in the hanger 52. The hanger 52 is journaled at an intermediate point in bearings 55 and 56 formed on the under side of the guideways 26 and 27. An arm 57 extends downward from the hanger 52 and is provided at its lower end with a stud 58 which passes into the cam track 59 in the cam member 49. As the latter is rotated, the hanger 52 is rocked in its bearings 55 and 56 to shift the position of the wheels 53 and 54 by which the bed 29 is reciprocated. The wheels 53 and 54 are adapted to be thrown into and out of mesh with a rack 60 upon the under side of the bed 29 to bring about this reciprocation. The parts are so positioned that both gear wheels 53 and 54 may be held out of operative engagement with the rack 60, or either one may be thrown into engagement with it. Inasmuch as these wheels rotate in op-

posite directions, it will be seen that when one is in engagement it will drive the bed in one direction, and when the other is in engagement it will drive the bed in the opposite direction. These several trains of gearing are located near the center of the press and a transverse frame member 61 is located at this point between the side frames 20 and 21 to strengthen the entire frame structure and to support the pillars 62, 63, 64 and 65 which support the guideways 24, 25, 26 and 27, respectively.

In operation, the gear wheels 53 and 54 drive the bed 29 through the central portions of its movement, but, as it approaches the ends of its to-and-fro movement, these gear wheels are thrown out of mesh and the motion of the bed is put under the control of the link 66. The central stud 67 on this link has a reciprocating movement which is substantially parallel to that of the bed 29 and, by coupling the bed to it at the ends of its motion, the bed is retarded, stopped and operatively accelerated up to the peripheral speed of the wheels 53 and 54. When this is reached, the proper wheel 53, or 54, is brought into mesh with the rack 60 to continue the movement of the bed until the opposite end of its movement is reached. When this is reached, the control of the movement of the bed is again shifted to the link 66 to cause its retardation, stopping and acceleration. In this way, the gear wheels 53 and 54 are alternately brought into mesh with the rack 60 to drive the bed at a uniform speed and the retarding, stopping and accelerating at the ends of the bed's motion are accomplished by the link 66. This link is provided with slots 68 and 69 through which crank pins 70 and 71 upon the wheels 54 and 53 extend. The link 66 may be held upon the pins 70 and 71 in any suitable way; I, however, preferably employ washers 70^a and 71^a secured by screws 70^b and 71^b screwed into the ends of the pins 70 and 71, respectively. These washers and screws, which hold the link 66 in position and allow it to move freely upon the pins, are shown in Fig. 9 but omitted for clearness, from the other figures of the drawing. The ends of the link 66 are also provided with shoulders 72 and 73 which cooperate with the crescent-shaped projections 74 and 75 to prevent the link from sliding upon the pins 70 and 71 during certain positions of the parts. With this arrangement, the stud 67 upon the link 66 travels approximately in a line parallel to the direction of motion of the bed 29, as indicated by the points 76 in the diagram of Fig. 8. Connection is established between the stud 67 and the bed 29 so as to bring about its reversal at the ends of its reciprocating movement by means of sliding latches 77 and 78 mounted in guide brackets 79 and 80, 139

secured to the under side of the bed 29 near its ends. These latches 77 and 78 are provided with studs having anti-friction rollers 81 and 82 for engagement in the cam tracks, or cam ways, 83 and 84, respectively. These cam ways extend lengthwise of the member 85 and have downwardly deflected portions 86 and 87, respectively, near their inner ends. As the bed moves under the propelling power of the gear wheels, the rollers 81 and 82 travel along the horizontal portions of the cam ways 83 and 84 and, when the bed 29 approaches one end of its movement, the roller 81 passes downward into the portion 86 of the cam way 83 and causes the latch 77 to engage the stud 67; and when the bed approaches the other end of its movement, the roller 82 moves into the depressed portion 87 of the cam way 84 and thereby brings the latch 78 into latching engagement with the stud 67. In each instance, when the reversal has taken place and when the bed has been accelerated up to the speed of the wheels 53 and 54, then the latches are disengaged from the stud 67 by the movement of the rollers out of the depressed portions of the cam ways into the horizontal portions. The movement of the bed 29 through its complete cycle will be readily understood from an inspection of Figs. 11 to 15, inclusive. In Fig. 11, the gear wheel 54 is in mesh with the rack 60 and the parts are in the position to begin printing. In other words, the stud 67 is disengaged and the bed is under the sole control of the driving wheel 54. Fig. 12 illustrates the bed at an intermediate point of the printing motion. The gear wheels 53 and 54 have moved through one hundred and eighty degrees each. Fig. 13 illustrates the parts as they approach the end of the printing movement. In this position, the gear wheels 53 and 54 have each made one complete revolution from the initial position illustrated in Fig. 11. With the parts having the proportions illustrated, the printing movement, however, is not completed until the gear wheels have moved approximately thirty degrees farther. When this additional distance has been passed through, then the hanger 52 is rocked by the cam member 49 and the gear 54 is thrown out of mesh, but not before latch 78 has engaged stud 67 to securely lock the bed to the link 66. At this point, the retardation of the bed begins. It continues until the gear wheel 54 reaches the 90 degree position. This brings the parts into the position illustrated in Fig. 14. Here the end of the motion is reached and all the parts are, for the instant, at rest. The further movement of the gear wheels 53 and 54 to the position illustrated in Fig. 15 starts the bed from its position of rest, carries it through its period of acceleration and brings it some distance under its uniform speed. Just as in Fig. 13,

the parts continued some distance farther before the printing period ceased, so in Fig. 15, the parts have passed the same distance beyond the point at which the uniform speed period in the return motion began. Just as the printing movement continued while the gear wheel 54 rotated thirty degrees beyond the position of Fig. 13, so the point at which the uniform speed began in the opposite direction was reached thirty degrees before reaching the position of Fig. 15. Thus Fig. 15 illustrates the parts after the gear wheel 53 has been thrown into mesh with the bed. This wheel, of course, drives the bed in the opposite direction, to carry it to the opposite end of its reciprocating movement. When this opposite end is reached, the bed is again retarded, stopped and accelerated in the manner I have just described. With the parts proportioned as illustrated, the retarding, stopping and accelerating takes place in one hundred and twenty degrees of rotation of the gear wheels 53 and 54, and thirty degrees, so to speak, are added to the printing movement and thirty degrees to the uniform speed return movement. With gear wheels 53 and 54 having twenty inches pitch diameter, these results may be obtained by positioning the crank pins with their centers 1.0873 inches inside of the pitch circles. By positioning the crank pins at other relative distances, other divisions of the one hundred and eighty degrees may be had. Thus, all the one hundred and eighty degrees may be utilized in retarding, stopping and accelerating, and none added to the uniform speed movement to print or return; or, a very few degrees may be utilized in retarding, stopping and accelerating, and the balance divided between the printing and return movements. It will also be noted that, with the proportions shown, the pin 67, which in itself constitutes a reciprocating member, has a to-and-fro movement as great as the diameter of the wheels 53 and 54.

In the diagram of Fig. 8, I graphically show certain characteristics of my novel movement. With the dimensions proportioned as there shown, the retardation and stopping take place while the gear wheel moves through approximately sixty degrees. This will be seen by comparing the spaces laid off on the upper side of the line 88—89 with those projected on its under side. The former represents the distances traveled by the periphery of the gear wheel and the latter the distances traveled in the same time intervals by the center of the link, which I before noted passes through the points 76 upon its outward movement. By comparing these spaces along the upper and lower sides of the line 88—89, I see that both are traveling at the same speed at about the thirty degree point. And so the bed 29 may be shifted from the gear wheel 53 or 54 to

the stud 67 on the link 66 at this thirty degree point. Consequently, the retarding and stopping is completed in ninety degrees minus thirty degrees, or sixty degrees.

5 With different proportions and dimensions of parts, this shifting point would be differently located. As before noted, by varying these proportions and dimensions, the position of the shifting point may be positioned

10 at any desired point through a wide range. A comparison between the two parts of Fig. 8 shows the differences in the character of my novel movement and the simple crank movement, whose projection is a simple harmonic motion. The latter is the movement

15 employed for retarding, stopping and accelerating the beds of machines in common use. It will be seen at once that it requires a revolution of ninety degrees to retard and stop as compared with sixty degrees, more

20 or less, in my movement; and another ninety degrees, as compared with sixty degrees, more or less, to accelerate. By comparison, it will also be seen that in the old movement, the first thirty degrees do not materially retard the bed movement, requiring

25 practically all the retardation to take place in the remaining sixty degrees of the quadrant; while with my movement, I retard in the sixty degrees, and have a greater space

30 in which to accomplish it. A comparison of the dimensions *a, b, c, d, e*, with the corresponding dimensions *a', b', c', d', e'*, is instructive. The dimensions *a, d*, show that in my motion a much longer stroke is

35 obtained than in the old motion. The dimensions *b, b'*, show that I have a much longer distance in which to retard and stop, and to accelerate, than in the old motion,

40 although using some of the rotation used by the latter in retarding, to print by. The dimensions *c, d*, show how much greater printing length I get than was present in the old motion. The dimensions *d, d'*, show

45 that as the gear wheel passes from the thirty degree position to the sixty degree position (half way to the ninety degree position), I have more distance in which to retard, or accelerate, in this portion of the motion,

50 than in the old motion. The distances *e, e'*, show that I have a much longer period in the last thirty degrees of the quarter revolution in which to continue the retardation than in the old movement. The rate of

55 change during the period the bed moves through these distances *e, e'*, is also more gradual in my movement than in the old movement. In the old movement, the rates of change in speed of the bed is very great

60 and produces an objectionable sudden jerk, which my movement avoids because of its better graduation of the retarding force. A further comparison shows that the retarding and accelerating forces are applied more

65 nearly in a line parallel to the direction of

movement of the bed. And the dimensions *f, f'*, show the distance that I add to the old printing length, which is used in the old motion to no useful end because, although the speed of the bed through this portion of its motion is varying and cannot be used for printing, yet it does not appreciably retard, or accelerate. By way of specific comparison, if the pitch circles of the gear wheels have a diameter of twenty inches, and the center of the crank pins in my movement be located 1.0873 inches inside the pitch circles and the crank pin of the old motion be located on the pitch circle, then in my movement the bed may be shifted from the gear wheel to the link exactly at the thirty degree point and vice versa, and the comparative dimensions are as follows:

<i>a</i>	equals	12.3080 inches	
<i>a'</i>	"	10.0000	85
<i>b</i>	"	7.2479	
<i>b'</i>	"	5.0000	
<i>c</i>	"	5.0601	
<i>c'</i>	"	5.0000	90
<i>d</i>	"	4.8338	
<i>d'</i>	"	3.6603	
<i>e</i>	"	2.3541	
<i>e'</i>	"	1.3397	95
<i>f</i>	"	5.2360	
<i>f'</i>	"	5.2360	

As before indicated, these dimensions may be varied through a wide range by varying the positions of the crank pins relative to the centers of the gear wheels. Under some conditions, one position may be desirable, and under other conditions, other positions. It is believed, however, the various advantages of my movement will be entirely clear without considering other specific instances.

From the above description and comparisons, it will be seen that I have succeeded in providing mechanism for reciprocating large and heavy members such as the type beds of printing presses of the reciprocating type which will accomplish all the results and functions of machines of the art, while at the same time simplifying the structure, reducing its size and increasing the output.

110 It will also be seen that although the invention is particularly applicable to printing presses of this type, still there are many other instances where the mechanism herein described, or its equivalent, might be employed to advantage. In the link between the two gear wheels (omitting the rack and the means for throwing the gear wheels into and out of mesh therewith), I have provided

125 a novel reciprocating motion which differs materially from a simple harmonic motion and which may be useful in many relations other than the particular one herein disclosed. It will also be apparent that in 130

carrying out my invention, many alterations and modifications may be made in the specific form herein disclosed without departing from the spirit and scope of the invention. I, therefore, do not wish to be limited to the specific matter herein disclosed, but aim to cover, by the terms of the appended claims, all such alterations and modifications, as well as different applications.

10 What I claim as new and desire to secure by Letters Patent of the United States is:—

1. In a printing press, the combination of a reciprocating member, a wheel for driving said member, means for throwing said wheel out of operative driving relation with said member when the latter approaches the end of its movement, and means, including a connecting link intermediate of said wheel and member, operative upon less than a quarter revolution of said wheel to retard and stop said member.

2. In a printing press, the combination of a reciprocating member, a wheel for driving said member, means for throwing said wheel out of operative driving relation with said member when the latter approaches the end of its movement, a crank pin on said wheel, and mechanism, including a link cooperating with said pin, to subsequently retard and stop said member upon other than a quarter revolution of said wheel.

3. In a printing press, the combination of a reciprocating member, a wheel for driving said member, means for throwing said wheel out of operative driving relation with said member when the latter approaches the end of its movement, and mechanism, including a second wheel and a link connected between said wheels, for subsequently retarding and stopping said member upon other than a quarter revolution of said first wheel.

4. In a printing press, the combination of a reciprocating member, a rack on said member, a gear wheel for engaging said rack to drive said member, means for throwing said gear wheel out of mesh with said rack when the latter approaches the end of its movement, and means, including a connecting link intermediate of said wheel and member, operative upon less than a quarter revolution of said wheel to retard and stop said member.

5. In a printing press, the combination of a reciprocating member, a pair of driving wheels for alternately driving said member in opposite directions, means for throwing each wheel out of operative driving relation with said member as the latter approaches the end of its movement under the driving action of said wheel, and means subsequently operative at each end of the movement of said member to retard and stop said member upon other than a quarter revolution of said wheels.

6. In a printing press, the combination of

a reciprocating member, a wheel for driving said member, means, including a connecting link intermediate of said wheel and member, operative upon less than a quarter revolution of said wheel to accelerate said member from rest to the speed of said wheel and means for thereupon throwing said wheel into driving relation with said member.

7. In a printing press, the combination of a reciprocating member, a wheel for driving said member, a crank pin on said wheel, mechanism, including a link cooperating with said pin, to accelerate said member from rest to the speed of said wheel upon other than a quarter revolution of said wheel, and means for thereupon throwing said wheel into driving relation with said member.

8. In a printing press, the combination of a reciprocating member, a wheel for driving said member, mechanism, including a second wheel and a link connected between said wheels, for accelerating said member from rest to the speed of said wheel upon other than a quarter revolution of said wheel, and means for thereupon throwing said wheel into driving relation with said member.

9. In a printing press, the combination of a reciprocating member, a rack on said member, a gear wheel for engaging said rack to drive said member, means, including a connecting link intermediate of said wheel and member, operative upon less than a quarter revolution of said wheel to accelerate said member from rest to the speed of said wheel, and means for thereupon throwing said gear wheel into mesh with said rack.

10. In a printing press, the combination of a reciprocating member, a pair of driving wheels for alternately driving said member in opposite directions, means operative upon other than a quarter revolution of said wheels to accelerate said member from rest to the speed of that one of said driving wheels operative to continue the movement of said member, and means for thereupon throwing said wheel into driving relation with said member.

11. In a printing press, the combination of a reciprocating member, a wheel for driving said member at a uniform speed, means for throwing said wheel out of operative driving relation with said member when the latter approaches the end of its movement, and means, including a connecting link intermediate of said wheel and member, subsequently operative upon less than a half revolution of said wheel to retard, stop and oppositely accelerate said member up to said uniform speed.

12. In a printing press, the combination of a reciprocating member, a wheel for driving said member at a uniform speed, means for throwing said wheel out of operative

driving relation with said member when the latter approaches the end of its movement, a crank pin on said wheel, and mechanism, including a link cooperating with said pin, to subsequently retard, stop and oppositely accelerate said member up to said uniform speed upon other than a half revolution of said wheel.

13. In a printing press, the combination of a reciprocating member, a wheel for driving said member at a uniform speed, means for throwing said wheel out of operative driving relation with said member when the latter approaches the end of its movement, and mechanism, including a second wheel and a link connected between said wheels, for subsequently retarding, stopping and oppositely accelerating said member up to said uniform speed upon other than a half revolution of said wheels.

14. In a printing press, the combination of a reciprocating member, a rack on said member, a gear wheel for engaging said rack to drive said member at a uniform speed, means for throwing said gear wheel out of mesh with said rack when said member approaches the end of its movement, and means, including a connecting link intermediate of said wheel and member, subsequently operative upon less than a half revolution of said gear wheel to retard, stop and oppositely accelerate said member up to said uniform speed.

15. In a printing press, the combination of a reciprocating member, a pair of driving wheels for alternately driving said member in opposite directions, means for throwing each wheel out of operative driving relation with said member as the latter approaches the end of its movement under the driving action of said wheel, and means subsequently operative at each end of the movement of said member to retard, stop and oppositely accelerate said member up to the speed given it by said wheels, upon other than a half revolution of said wheels.

16. In a printing press, the combination of a reciprocating member, a wheel for driving said member, the line of movement of said member being substantially tangential to said wheel, means for throwing said wheel out of operative driving relation with said member when the latter approaches the end of its movement, and means for subsequently applying and continuing the application of force substantially parallel to said member and in line with the center of said wheel to control the further movement of said member.

17. In a printing press, the combination of a reciprocating member, a wheel for driving said member, the line of movement of said member being substantially tangential to said wheel, means for applying and con-

tinuing the application of force substantially parallel to said member and in line with the center of said wheel to advance said member up to the speed of said wheel, and means for thereupon throwing said wheel into driving relation with said member.

18. In a printing press, the combination of a reciprocating member, a wheel for driving said member through the central portion of its reciprocating movement, the line of movement of said member being substantially tangential to said wheel, and means for applying and continuing the application of force substantially parallel to said member and in line with the center of said wheel to control the end portions of said reciprocating movement.

19. In a printing press, the combination of a reciprocating member, a wheel for driving said member through the central portion of its reciprocating movement, a second wheel geared to said first mentioned wheel, a second member independently connected to said wheels and having a reciprocating movement substantially parallel to that of said first mentioned member, and means for coupling said members together to control the end portions of the reciprocating movement of the first member by the second.

20. In a printing press, the combination of a reciprocating member, a wheel for driving said member, means for throwing said wheel out of operative relation with said member when the latter approaches the end of its movement, a second wheel geared to said first mentioned wheel, and means independently connected to said wheels for subsequently applying force to said member at substantially a single point to control its further movement.

21. In a printing press, the combination of a reciprocating member, a wheel for driving said member, a second wheel geared to said first mentioned wheel, means independently connected to said wheels for applying force at substantially a single point to advance said member to the speed of said wheel, and means for thereupon throwing said wheel into driving relation with said member.

22. In a printing press, the combination of a reciprocating member, a wheel for driving said member through the central portion of its reciprocating movement, a second wheel geared to said first mentioned wheel, and means independently connected to said wheels for applying force to said member at substantially a single point to control the end portions of said reciprocating movement.

23. In a printing press, the combination of a reciprocating member, a wheel for driving said member, means for throwing said wheel out of operative driving relation with

said member when the latter approaches the end of its movement, and means, including a crank pin on said wheel and a link cooperating with said pin and member, operative within a length other than one-half the throw of said pin to retard and stop said member.

24. In a printing press, the combination of a reciprocating member, a wheel for driving said member, means, including a crank pin on said wheel and a link cooperating with said pin and member, operative within a length other than one-half the throw of said pin to accelerate said member from rest to the speed of said wheel, and means for thereupon throwing said wheel into driving relation with said member.

25. In a printing press, the combination of a reciprocating member, a wheel for driving said member, means for throwing said wheel out of operative driving relation with said member when the latter approaches the end of its movement, and means, including a crank pin on said wheel and a link cooperating with said pin and member, operative within a length other than one-half the throw of said pin to subsequently retard, stop and oppositely accelerate said member up to the speed of said wheel.

26. In a printing press, the combination of a reciprocating member, a wheel for driving said member, means for throwing said wheel out of operative driving relation with said member when the latter approaches the end of its movement, and reciprocating means, having a movement as great as the diameter of said wheel, for retarding and stopping said member within a length other than one half of said diameter.

27. In a printing press, the combination of a reciprocating member, a wheel for driving said member, reciprocating means, having a movement as great as the diameter of said wheel, for accelerating said member from rest to the speed of said wheel within a length other than one half said diameter, and means for thereupon throwing said wheel into driving relation with said member.

28. In a printing press, the combination of a reciprocating member, a wheel for driving said member, means for throwing said wheel out of operative driving relation with said member when the latter approaches the end of its movement, and reciprocating means, having a movement as great as the diameter of said wheel, for retarding, stopping and oppositely accelerating said member up to the speed of said wheel.

29. In a printing press, the combination of a reciprocating member, a wheel for driving said member a given length at a uniform speed upon a fractional number of revolutions, and means, including a connect-

ing link intermediate of said wheel and member, for retarding and stopping said member upon a further fractional revolution of said wheel.

30. In a printing press, the combination of a reciprocating member, a wheel for driving said member a given length at a uniform speed upon a fractional number of revolutions, and means, including a connecting link intermediate of said wheel and member, for retarding, stopping and oppositely accelerating said member up to said speed upon a further fractional revolution of said wheel.

31. In a printing press, the combination of a reciprocating member, a pair of driving wheels having an integral number of revolutions for each to-and-fro movement of said member, means for putting said wheels in operative driving relation with said member for a fractional number of revolutions upon each to-and-fro stroke respectively, and means for retarding, stopping and oppositely accelerating said member up to the speed of said wheels, at each end of said reciprocating movement, in the remaining fractional revolutions necessary to complete said integral number of revolutions.

32. In a printing press, the combination of a reciprocating member, a pair of oppositely rotatable intermeshing gear wheels, means for placing said wheels alternately in driving relation with said reciprocating member, a link adapted to extend across the point of engagement of said gear wheels in all positions of the parts, loose connections between the ends of said link and said wheels respectively, and means for utilizing said link in controlling the movements of said reciprocating member.

33. In a printing press, the combination of a reciprocating member, a pair of oppositely rotatable intermeshing gear wheels, means for placing said wheels alternately in driving relation with said reciprocating member, a link adapted to extend across the point of engagement of said gear wheels in all positions of the parts, pin and slot connections between the ends of said link and said wheels respectively, and means for utilizing said link in controlling the movements of said reciprocating member.

34. In a printing press, the combination of a reciprocating member, a pair of oppositely rotatable intermeshing gear wheels, means for placing said wheels alternately in driving relation with said reciprocating member, a link adapted to extend across the point of engagement of said gear wheels in all positions of the parts, pins near the peripheries of said wheels respectively extending through slots in the ends of said link, means for holding said link from sliding on said pins in certain positions of the parts.

and means for utilizing said link in controlling the movements of said reciprocating member.

35. In a printing press, the combination of a reciprocating member, a pair of oppositely rotatable intermeshing gear wheels, means for placing said wheels alternately in driving relation with said reciprocating member, a link adapted to extend across the point of engagement of said gear wheels in all positions of the parts, pins near the peripheries of said wheels respectively extending through slots in the ends of said link, cooperating engaging surfaces on said wheels and link for holding said link from sliding on said pins in certain positions of the parts, and means for utilizing said link in controlling the movements of said reciprocating member.
36. In a printing press, the combination of a reciprocating member, a pair of oppositely rotatable members movable at the same angular velocity, means for placing said latter members alternately in driving relation with said former member, a link loosely connected at its ends to said rotatable members at equal distances from their centers of rotation and in position to extend over a point between said members in all positions of the parts, and means for utilizing said link in controlling the movements of said reciprocating member.
37. In a printing press, the combination of a reciprocating member, a pair of oppositely rotatable members movable at the same angular velocity, means for placing said latter members alternately in driving relation with said former member, crank pins on said rotatable members at equal distances from their respective centers of rotation, said pins being positioned so as to maintain a minimum variation of distance between them as said members rotate, a link having slotted connection with said pins at its ends, and means for utilizing said link in controlling the movements of said reciprocating member.
38. In a printing press, the combination of a reciprocating member, a pair of oppositely rotatable members movable at the same angular velocity, means for placing said latter members alternately in driving relation with said former member, crank pins on said rotatable members at equal distances from their respective centers of rotation, said pins being positioned so as to maintain a minimum variation of distance between them as said members rotate, a link having slotted connection with said pins at its ends means for holding said link from sliding on said pins in certain positions of said rotatable members, and means for utilizing said link in controlling the movements of said reciprocating member.
39. In a printing press, the combination

of a reciprocating member, a pair of oppositely rotatable members movable at the same angular velocity, means for placing said latter members alternately in driving relation with said former member, crank pins on said rotatable members at equal distances from their respective centers of rotation, said pins being positioned so as to maintain a minimum variation of distance between them as said members rotate, a link having slotted connection with said pins at its ends cooperating engaging surfaces on said members and link for holding said link from sliding on said pins in certain positions of said rotatable members, and means for utilizing said link in controlling the movements of said reciprocating member.

40. In a printing press, the combination of a reciprocating bed, a rack on said bed, a pair of gear wheels for alternately engaging said rack to reciprocate said bed, cam mechanism for throwing said wheels into and out of mesh with said rack, a link having pin and slot connections with said wheels at its opposite ends, latch mechanism for connecting said bed to an intermediate point of said link, and cam mechanism for operating said latch mechanism just before and after said bed reaches the end of its movement, whereby said rack is driven by said wheels during the greater portion of its to and fro movements and is transferred to said link to be retarded, stopped and oppositely accelerated at the ends of said movements.

41. In a printing press, the combination of a reciprocating member, a pair of oppositely rotatable intermeshing gear wheels, means for placing said wheels alternately in driving relation with said reciprocating member, a link extending across the point of engagement of said gears in all positions, loose connections between said wheels and the ends of said links, and means for utilizing said link in controlling the movements of said reciprocating member.

42. In a printing press, the combination of a crank pin, a rectilinearly reciprocating member, and permanent connections between said pin and member whereby said member has a throw in excess of that of said crank pin.

43. In a printing press, the combination of a reciprocating member, a wheel for directly engaging said member to drive it, means for throwing said wheel out of operative driving relation with said member when the latter approaches the end of its movement, and means including a link directly connected to said wheel, operative upon other than a quarter revolution of said wheel to retard and stop said member.

44. In a printing press, the combination of a reciprocating member, a rack on said member, a gear wheel for engaging said rack

to drive said member, means for throwing said gear wheel out of mesh with said rack when the latter approaches the end of its movement, and means including a link directly connected to said gear wheel, operative upon other than a quarter revolution of said gear wheel to retard and stop said member.

45. In a printing press, the combination of a reciprocating member, a wheel for driving said member, means including a link directly connected to said wheel, operative upon other than a quarter revolution of said wheel to accelerate said member from rest to the speed of said wheel, and means for thereupon throwing said wheel into driving relation with said member.

46. In a printing press, the combination of a reciprocating member, a rack on said member, a gear wheel for engaging said rack to drive said member, means including a link directly connected to said wheel, operative upon other than a quarter revolution of said wheel to accelerate said member from rest to the speed of said wheel, and means for thereupon throwing said gear wheel into mesh with said rack.

47. In a printing press, the combination of a reciprocating member, a wheel for driving said member at a uniform speed, means for throwing said wheel out of operative driving relation with said member when the latter approaches the end of its movement, and means including a link directly connected to said wheel, subsequently operative upon other than a half revolution of said wheel to retard, stop and oppositely accelerate said member up to said uniform speed.

48. In a printing press, the combination of a reciprocating member, a rack on said member, a gear wheel for engaging said rack to drive said member at a uniform speed, means for throwing said gear wheel out of mesh with said rack when said member approaches the end of its movement, and means including a link directly connected to said wheel, subsequently operative upon other than a half revolution of said wheel to retard, stop and oppositely accelerate said member up to said uniform speed.

49. In a printing press, the combination of a reciprocating member, a wheel for driving said member through the central portion of its reciprocating movement, a second wheel geared to said first mentioned wheel, a second member supported solely by said wheels and having a reciprocating movement substantially parallel to that of said first mentioned member, and means for coupling said members together to control the end portions of the reciprocating movement of the first member by the second member.

50. In a printing press, the combination of a reciprocating member, a wheel for driv-

ing said member, means for throwing said wheel out of operative relation with said member when the latter approaches the end of its movement, a second wheel geared to said first mentioned wheel, and means supported solely by said wheels and operative to subsequently apply force to said member at substantially a single point to control its further movement.

51. In a printing press, the combination of a reciprocating member, a wheel for driving said member, a second wheel geared to said first mentioned wheel, means supported solely by said wheels and operative to apply force at substantially a single point to advance said member to the speed of said wheel, and means for thereupon throwing said wheel into driving relation with said member.

52. In a printing press, the combination of a reciprocating member, a wheel for driving said member through the central portion of its reciprocating movement, a second wheel geared to said first mentioned wheel, and means supported solely by said wheels and operative to apply force to said member at substantially a single point to control the end portions of its reciprocating movement.

53. In a printing press, the combination of a reciprocating member, a single rack on said member, a pair of gear wheels for alternately engaging said rack to drive said member in opposite directions, means for throwing said wheels into and out of mesh with said rack, and means operative upon other than a quarter revolution of said wheels to retard and stop said member at the ends of its movement.

54. In a printing press, the combination of a reciprocating member, a single rack on said member, a pair of gear wheels for alternately engaging said rack to drive said member in opposite directions, means for throwing said wheels into and out of mesh with said rack, and means operative upon other than a half revolution of said wheels to retard, stop and oppositely accelerate said member up to the speed of said wheels, at each end of its movement.

55. In a printing press, the combination of a reciprocating member, a pair of gear wheels, a link connected at its ends to said wheels respectively, and means actuated thereby to retard and stop said member at the ends of its reciprocating movement.

56. In a printing press, the combination of a reciprocating member, a wheel for driving said member, means for throwing said wheel out of operative driving relation with said member when the latter approaches the end of its movements, and means for subsequently applying and continuing the application of a force at a substantially constant distance from said member in a direction

substantially parallel to the direction of movement of said member to retard and stop said member in other than a quarter revolution of said wheel.

57. In a printing press, the combination of a reciprocating member, a wheel for driving said member, means for throwing said wheel into and out of driving relation with said member, a link connected at one point to said wheel and at another point to said member, and means associated with said link for bringing about a retardation and stopping of said member at the ends of its reciprocating movement in other than a quarter revolution of said wheel.

58. In a printing press, the combination of a crank pin, a unitary reciprocating member, connections solely between said pin and member whereby said member has a throw in excess of that of said crank pin, a second reciprocating member as a whole having a movement parallel to said first member, and means for utilizing the movements of said first member in controlling the movements of said second member.

59. In a printing press, the combination of a crank pin, a unitary reciprocating member, connections solely between said pin and member whereby said member has a throw in excess of that of said crank pin, a second reciprocating member, and means for connecting said first member to said second member as the latter approaches each end of its reciprocating movement to control the reversing movements of the latter by the former.

60. In a printing press, the combination of a reciprocating member, a wheel rotatable an integral number of revolutions for each to-and-fro movement of said reciprocating member and operative to drive said member a given length at a uniform speed upon a fractional number of revolutions, a crank pin carried by said wheel, and means, including a member connected to said crank pin and having a throw other than that of said crank pin, for retarding and stopping said reciprocating member upon a further fractional revolution of said wheel.

61. In a printing press, the combination of a reciprocating member, a wheel rotatable an integral number of revolutions for each to-and-fro movement of said reciprocating member and operative to drive said member a given length at a uniform speed upon a fractional number of revolutions, a crank pin carried by said wheel, and means, including a member connected to said crank pin and having a throw other than that of said crank pin, for retarding, stopping and oppositely accelerating said reciprocating member up to said speed upon a further fractional revolution of said wheel.

62. In a printing press, the combination of a reciprocating member, a wheel for driv-

ing said member through a portion of its movement, a crank pin carried by said wheel, and means, including a link longitudinally movable on said pin and adapted to be connected with said member, whereby said member is retarded and stopped in a distance other than the corresponding portion of the throw of said crank pin.

63. In a printing press, the combination of a reciprocating member, a wheel for driving said member through a portion of its movement, a crank pin carried by said wheel, and means, including connections with said pin and member, whereby said member is retarded and stopped in a distance other than the corresponding portion of the throw of said crank pin and upon other than a quarter revolution of said crank pin.

64. In a printing press, the combination of a reciprocating member, a wheel for driving said member through a portion of its movement, a crank pin carried by said wheel, and means, including a link longitudinally movable on said pin and adapted to be connected with said member, whereby said member is accelerated from rest up to the speed imparted by said wheel in a distance other than the corresponding portion of the throw of said crank pin.

65. In a printing press, the combination of a reciprocating member, a wheel for driving said member through a portion of its movement, a crank pin carried by said wheel, and means, including connections with said pin and member, whereby said member is accelerated from rest up to the speed imparted by said wheel in a distance other than the corresponding portion of the throw of said crank pin and upon other than a quarter revolution of said crank pin.

66. In a printing press, the combination of a crank pin, a reciprocating member, and means, including a link longitudinally slidable upon said pin and adapted to be connected to said member, whereby said member is brought from rest to a speed as great as the peripheral speed of said crank pin in a distance other than the corresponding portion of the throw of said crank pin.

67. In a printing press, the combination of a crank pin, a reciprocating member, and means, including a link longitudinally slidable upon said pin and adapted to be connected to said member, whereby said member has its speed reduced from a speed as great as the peripheral speed of said crank pin to zero in a distance other than the corresponding portion of the throw of said crank pin.

68. In a printing press, the combination of a reciprocating member, wheels for driving said member through the central portions respectively of its reciprocating movement, a crank pin carried by each said wheel, a second member having a reciprocating

movement substantially parallel to that of said first member, means whereby the rotation of said crank pins gives said second member a throw *greater* than the throw of either of said crank pins, and means for coupling said members together to control the end portions of the reciprocating movement of the first member by the second.

69. In a printing press, the combination of a pair of crank pins, a reciprocating member, connections between said pins and member whereby said member has a throw in excess of that of either of said pins, a second reciprocating member having a movement substantially parallel to said first member, and means for utilizing the movements of said first member in controlling the movements of said second member.

70. In a printing press, the combination of a pair of crank pins, a reciprocating member, connections between said pins and member whereby said member has a throw in excess of that of either of said pins, a second reciprocating member, and means for connecting said first member with said second member as the latter approaches each end of its reciprocating movement to control the reversing movements of the latter by the former.

71. In a printing press, the combination of a reciprocating member, wheels for respectively driving said member a given length at a uniform speed upon a fractional number of revolutions, the one in one direction and the other in the opposite direction, crank pins carried by said wheels, and means, including a member connected to said crank pins and having a throw other than that of either of said crank pins, for retarding and stopping said reciprocating member upon a further fractional revolution of said wheels respectively.

72. In a printing press, the combination of a reciprocating member, wheels for respectively driving said member a given length at a uniform speed upon a fractional number of revolutions, the one in one direction and the other in the opposite direction, crank pins carried by said wheels, and means, including a member connected to said

crank pins and having a throw other than that of said crank pins, for retarding, stopping and oppositely accelerating said reciprocating member up to said speed upon a further fractional revolution of said wheels respectively.

73. In a printing press, the combination of a reciprocating member, wheels for respectively driving said member through portions of its opposite movements, crank pins carried by said wheels, and means, including connections with said pins and member, whereby said member is retarded and stopped in a distance other than the corresponding portion of the throw of said crank pins respectively.

74. In a printing press, the combination of a reciprocating member, wheels for respectively driving said member through portions of its opposite movements, crank pins carried by said wheels, and means, including connections with said pins and member, whereby said member is accelerated from rest up to the speed imparted by said wheels respectively in a distance other than the corresponding portions of the throw of said respective crank pins.

75. In a printing press, the combination of a pair of crank pins, a reciprocating member, and means, including connections with said pins and member, whereby said member is brought from rest to a speed as great as the peripheral speed of said crank pins in a distance other than the corresponding portion of the throw of said crank pins.

76. In a printing press, the combination of a pair of crank pins, a reciprocating member, and means, including connections with said pins and member, whereby said member has its speed reduced from a speed as great as the peripheral speed of said crank pins to zero in a distance other than the corresponding portion of the throw of said crank pins.

In witness whereof, I hereunto subscribe my name this 9th day of March, 1912.

CYRUS A. McCAIN.

Witnesses:

T. H. FERGUSON,
H. G. WEBSTER.

Correction in Letters Patent No. 1,063,273.

It is hereby certified that in Letters Patent No. 1,063,273, granted June 3, 1913, upon the application of Cyrus A. McCain, of Oak Park, Illinois, for an improvement in "Reciprocating Mechanisms for Printing-Presses and the Like," errors appear in the printed specification requiring correction as follows: Page 2, line 89, for the word "operatively" read *oppositely*; page 3, line 127, for the pronoun "I" read *we*; page 4, line 58, for the word "rates" read *rate*; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 24th day of June, A. D., 1913.

[SEAL.]

C. C. BILLINGS,

Acting Commissioner of Patents.