(No Model.)

4 Sheets—Sheet 1.

A. CAMPBELL.

OSCILLATING CYLINDER PRINTING MACHINE.

No. 289,810. Patented Dec. 11, 1883.

Fig. 1.

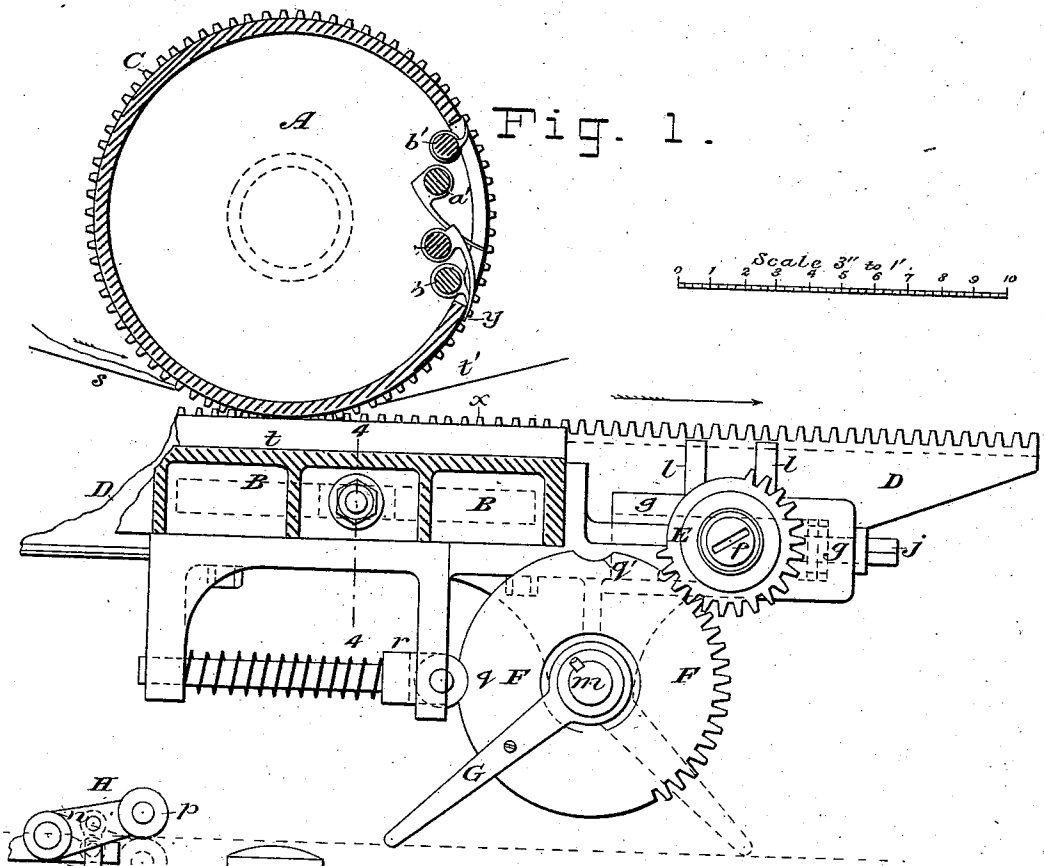
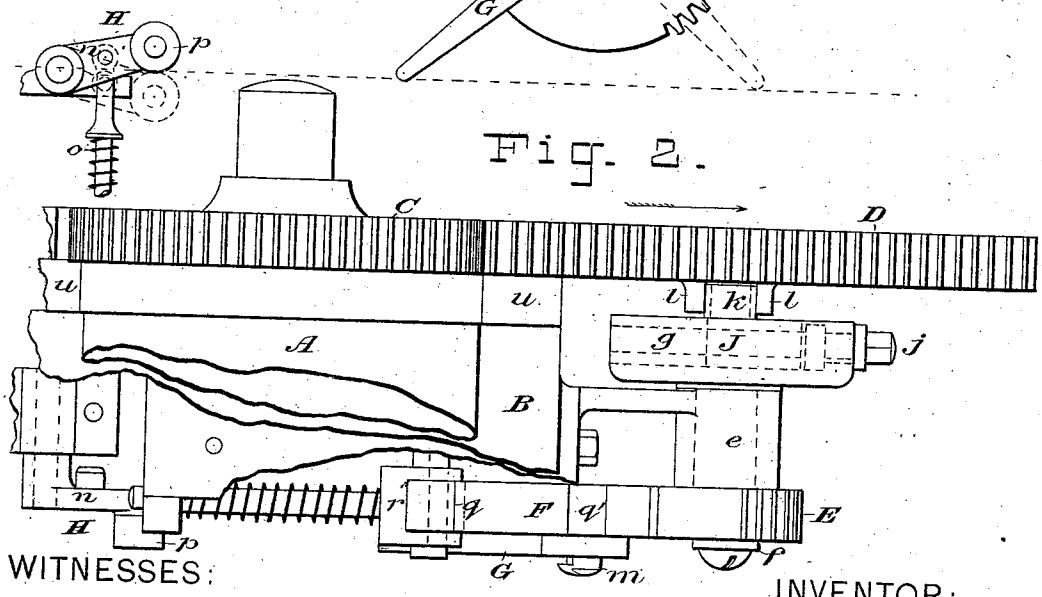


Fig. 2.



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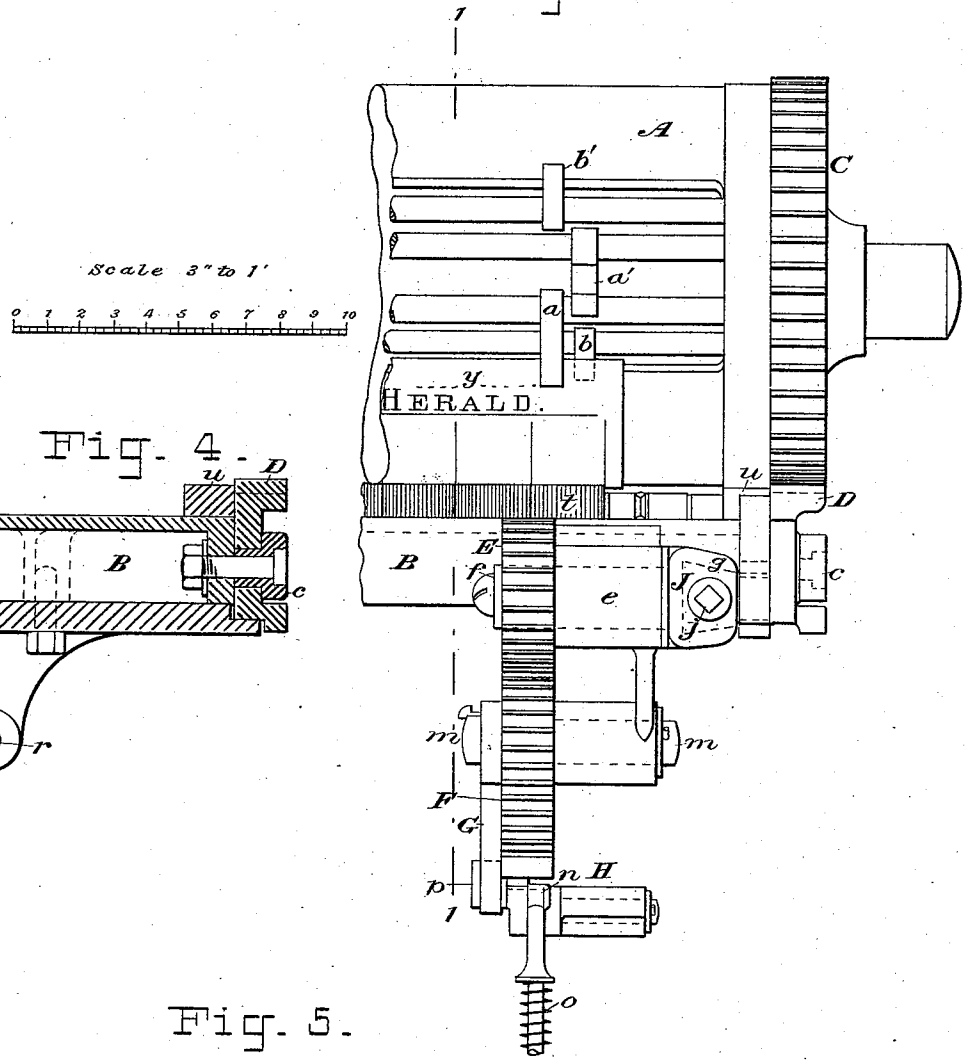
(No Model.) 4 Sheets—Sheet 2.

A. CAMPBELL.

OSCILLATING CYLINDER PRINTING MACHINE.

No. 289,810. Patented Dec. 11, 1883.

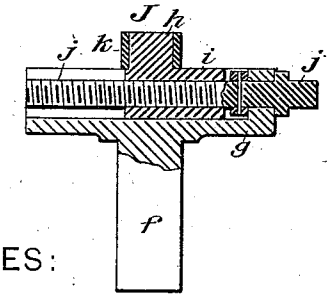
Fig. 8.



Scale 3" to 1'

Fig. 4.

Fig. 5.



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(No Model.) 4 Sheets—Sheet 3.

A. CAMPBELL.

OSCILLATING CYLINDER PRINTING MACHINE.

No. 289,810. Patented Dec. 11, 1883.

Fig. 6.

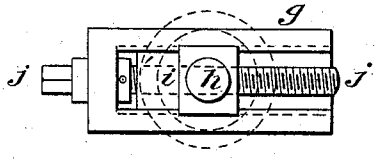
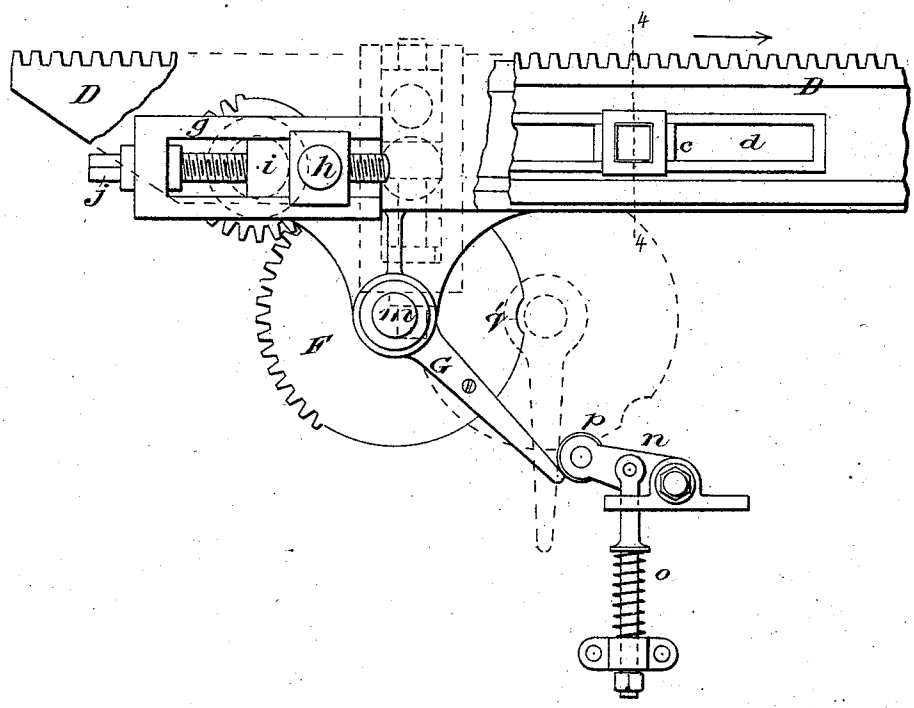


Fig. 7.



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4 Sheets—Sheet 4.

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OSCILLATING CYLINDER PRINTING MACHINE.

No. 289,810. Patented Dec. 11, 1883.

Fig. 8.

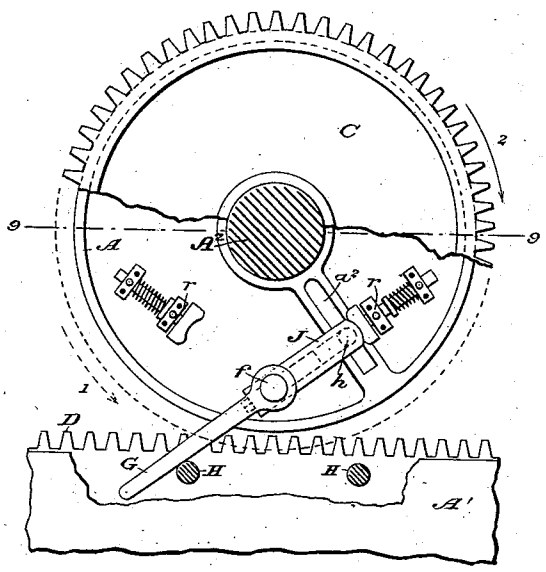


Fig. 8ª.

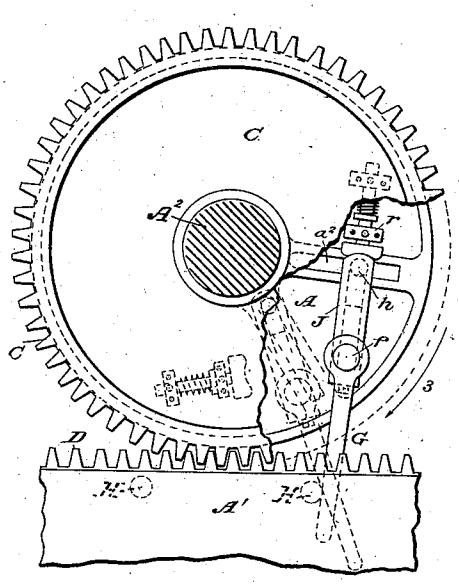
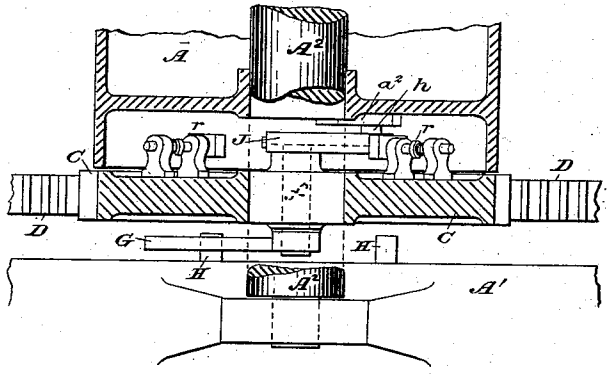


Fig. 8.



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UNITED STATES PATENT OFFICE.

ANDREW CAMPBELL, OF BROOKLYN, ASSIGNOR TO JOHN McLOUGHLIN AND EDMUND McLOUGHLIN, OF NEW YORK, N. Y.

OSCILLATING-CYLINDER PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 289,810, dated December 11, 1883.

Application filed May 28, 1881. (No model.)

To all whom it may concern:

Be it known that I, ANDREW CAMPBELL, a citizen of the United States, residing in Brooklyn, Kings county, New York, have invented certain Improvements in Oscillating-Cylinder Printing-Machines, of which the following is a specification.

This invention relates to that type of press in which the cylinder is geared positively to the bed by a toothed side rack on the latter, which meshes with a toothed wheel or circular rack fixed on the same axis with the cylinder. Reciprocating motion is imparted to the bed by a crank, or by any other suitable means, and horizontal alternate reciprocation of the bed produces oscillation of the cylinder, and the number of degrees through which the cylinder oscillates is determined by the distance through which the bed moves. In presses of this type, as ordinarily constructed, the form is of a fixed size and is placed in the center of the bed, and the printing face or surface of the cylinder is just equal in length to the form, with a margin added at each end for the grippers to close on and hold the margins of the sheets. Two sets of grippers are employed—one set at each end of the printing-surface—in order that the press may print a sheet at each semi-oscillation, the sheets being fed in alternately on opposite sides. With the cylinder and bed fixedly geared in the manner above described, it is obvious that sheets of but one uniform length only can be printed on the press.

The object of my invention is to construct a press of this class in which the relations of the bed to the cylinder may be automatically changed within reasonable limits, so that a sheet of any desired size within the limits may be conveniently printed. This I accomplish by so gearing the bed and cylinder together that the cylinder may be set to oscillate through any given number of degrees (less than the maximum) at each movement of the bed which oscillates it, this proportion being preserved until the adjustment is changed. The means I prefer to employ in accomplishing this result consists of a side rack mounted on the bed, so that it may play endwise on the bed the desired distance, and to connect this rack to the bed by means of a crank mounted to rotate on the bed through a half-revolution. The crank-pin engages a vertical slot or keeper on the bed-rack, and the crank is arranged to turn half-way over at the beginning of each movement of the bed and in an opposite direction thereto. Thus, as the crank turns back while the bed moves forward and the crank-pin engages the rack, it is obvious that the rack will be retarded in its movement and will also retard the cylinder until the bed has moved forward a distance equal to the throw of the crank. I make the crank-pin adjustable radially from the axis of the crank-shaft, in order that I may vary the throw at will, and by setting the crank-pin so that its axis coincides with that of the crank-shaft it is obvious that the device will lose the character of a crank and the bed and rack will move together.

In the drawings, which serve to illustrate my invention in its preferred form, I have shown only those portions of a printing-press to which my invention appertains, and I have omitted the press-frame entirely, as not essential to the full understanding of the invention, and because it would only tend to obscure the drawings. This frame may be of the ordinary or any good kind. The parts shown are all drawn to a proportionate scale, and may be considered as illustrating a press that will take a sheet of thirty-four by forty-seven inches as a maximum size, and twenty-eight by forty-two inches as a minimum size. The first six figures represent the press as set to print the maximum size, only the rack and bed moving together. The last figure represents it set to print a smaller sheet.

Figure 1 is a vertical section or sectional elevation taken on line 1 1 in Fig. 3, looking from the left. Fig. 2 is a plan of Fig. 1. Fig. 3 is an elevation of Fig. 1 as seen from the right. Fig. 4 is a vertical section through the bed and rack of the press, taken on line 4 4 in Figs. 1 and 7. Fig. 5 is a detached sectional plan of the crank, and Fig. 6 is a front view. Fig. 7 is an elevation of the bed, rack, and shifting mechanism, arranged to show the crank set with a throw of four inches. Figs. 8, 8ª, and 9 illustrate a modification, which

will be referred to more particularly hereinafter.

A represents the cylinder, provided with two sets of grippers, *a a'*, and two sets of sheet-lifters, *b b'*. These may be mounted and arranged to operate in the usual way.

B is the bed of the press, which may be provided with any of the well-known means for giving it the necessary reciprocating movement.

C is a circular rack or toothed wheel mounted on the end of the cylinder and rotating with the latter, and D is the side rack on the bed, with which the circular rack C meshes. This rack is mounted on the side of the bed, as best shown in Figs. 4 and 7, a flanged block, *c*, fixed to the bed by a bolt, being arranged to engage a slot, *d*, in the rack. Several of these attachments are employed at intervals, and the slots are made long enough to permit the proper longitudinal play of the rack.

Mounted in a suitable bearing, *e*, in the bed is a crank-shaft, *f*, bearing a cross-head, *g*, in which is mounted the adjustable crank-pin *h*. Referring particularly to Figs. 5, 6, and 7, it will be seen that the pin *h* is fixed on a dovetail nut, *i*, that plays in a channel in a cross-head, *g*, wherein it is adjusted or set by means of a screw, *j*. This enables the operator to set the crank-pin at any point within limits to give the crank the desired throw. The crank-pin is provided with a suitable square sliding block, *k*, which engages the slot or way formed by two keepers, *l l*, fixed on the inner face of the rack D. It is easy to see that if the crank-pin be so set, for example, as to give the crank a throw of four inches, as in Fig. 7, and the crank be turned over half-way from a horizontal position on one side to the opposite side, the rack D will be moved endwise four inches.

I will refer to the crank as a whole by the letter J.

On the end of the crank-shaft *f*, I fix a toothed wheel or segment-rack, E, and on a stud or shaft, *m*, I mount another larger segment-rack, F, arranged to mesh with E.

To the rack F, I fix an arm, G, and arrange in its path a spring tripping device, which I will designate, as a whole, by H. This device is mounted fixedly at the proper point on the press-frame, and comprises an arm, *n*, elastically upheld by a spring, *o*, and bearing, by preference, a friction-roller, *p*, in its free end. The function of the device H is to catch the arm G, and by means of the intermediate racks, E and F, to throw over the crank J and shift the bed-rack D. My object in employing the segment-rack F, which is shown as twice the size of E, is partly to enable me to turn the crank in the opposite direction to that in which the bed is moving, and partly to enable me to throw the crank over through the half-revolution without the necessity of swinging the arm G through so great an arc. The smooth portion of the segment-rack F, which is disk-like in form, is provided with two recesses, *q q'*, which at the proper time are engaged by a roller-pawl, *r*, suitably mounted on the bed B. This pawl engages one of the recesses when the crank has been thrown over, and steadies the crank. When the arm G in the movement of the bed comes in contact with the tripping device H, this pawl is readily displaced by the rotation of the rack F.

In Figs. 1, 2, and 3 the bed B is represented as moving in the direction of the arrow, and the grippers *a* as having taken a sheet from the feed-board *s*. *x* represents the forward or advancing edge of the form *t* on the bed, and *y* the point on the cylinder which coincides with the point *x* on the form. I will call this the "printing-point." The feed-board on the opposite side of the cylinder is represented at *t'*, and the wooden bearer on the bed is represented by *u*.

As before stated, the crank-pin *h* is shown as set with its axis in line with the axis of the crank-shaft in the principal figures of the drawings, and although the tripping device H will turn the crank at each movement of the bed the rack D will not be shifted; but in Fig. 7 I have shown the crank-pin set to give the crank a throw of four inches. With reference to the arrangement of the crank J, as shown in the first three figures, it will only be necessary to say that the press so arranged will print a sheet of the maximum size, as the bed and cylinder move together throughout. I will say, however, that an excess in the travel of the bed, amounting to about twelve inches above that required for printing only, is necessary in order to bring the form properly under the inking-rollers, and this I utilize to enable the device H to shift the crank through the medium of the arm G.

A press of this character prints from the grippers, and it is obvious that if it be fed from both sides, and the cylinder be fixedly geared to the bed, it is feasible to print only from a form suited to the largest-sized sheet—thirty-four inches in the present case.

I will now describe the operation of my improved press when set to print a sheet of twenty-six inches.

The crank-pin is set two inches from the axis of the crank-shaft to give the crank a throw of four inches, and the form is placed in the center of the bed. The bed is now set in motion, it being supposed to start from the position shown in Fig. 7, moving in the direction of the arrow. The bed being at the end of its movement to the left, the arm G has passed over roller *p*, depressing arm *n* in its passage, and the said roller has been thrown up to the position shown. As the bed starts to move, arm G takes under roller *p*, which detains it, and as the bed moves on arm G is shifted over, its position when vertical being shown in dotted lines. This movement of arm G acts through the segment-racks to turn the crank J, and thus retard the movement of the rack

D, and through it the movement of the cylinder A. The position of the crank when turned half-way over is also shown in dotted lines. The further movement of the bed turns the crank completely over, the arm G wipes over the roller *p*, and the roller-pawl *r* (not shown in Fig. 7) drops into recess *q'* in the disk of segment F. It will now be found that while the bed has been advancing with its regular speed the action of the crank-pin *h* on the rack has retarded the cylinder until the printing-point on the latter coincides with a point on the bed four inches back of the printing-point on the same; but as the form is eight inches shorter than before, this will bring the front edge of the latter properly into coincidence with the printing-point on the cylinder, and the impression will be properly placed on the sheet. The bed moves on to the end of its travel, and lever G wipes over the tripping device at that end of the press. When the bed starts to return, the crank J shifts the rack D back again, the cylinder is retarded, and the opposite end of the form is properly presented to the printing-point on the cylinder. Thus it will be seen that with a crank having the proper throw the rack and cylinder may be so retarded as to enable one to print very small sheets from very small forms, and at the same time to feed from both sides of the cylinder.

The rack D being mounted firmly and solidly on the bed, with only play in the direction of its length, and the crank-pin being on "centers," when the strain is thrown upon it, it will be seen that the press will operate as steadily as if the rack were fixed.

As modifications of my method of changing the relations between the reciprocating bed and the cylinder, I may fix the side rack on the bed and make the circular rack C to shift. This is illustrated in Figs. 8, 8ª, and 9, the first two being mutilated elevations, and the latter a horizontal section taken on line 9 9 in Fig. 8. In these figures I have employed the same letters of reference as in the principal figures of the drawings, as far as possible, and in order to avoid obscuring the working parts I have broken away part of the rack or toothed wheel C in Figs. 8 and 8ª, and part of the press-frame A' in Fig. 8. In this construction, the wheel C is fixed on the cylinder-axis A^2, and the cylinder A is mounted to turn freely on same, except as it is prevented by its connection with the wheel C, as will be described. The bed-rack D meshes with C, and by its reciprocation effects the regular oscillation of the wheel C and axis A^2. It also effects irregular oscillation of the cylinder A through the medium of the mechanism I will now describe.

J is a crank, constructed similar to that shown in Fig. 6, and G is an arm. These are fixed on opposite ends of a short shaft, *f*, which has a bearing in the web of the wheel C, the crank J being on the inside of said wheel next the cylinder, and the arm G outside, as shown in Fig. 9. The breaking away of wheel C in Figs. 8 and 8ª enables me to show both the crank and the arm. The wrist or crank pin *h*, which is adapted to be adjusted radially in the crank to or from the axis *f*, engages a radial slot, a^2, in the end of the cylinder A, and this forms the connection between the cylinder and wheel C. On the inner face of the wheel C are mounted two elastic stops, *r r*, which engage the end of the crank J in its two terminal positions, and by elastic pressure steady it in its said positions.

H H are two fixed studs or pins in the frame A', which serve to engage the arm G alternately, and effect the shifting of the cylinder at the termination of each oscillation.

In Fig. 8 the cylinder and wheel C are shown as at the termination of their oscillation in the direction indicated by dotted arrow 1 and just ready to turn back in the direction indicated by arrow 2 in same figure. Fig. 8ª shows in full lines the continuation of the revolution in this latter direction (indicated by arrow 3 in Fig. 8ª) until the arm G has just engaged one of the studs H, which now checks the movement of the free end of the said arm. As the wheel C continues to revolve, the axis *f* is of course carried on, and this causes the end or crank J to release itself from the stop *r* and to swing over, as indicated by the dotted lines in Fig. 8ª; but in so doing its crank-pin *h*, which engages the slot a^2 in the cylinder, compels the cylinder to move on its axis ahead of or faster than the wheel C. When the axis *f* reaches a point directly under the cylinder-axis, the oscillation will have reached its limits, and the parts will turn back again. It will be seen that the wrist-pin *h* is shown as set at the extreme end of crank J, in which position it will shift the cylinder to the greatest possible extent. If it be placed to coincide with the axis *f*, as it may be, then the cylinder will not be shifted, but will move with wheel C, although the arm G will be shifted from side to side by the studs H at each oscillation. By setting the crank-pin in or out on the crank, any desired degree of shift within limits may be given to the cylinder. The wheel C draws the cylinder around by reason of the wrist-pin *h*, which engages the cylinder, the shaft *f*, which engages the wheel C, and the crank J, which connects *f* and *h*. When the arm G engages stud H, as in Fig. 8ª, the said stud may be considered as a fulcrum, J G a lever, the cylinder the weight attached at *h*, and the wheel C the power applied at *f*. In this construction, as well as in that shown in the principal figures, the reciprocating bed and the cylinder are made to shift with reference to each other, and the result attained is precisely the same in both cases. I have omitted as superfluous in these views the grippers, feed-board, &c., as these are the same as shown in Figs. 1 and 3.

I do not claim a press with an oscillating cylinder fixedly geared to the reciprocating

bed, so that points on the cylinder will always coincide with corresponding points on the bed, as this is an old and well-known device; but

What I do claim is—

1. An improved printing-press having an oscillating cylinder and reciprocating bed, and capable of printing while the bed is moving in either direction, the cylinder being driven from the bed by means of a toothed rack on the bed engaging a circular toothed rack on the cylinder, and said press provided with means, substantially as described, for shifting one of said racks at each movement of the bed, substantially as and for the purposes set forth.

2. A cylinder printing-press provided with a bed-rack capable of being shifted longitudinally, and means, substantially as described, for automatically shifting said rack after the form has passed the cylinder and before it again reaches it on its return, substantially as and for the purposes set forth.

3. The combination, with the bed, of the rack D, mounted to play longitudinally and provided with keepers *l l*, and the crank J, mounted on the bed and provided with an adjustable crank-pin, *h*, all arranged to operate substantially as set forth.

4. A cylinder printing-press provided with a shifting bed-rack and with means, substantially as described, for automatically shifting said rack through the medium of the movement of the bed and in an opposite direction to that in which the bed moves, substantially as set forth.

5. The combination, in a printing-press, of the bed, the oscillating cylinder, the shifting bed-rack, the circular rack on the cylinder, an adjustable crank, with its pin in engagement with the bed-rack, and mechanism, substantially as described, for shifting said crank through a half-revolution at the beginning of each movement of the bed, whereby the movement of the cylinder may be retarded and shortened proportionately to the throw of the crank, substantially as and for the purposes set forth.

6. In an oscillating-cylinder printing-press provided with an intermeshing bed-rack and circular cylinder-rack, the combination of the adjustable crank J, with its pin arranged to engage the bed-rack, the segment-racks E and F, the latter provided with an arm, G, and recesses *q* and *q'*, the tripping device H, and the spring roller-pawl to engage the recesses *q* and *q'* and hold the crank steadily in its horizontal position, substantially as set forth.

7. An oscillating-cylinder printing-press wherein the cylinder is driven from the bed by means of a rack, and wherein means, substantially as described, are provided for automatically changing the relations of the cylinder to the bed at each movement of the latter, substantially as and for the purpose set forth.

8. The combination of the oscillating cylinder, the reciprocating bed, the sliding rack on the bed, the crank J, mounted on the bed, and provided with an adjustable crank-pin arranged to engage the sliding rack, the segment-racks E and F, the shifting-arm G, pawl *r*, and tripping device H, all arranged to operate substantially as set forth.

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Witnesses:
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