

No. 748,133.

PATENTED DEC. 29, 1903.

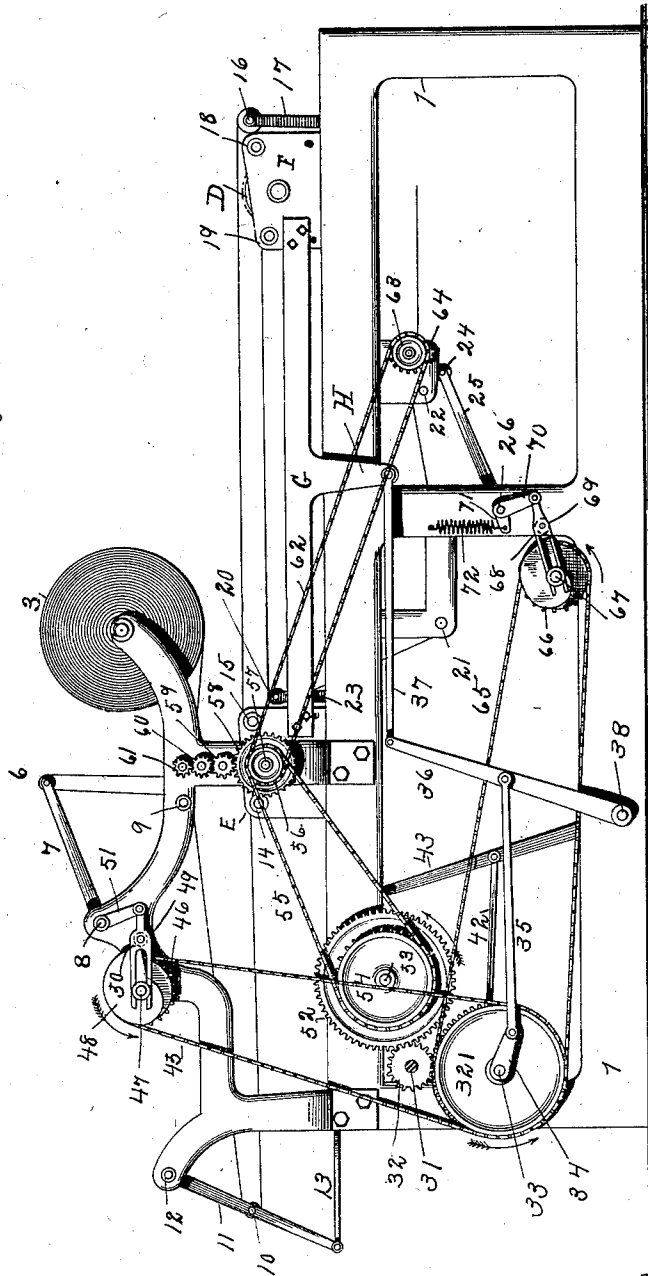
H. A. W. WOOD.  
PRINTING MACHINE.

APPLICATION FILED AUG. 22, 1892. RENEWED MAY 8, 1903.

NO MODEL.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses  
Chas. F. Schindler  
E. M. Healy.

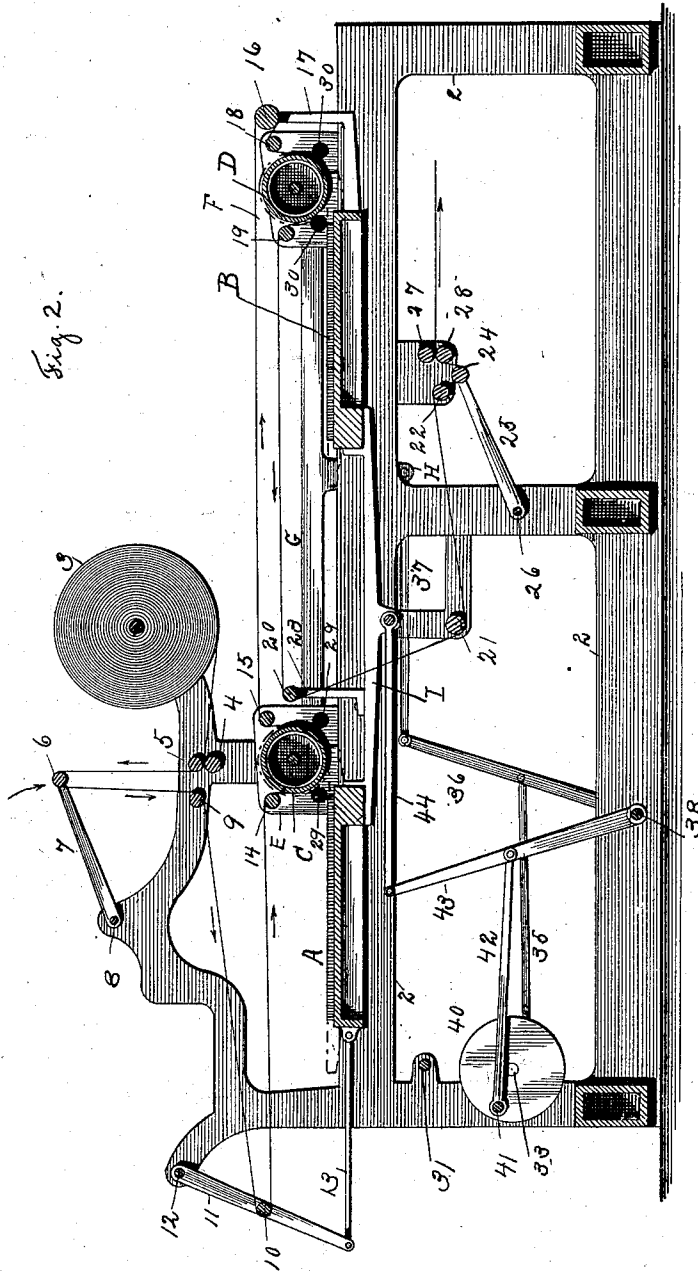
Inventor  
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By his Attorney  
Louis W. Southgate

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NO MODEL.

4 SHEETS—SHEET 2.



Witnesses  
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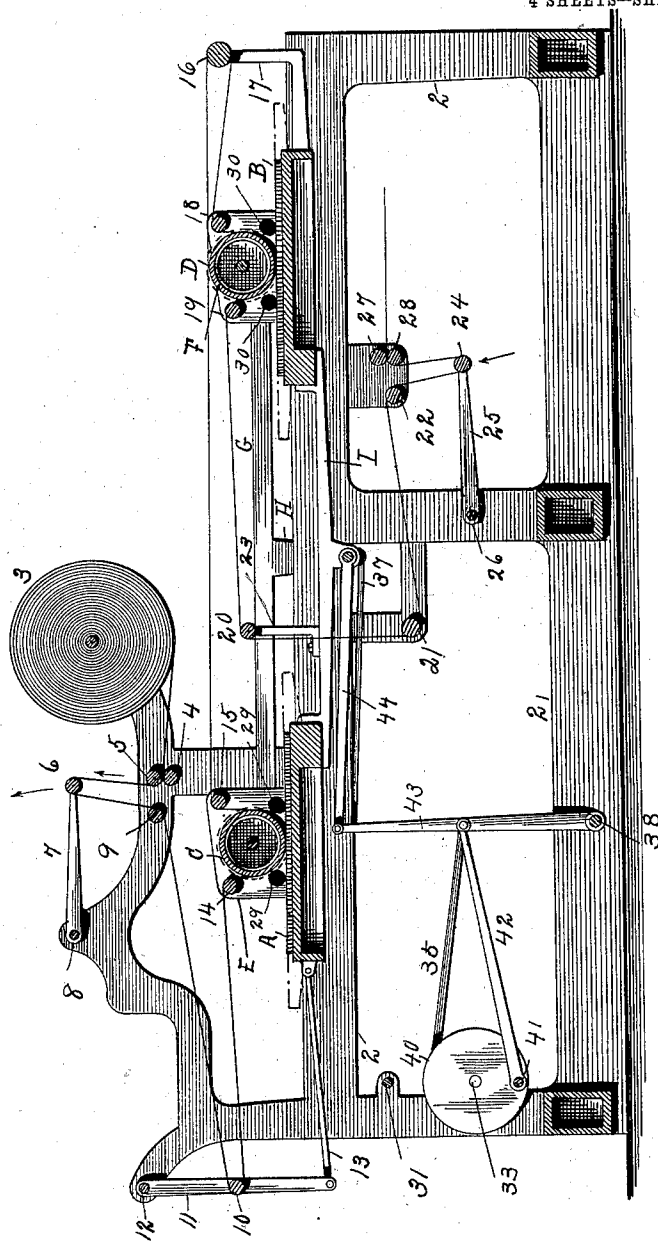
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NO MODEL.

4 SHEETS—SHEET 3.

Fig. 3.



Witnesses  
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*E. M. Healy*

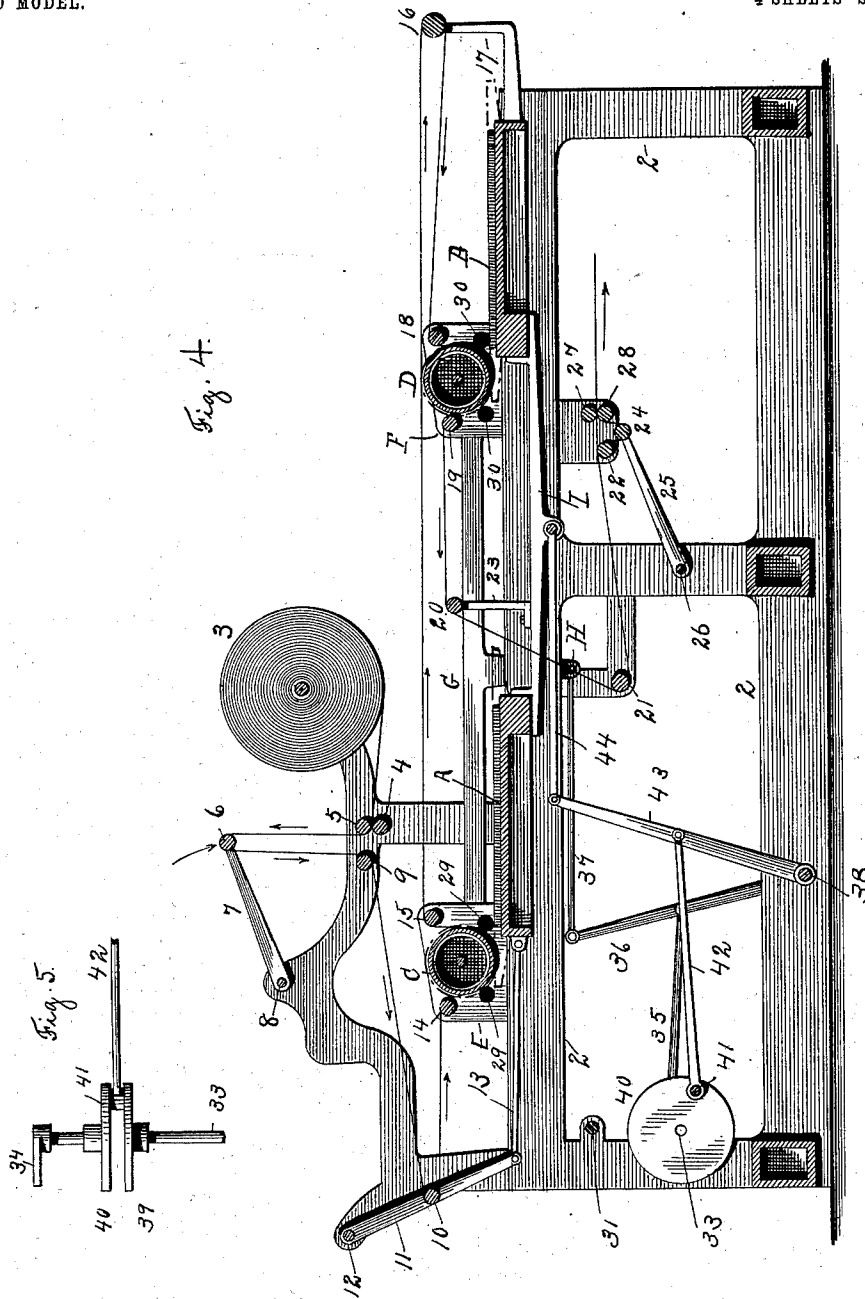
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NO MODEL.

4 SHEETS—SHEET 4.



Witnesses  
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# UNITED STATES PATENT OFFICE.

HENRY A. WISE WOOD, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO DETROIT TRUST CO., TRUSTEE, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

## PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 748,133, dated December 29, 1903.

Application filed August 22, 1892. Renewed May 8, 1903. Serial No. 156,278. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY A. WISE WOOD, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a new and useful Improvement in Printing-Machines, of which the following is a specification.

The aim of this invention is to produce a new and improved printing-machine especially adapted to print upon a web from flat forms; and to this end the invention consists of the device described and claimed in this specification and illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of a machine, illustrating one way in which my invention may be carried out. Fig. 2 is a sectional elevation taken just inside the main framing, showing the cylinders at their right-hand extreme. Fig. 3 is a similar view showing the cylinders in their middle position. Fig. 4 is a similar view showing the cylinders in their left-hand position, and Fig. 5 is a detail of the bed-operating mechanism.

Flat-bed or similar web-printing presses may be classified in two types—first, a type in which the form-bed reciprocates and cooperates with a stationary impression-cylinder, and, second, a type in which the impression-cylinder reciprocates and cooperates with a stationary form-bed. In the latter class of machines, in which the cylinder reciprocates and the bed is stationary, the web is held stationary during the printing and is shifted the amount printed as the cylinder reverses off the type. In the first class of machines the web must travel with the bed during the printing operation and must also shift at the end of each impression the amount that has been printed; otherwise the cylinder in its oscillation will draw back and reprint that portion of the web which has just been printed.

In either of the above types of presses the reciprocating member, whether it be the bed or cylinder, must move at each stroke a distance equal to the length of the full form plus enough at each end to permit the ink-rollers to clear the form. For instance, consider the whole distance of such run to be

forty inches and that each stroke occupies one second. Then in two seconds the cylinder or bed, as the case may be, will have made one complete reciprocation and have printed two sheets.

The object of this invention, distinguished from the above types of machines, is to so combine both the above methods and styles of machines in a single method or machine as to divide the labor between the cylinder and the bed, each taking part, and increase the speed of production without increasing the velocity of either of the reciprocating members beyond what is usual. To accomplish this, I make both the bed and cylinder reciprocate or move in opposition.

I have shown in the drawings a double machine, by which the web may be twice printed or perfected to illustrate the fullest conception of my invention, although, of course, it is within the scope of my invention to use a single bed and cylinder.

In the drawings I have omitted the ink-supplying mechanism and have omitted showing how the beds and cylinders are mounted so as to reciprocate, all this mechanism being well known to a mechanic skilled in this art.

Referring now to the drawings and in detail, 1 and 2 represent the usual side frames, and mounted so as to reciprocate on the side frames are the form-beds A and B and the impression-cylinders C and D. The impression-cylinders may be geared to turn with the reciprocating beds and always keep in register therewith, as shown in Letters Patent to John H. Stonemetz, No. 376,053, January 3, 1888, and this gearing is indicated in dotted lines on the drawings.

The impression-cylinder C is mounted in a suitable carriage E, consisting of side frames and the cylinder D is mounted in a similar carriage F, consisting of side frames, and these two carriages E and F are connected together by tie-beams G, which have the depending arms H.

The form-beds A and B are connected together by the beams I, so that they will move in unison, whereby both cylinders and both beds will each form a moving member.

A roll of paper, as 3, is mounted in the

framings 1 and 2 in any of the usual manners, and the web from this roll is led between the rollers 4 and 5, which may be continuously driven, as hereinafter described, then around the looping-roller 6, which is mounted in arms 7, which are fastened on the shaft 8, journaled in the main frames, then around stationary roll 9, then around the roll 10, which I term the "compensating feeding-roller," which roller 10 is mounted on arms 11, which are mounted on a shaft 12, secured in the main frame, and the arms 11 are connected by suitable rods 13 to the bed A, as shown, so that the roller 10 will move back and forth for a purpose hereinafter described. From the roller 10 the web passes around guide-roller 14, mounted in the carriage E, then around the impression-cylinder C, then around a roller 15, mounted in the carriage E, then across the press to a roller 16, mounted in arms 17, carried by the bed B, then around roller 18, carried by carriage F, around cylinder D, and then around the roller 19, carried by the carriage F, to roller 20, mounted in arms 23, which arms 23 are attached to the beams I, which connect the beds A and B, whereby the roller 20 will move with the beds A and B. From the roller 20 the web is led around the roll 21, mounted in the main frames, around roll 22, then around the looping delivery-roll 24, which is mounted in arms 25, fastened on the shaft 26, which is journaled in the main frame, and then between the rollers 27 and 28, which may be continuously driven, as hereinafter described. During this passage of the web it will be seen that both sides of the same are printed or that one side will be presented to the form on bed A and the other side to the form on bed B.

On each side of the impression-cylinder C are arranged form-inking rollers 29, 29, to which ink is supplied by any suitable mechanism, not necessary here to show, and these form-inking rollers will act to ink the form placed on bed A. Similar form-inking rollers 30, 30 are mounted on each side of the impression-cylinder D.

The roller 10, around which the web is led from the feeding device, is mounted in the arms 11, so as to move at substantially one-half the speed of the bed, or, in other words, the radius of the roller 10 about the center of the shaft 12 is substantially one-half the radius of the point of connection of the link 13 to the arms 11, and this accomplishes a very useful function, as hereinafter described.

The driving mechanism is such that it will move the impression-cylinders and beds in opposition, and when the cylinders are off the impression in either direction the proper length of web will be paid out by the feeding device and drawn forward by the delivering device.

The mechanisms for driving the various devices before described may be as follows: A shaft 31 may be mounted in the main

frames and may constitute the shaft to which power is applied, and this shaft carries a pinion 32, which meshes with and drives a wide-faced gear 321, mounted on a shaft 33, suitably journaled in the main frames. On the ends of this shaft 33 are arranged the crank-arms 34, which connect by links 35 to the arms 36, which are pivoted on the outside ends of shaft 38, which is mounted in the main framing, as shown, and these arms 36 are connected by suitable links 37 to the projections H, before referred to, and by this mechanism the impression-cylinders will be reciprocated back and forth. The shaft 33 is not a continuous shaft, but is separated near each frame and carries disks 39 and 40, between which are arranged crank-pins 41, and to these crank-pins 41 are connected links 42, which links 42 connect to arms 43, pivoted on shaft 38, and these pivoted arms 43 connect by links 44 to the beams I, which connect the form-beds A and B. By this mechanism it will be seen that the form-beds will be reciprocated back and forth as the shaft 33 revolves. The radius of the crank-pins 41 is the same as the radius of the crank-arms 34; but the crank-pins 41 and the crank-arms 34 are set in opposition or on opposite sides of the center, whereby the cylinders and beds will move oppositely. The gear 321 is made with a wide face, and the same has on the periphery thereof two sets of sprocket-teeth, one of which carries the sprocket-chain 45, which drives the gear 46, fast on short shaft 47, mounted in the main frame 1, and on this shaft is also mounted the cam 48, and arranged to operate in connection with this cam is the usual yoke 49, which carries a roller 50, which bears against the face of said cam 48. The yoke 49 connects to an arm 51, which is attached to shaft 8, on which shaft 8 are attached the arms 7, which carry the looping-roller 6. Thus as the cam revolves the looping-roller will take up the web paid out by rollers 4 and 5 and when the cylinders are off the form-beds in either direction will descend to allow this web to be run into and to be pulled through the press by the delivery mechanism. The pinion 32 meshes with and drives another gear 52, which is mounted on a short shaft 53, journaled in the main frame, and on this shaft is arranged a sprocket-wheel 54, which drives chain 55, which chain 55 communicates motion to gear 56, which is mounted on a short shaft 57, journaled in the main frame, and on this shaft 57 is mounted a gear 58, which by means of intermediate 59 and pinions 60 and 61 continuously turn the rollers 4 and 5 to continuously unwind the web from roll 3. The sprocket-wheel 56 has a double face and drives the sprocket-chain 62, which is connected to drive the sprocket-wheel 63, fast on the shaft of the roller 27, and roller 27 communicates motion to roller 28 by means of pinion 64. Another chain 65 is driven from gear 321, and the same turns the sprocket-wheel 66, mounted on the short shaft 67, jour-

naled in the main frame, and on this shaft 67 is mounted the cam 66, and arranged to cooperate with this cam 66 is the yoke 68, which has a roller 69 bearing against the face 5 of the same. The yoke 68 is connected to an arm 70, mounted on the shaft 26. A spring 72 may be arranged between said arm 70 and a stationary point and serve to keep the roll 69 against the cam. By means of this mechanism the looping-roller 24 will be operated 10 to pull forward the proper length of web when the cylinders are off the impression in either direction. The operation of this feeding and looping mechanism is well understood and 15 will not be further described except to say that the rollers 4 and 5 and 27 and 28 are continuously driven to feed the web continuously into and out of the press, and the looping-rollers 6 and 24 are operated to shift 20 the proper length of web when the impression-cylinders are off the forms in either direction.

The operation of my complete device is as follows: Suppose, as before stated, that the 25 necessary travel in one of the old types of machines would be forty inches. I divide this motion between the cylinder and bed and make each move twenty inches in opposition, and this will accomplish the same result that either the cylinder or bed moving 30 forty inches would accomplish. Referring now especially to Figs. 2, 3, and 4, in Fig. 2 the impression-cylinders are just commencing their reversal at the right-hand extremes, 35 and during this reversal the rollers 6 and 24 will descend and feed and pull forward a fresh portion of web around the impression-cylinders. Starting with the cylinders in their extreme right-hand position, during the 40 next quarter-revolution of the shaft 3 3 the beds will be moved to the right ten inches and the cylinders to the left ten inches, or the parts will be brought to the position shown in Fig. 3. Considering the web as remaining 45 stationary between the rollers 9 and 21, it will be seen that during this motion to the right of the beds the roll 10 will be moved to the right five inches, and will thus pay out to impression-cylinder C ten inches, 50 which is necessary, because the bed has moved ten inches. This ten inches paid out by the roll 10 will be taken up by the roll 16, which will have moved ten inches to the right; but this roll 16 by its movement 55 of ten inches will take up twenty inches of web, and will thus pull an additional ten inches around impression-cylinder D, which is necessary because the bed B has moved to the right ten inches, and this ten inches of 60 web thus pulled forward around the cylinder D by roll 16 will be given to roll 16 by roll 20, which by the movement of the beds has moved ten inches to the right. During the next quarter-revolution of the shaft 33 the 65 beds will be moved ten inches farther to the right and the cylinders ten inches farther to the left, and the same operation will con-

tinue—that is, the web will be paid out to the impression-cylinders just the amount that 70 the beds have moved. This operation will bring the parts to the position shown in Fig. 4. As the beds and cylinders reverse in this position the rollers 6 and 24, which have 75 been raised during the printing operation, will descend and will feed or shift the proper length of web through the machine. Now the impression-cylinders will move to the right and the beds to the left each twenty 80 inches. During this movement to the left of the beds the roller 10 will be moved ten inches to the left and will take up and pull 85 twenty inches around the impression-cylinders C and D, which is necessary because the beds have moved twenty inches. This twenty inches pulled to the left by the roller 10 will 85 be given out by roller 16, which moves twenty inches also to the left, and this roller 16 will also give twenty inches to the impression-cylinder D, which twenty inches will be taken 90 up by the roller 20 as the same moves to the left with the beds. Thus it will be seen that by this mechanism as the parts reciprocate 95 the web is paid out to move with the beds and that this operation takes place on the movements of the bed in either direction. Thus for each complete reciprocation or two 100 movements of the impression-cylinders and beds two sheets will be perfected in two seconds, keeping the same time limits as before, and thus the capacity of the press is double 100 over that of either type previously described. It will be seen that the roller 10 moves on the arc of a circle. This will tend when the cylinders first engage the forms and leave the 105 forms to allow a little slack in the web, but when the impression-cylinder is in the middle of the form to keep the web taut. This slight 110 error may be corrected by properly shaping the cam 48, if desired, so as to cause the looper 6 to take care of the same. This is 110 the proper action, because when the impression-cylinder is fully in engagement with the form it will hold the web tightly in bite between the same and the form. The slight 115 pull or take-up on the web that is caused by the roller 20 moving about the roller 21 may be counterbalanced by properly shaping the cam 66, and the spring 72 is useful in that it 120 will tend to keep the web taut on the roll 20 should the roll 20 pull the roller 69 off the face of the cam 66.

It is within the scope of my invention to make the cylinders print only when they move in one direction and to run them idly in the other direction; but the preferred method is 125 as before described, because by making the cylinders operate both ways the press will very rapidly print the web. It is also within the scope of my invention to lead the web through the machine and from cylinder to 130 cylinder in other ways.

It is not necessary, as before described, to make the beds and cylinders each move equal distances, because this ratio can be differently

divided between the beds and cylinders and either made to move more than the other.

It will be seen that my device covers the combination, with a reciprocating bed and a reciprocating cylinder or with two reciprocating beds and two reciprocating cylinders, of web-controlling devices. The specific web-controlling devices shown consist of two web-manipulating instrumentalities. The first of these web-manipulating instrumentalities comprises the devices which will move the web at the same speed and in the same direction as the bed moves, and the second of such instrumentalities is the device which feeds or shifts the web through the machine when the cylinder is not in impression. The details and arrangement of parts to accomplish these two functions may be varied as desired.

So far as the last mechanism is concerned—that is, the mechanism which feeds or shifts the web when the cylinder is not in impression—there are known in the art other forms of feeding or shifting devices, and it is of course within the scope of my invention to substitute for the specific devices I have shown any other web-manipulating device which will shift the web at the proper time.

So far as the web-manipulating mechanism which causes the web to move in harmony with the reciprocating bed, which mechanism may be conveniently called a "compensating" mechanism, is concerned other means may be worked out to accomplish this function.

The details of the various mechanisms and the construction adopted may be greatly varied by a skilled mechanic without departing from the scope of my invention as expressed in the claims.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination in a web-printing press of a form-bed and an impression-cylinder, means for moving the same in opposite directions, and web-controlling devices.

2. The combination in a web-printing press of two form-beds, an impression-cylinder co-acting with each form-bed, means for moving the beds and the cylinders in opposite directions, and web-controlling devices.

3. The combination in a web-printing press of a form-bed and an impression-cylinder, means for moving the same in opposite directions, and a compensating web-manipulating mechanism arranged to move the web at the same speed and in the same direction as the bed moves.

4. The combination in a web-printing press of two form-beds, an impression-cylinder co-operating with each form-bed, means for moving the beds and cylinders in opposite directions and a compensating web-manipulating mechanism arranged to move the web at the same speed and in the same direction as the beds move.

5. The combination in a web-printing press

of two form-beds connected to move in unison, an impression-cylinder adapted to coact with each of said beds and connected to move in unison, means for moving the form-beds and the impression-cylinders alternately in opposite directions, web-guides adapted to guide a web around said impression-cylinder so that the same will be presented to the form placed on each bed, and a compensating web-manipulating mechanism adapted to move the web at the same speed and in the same direction as the beds move.

6. The combination in a printing-press of a form-bed, and an impression-cylinder, means for moving the same in opposite directions, web-guides arranged to guide a web between said impression-cylinder and form-bed, a compensating feeding device adapted to move the web at the same speed, and in the same direction as the movement of the bed, and a web-shifting mechanism.

7. The combination in a printing-press of two form-beds, and two impression-cylinders, means for moving the impression-cylinders and form-beds alternately in opposite directions, web-guides arranged to direct a web around said impression-cylinders so that the web will be presented to the form placed on each bed, a compensating feeding device adapted to move the web to compensate for the movement of the beds, and a web-shifting mechanism.

8. The combination in a printing-press of a form-bed and an impression-cylinder, means for moving the same in opposite directions, web-guides arranged to direct a web between said impression-cylinder and form-bed, a compensating feeding device arranged to move the web in a direction corresponding to the movement of the bed to compensate for the movement of the bed, and an intermittent delivery device arranged to draw forward the web when the cylinder is off impression.

9. The combination in a printing-press of a form-bed and an impression-cylinder, a crank mechanism arranged to move the same in opposite directions, web-guides arranged to direct a web between said impression-cylinder and form-bed, and a web-compensating mechanism arranged to move the web in harmony with the bed.

10. The combination in a printing-press of a form-bed, and an impression-cylinder, means for moving the same in opposite directions, and a web-manipulating device operated from the movement of the bed, arranged to move the web to compensate for the movement of the form-bed.

11. The combination in a printing-press of the form-bed A and the impression-cylinder C, means for moving the same alternately in opposite directions, web-guides arranged to direct a web between said cylinder and form-bed, and rollers around which the web is led to and from the impression-cylinder, and

means for moving said rollers to move the web so as to compensate for the movement of the form-bed A.

12. The combination in a printing-press of two form-beds connected to move together, two impression-cylinders connected to move together, means for moving the form-beds and impression-cylinders alternately in opposite directions, web-guides arranged to direct a web around said cylinders so that the same will be presented to forms placed upon said bed, a roller around which the web is led before it passes to the first impression-cylinder, a roller around which the web is looped between the impression-cylinders, a roller around which the web is led from the second impression-cylinder, means for operating said rollers to move the web in harmony with the beds, and a web-shifting mechanism.

13. The combination in a printing-press of the connected form-beds A and B, and connected impression-cylinders C and D, means for moving said impression-cylinders and form-beds alternately in opposite directions, web-guides arranged to direct a web between said impression-cylinders and form-beds, the roller 10 arranged to move the web in unison with the form-beds, the roll 16 around which the web is looped between the impression-cylinders, the roller 20 to which the web is led from the impression-cylinders, said rollers 16 and 20 being arranged to move with the beds, and a web-shifting mechanism.

14. The combination in a printing-press of a form-bed, and an impression-cylinder, means for moving the same in opposite directions, web-guides arranged to direct a web between said impression-cylinder and form-bed, feeding and delivery mechanisms arranged to draw forward the proper length of web when the impression-cylinder is off the form-bed, and a compensating web-manipulating mechanism arranged to move the web between the impression-cylinder and form-bed to compensate for the movement of the form-bed.

15. The combination in a printing-press of two form-beds and two impression-cylinders, means for moving the same in opposite directions, web-guides arranged to direct a web between said impression-cylinders and form-beds, feeding and delivery mechanisms arranged to feed and draw forward the proper length of web when the impression-cylinders are off impression, and a compensating web-manipulating device arranged to move the web between the impression-cylinders and form-beds to compensate for the movement of the form-beds.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

H. A. WISE WOOD.

Witnesses:

W. F. WOOD,  
CHAS. A. THROCKMORTON.