

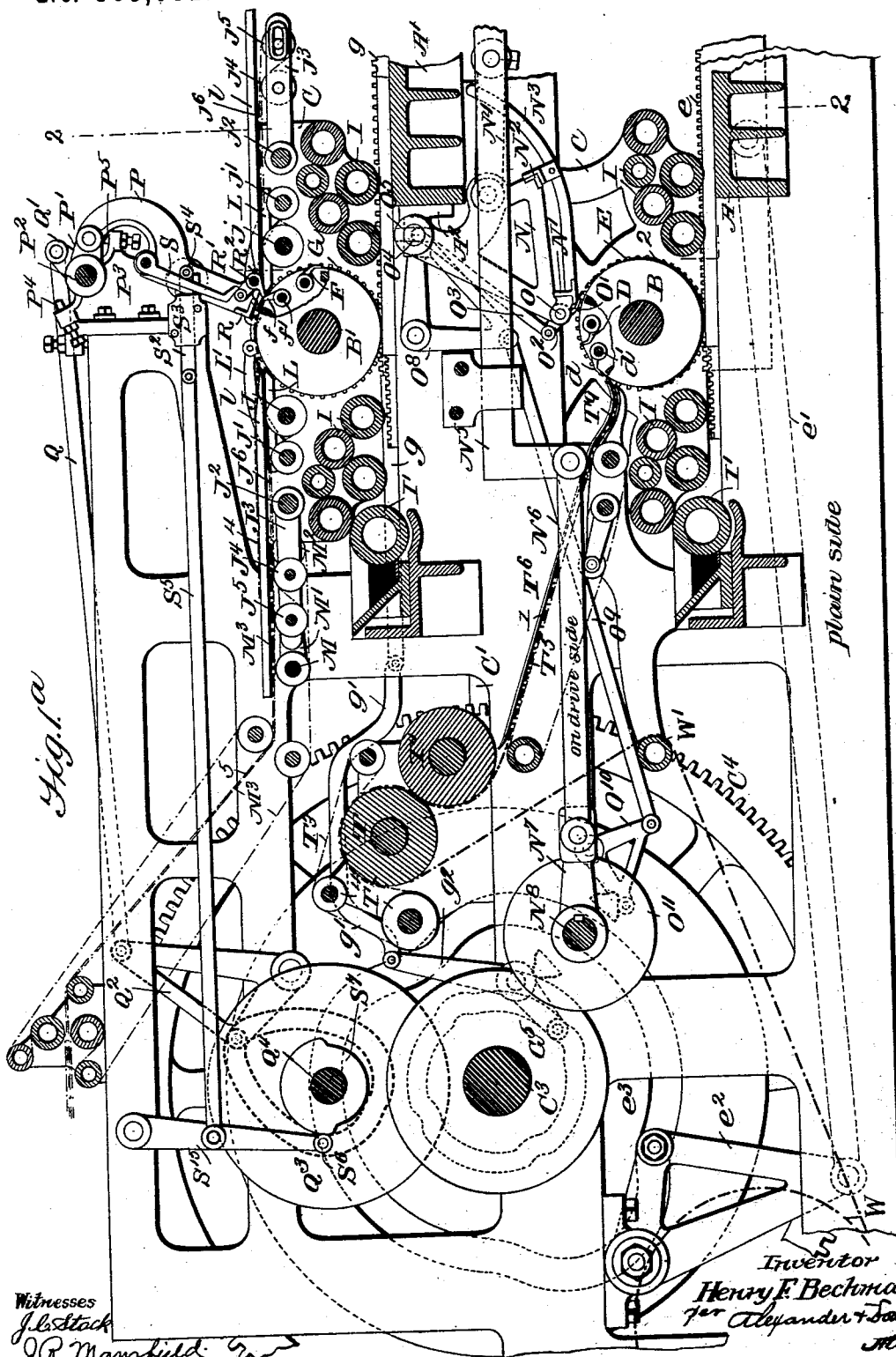
(No Model.)

9 Sheets—Sheet 1.

H. F. BECHMAN.
PRINTING PRESS.

No. 569,081.

Patented Oct. 6, 1896.



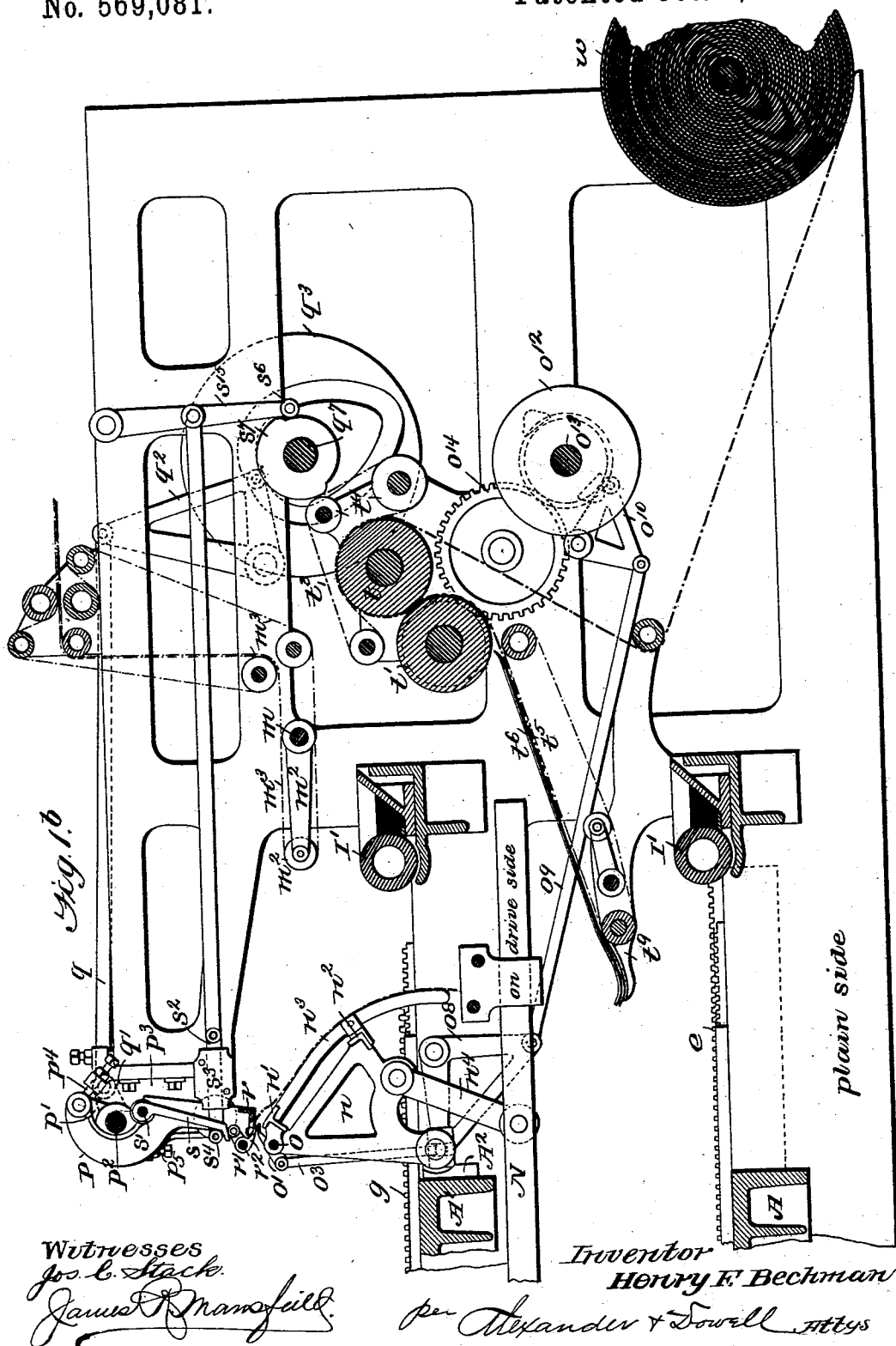
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9 Sheets—Sheet 2.

H. F. BECHMAN.
PRINTING PRESS.

No. 569,081.

Patented Oct. 6, 1896.



Witnesses
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James R. Mansfield.

Inventor
Henry F. Beckman
per Alexander & Dowell Attys

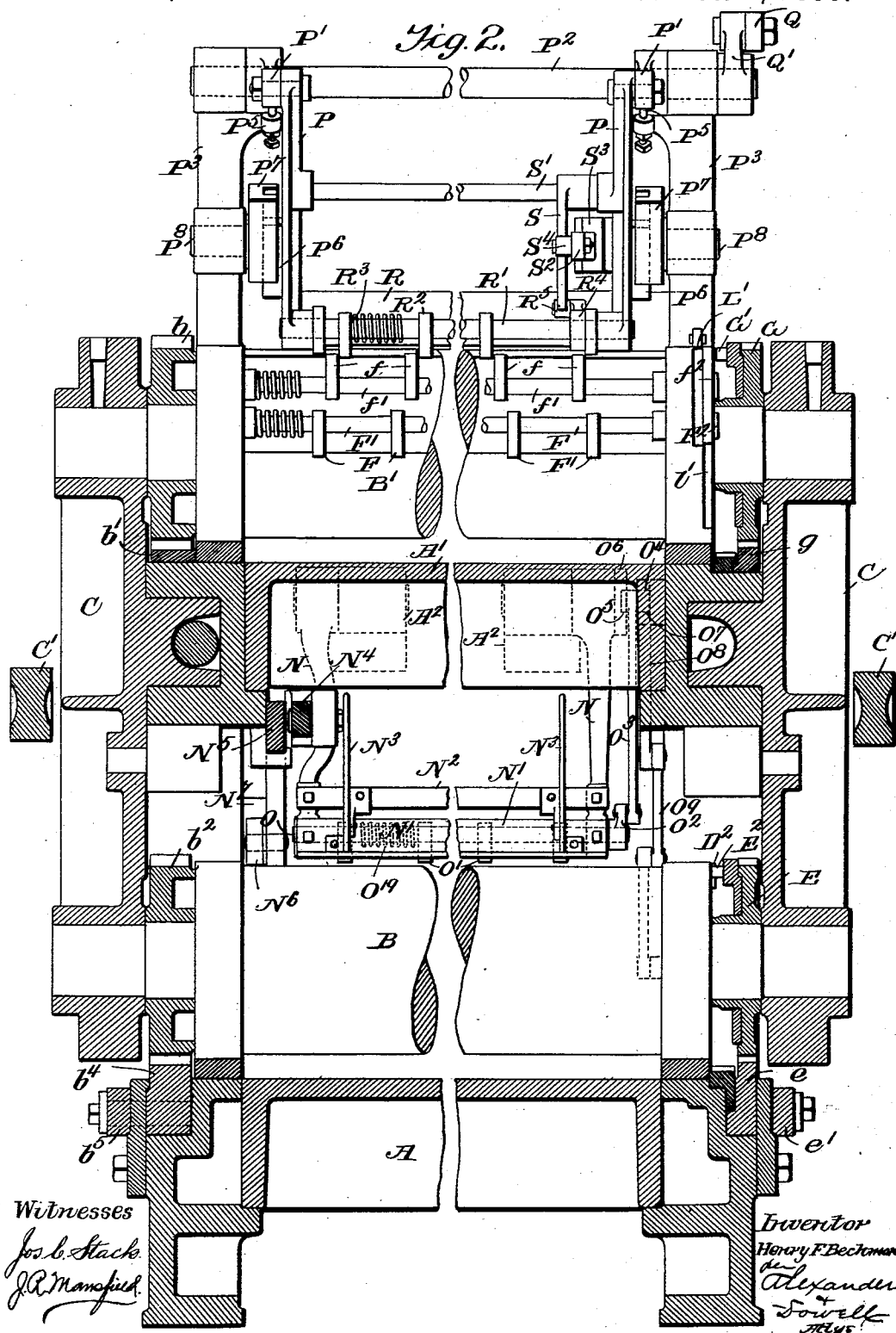
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H. F. BECHMAN.
PRINTING PRESS.

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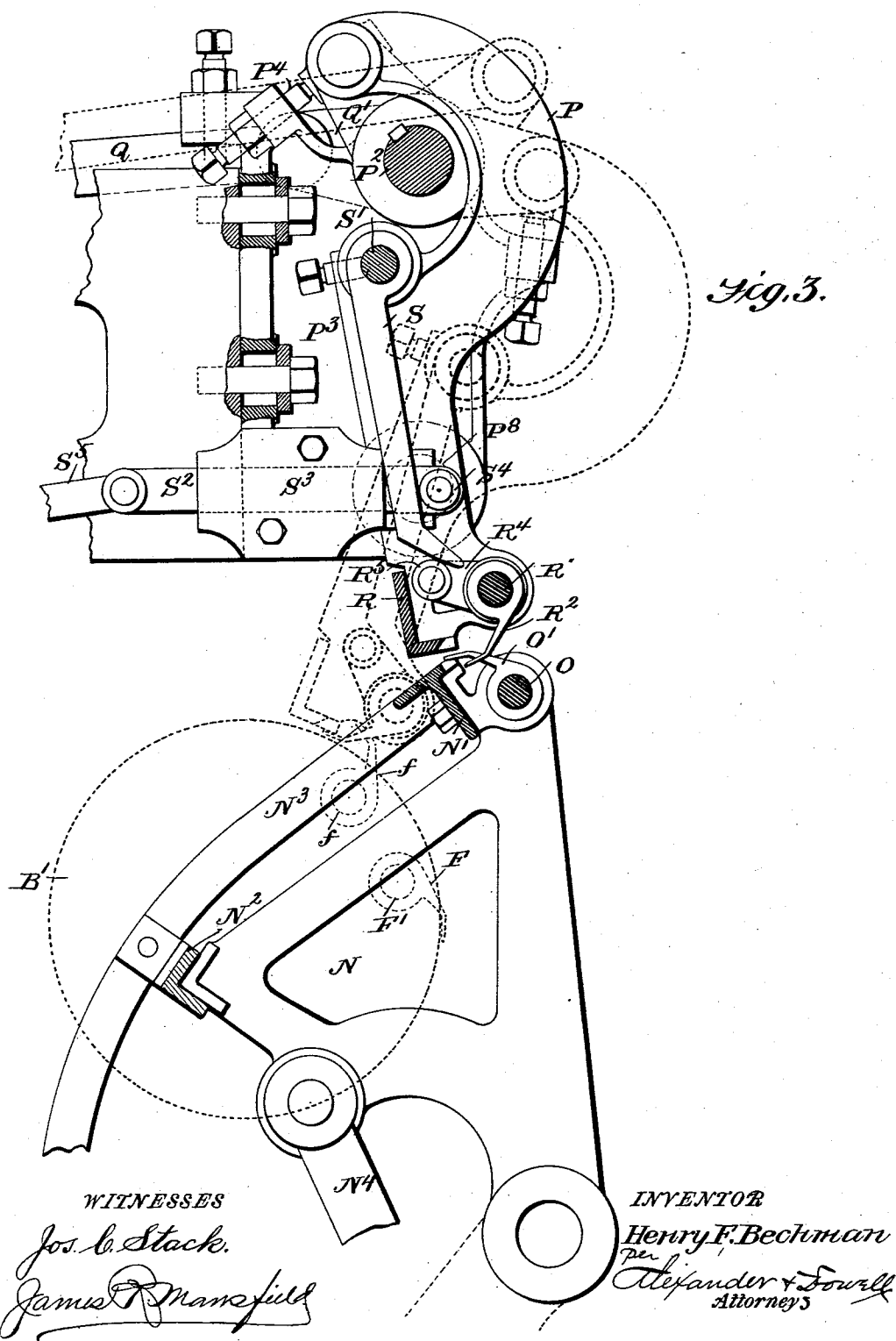
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H. F. BECHMAN.
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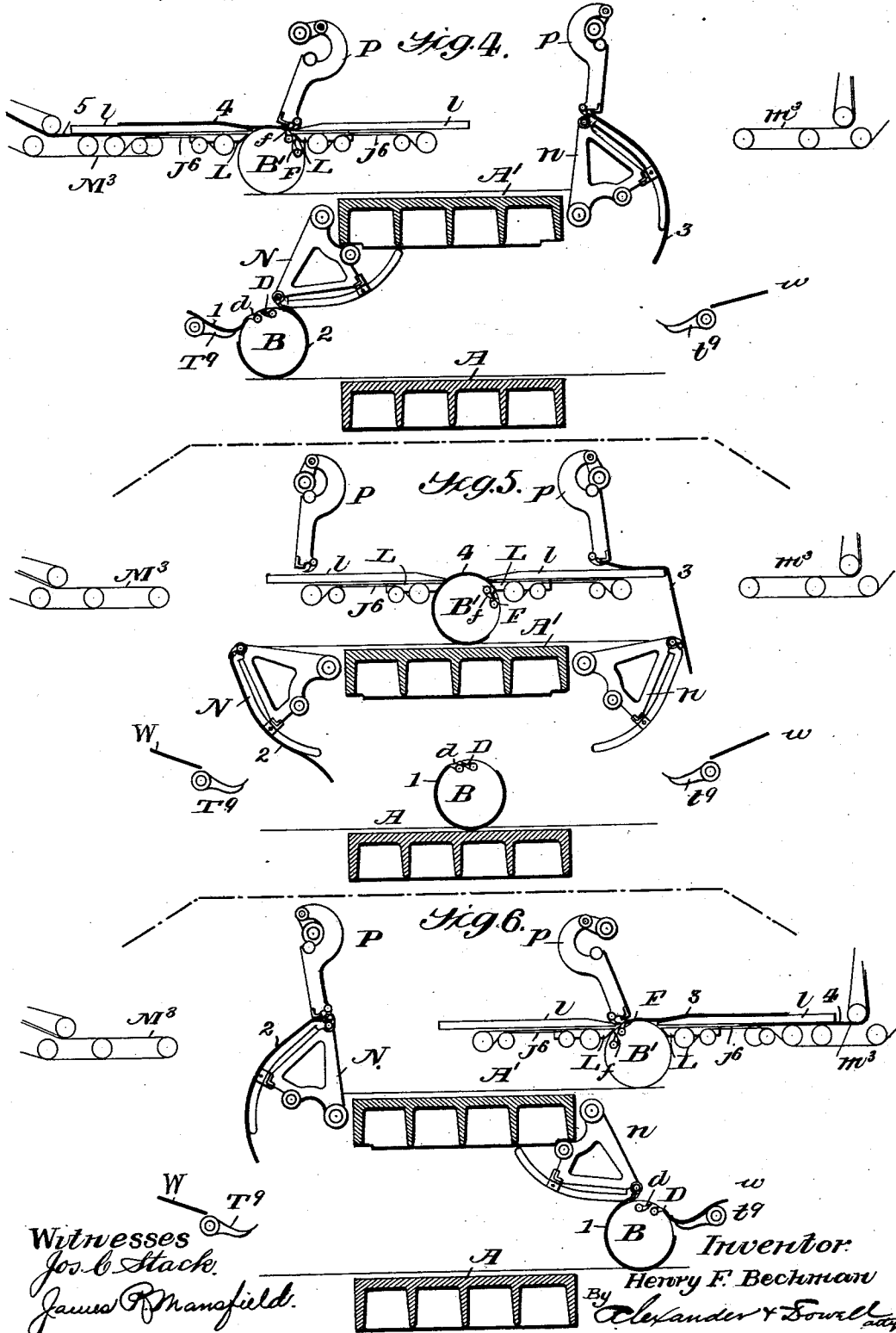
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H. F. BECHMAN:
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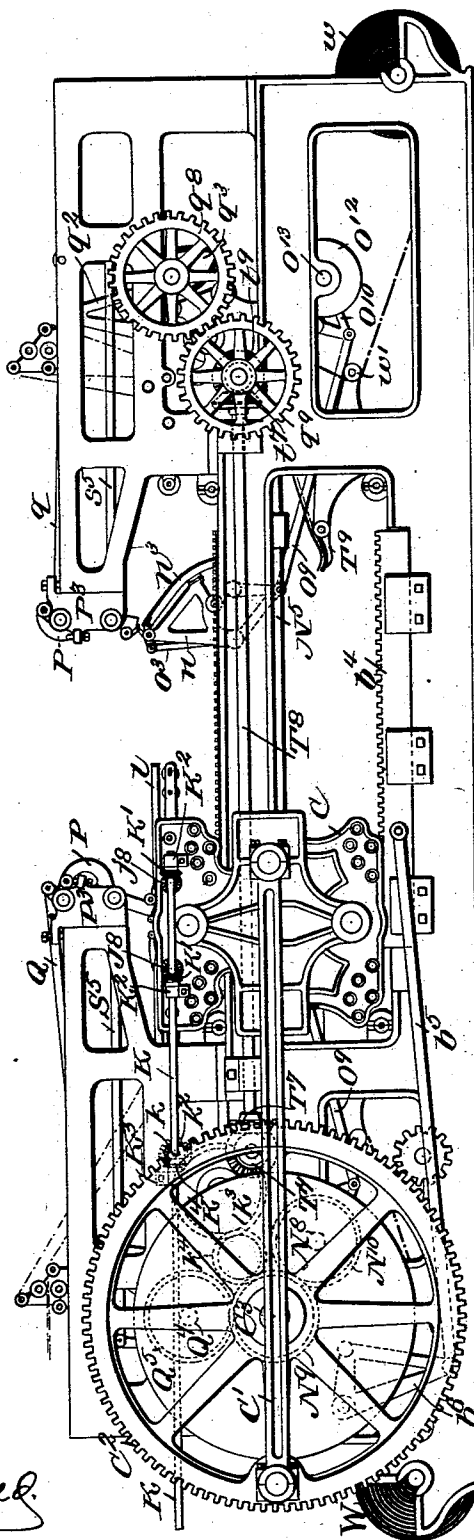
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H. F. BECHMAN.
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No. 569,081.

Patented Oct. 6, 1896.



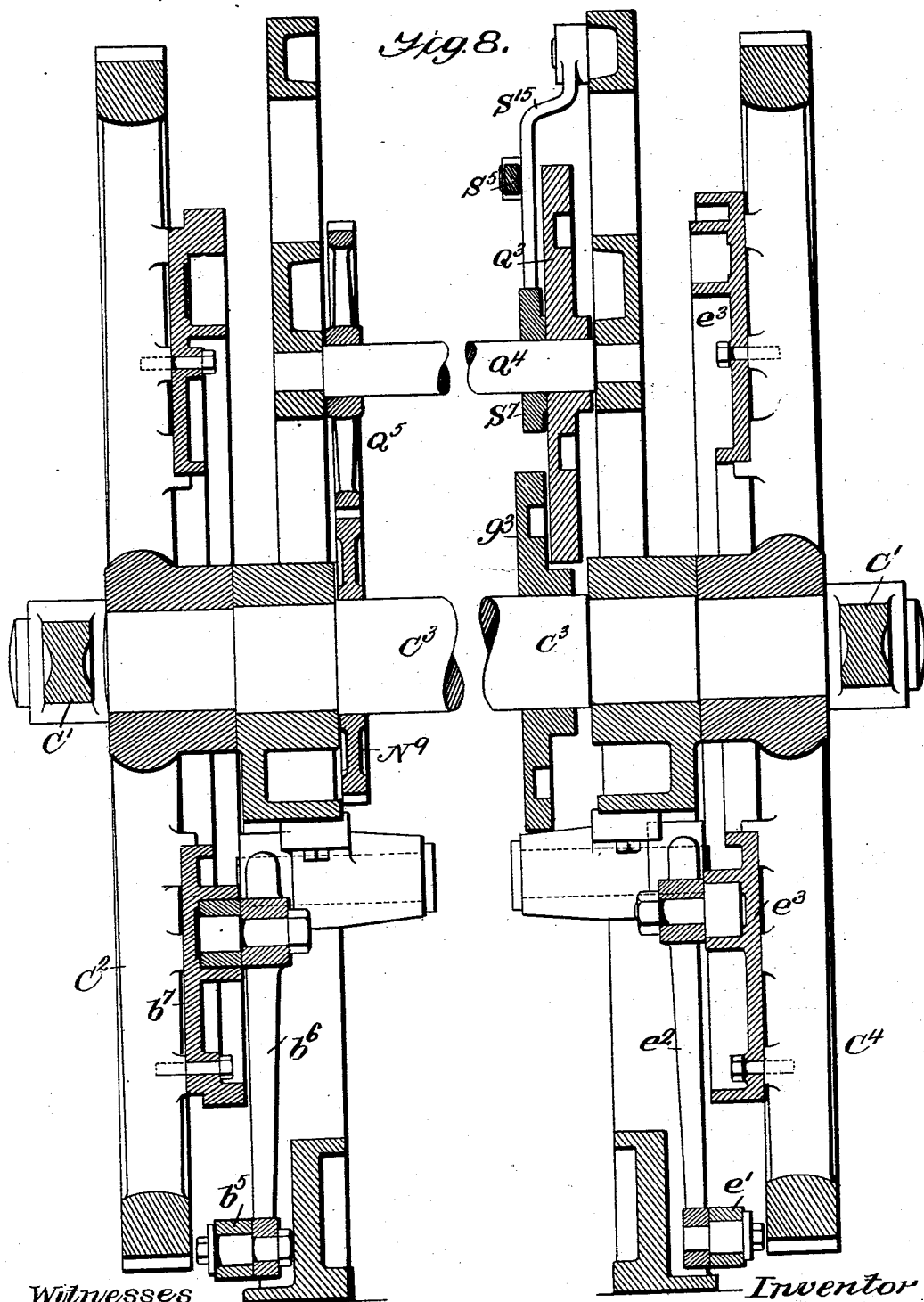
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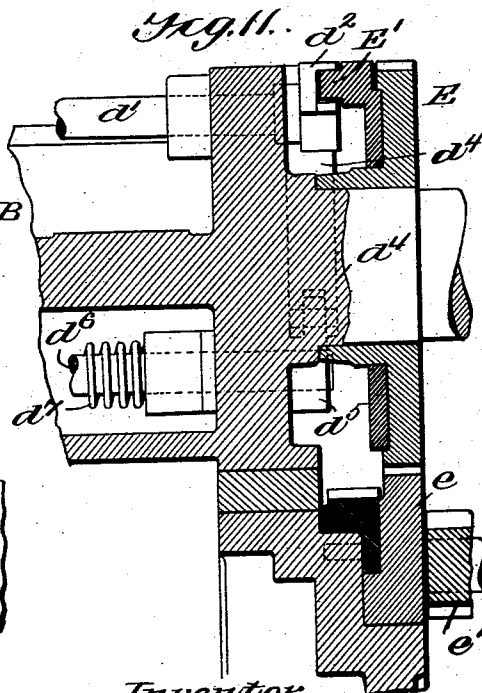
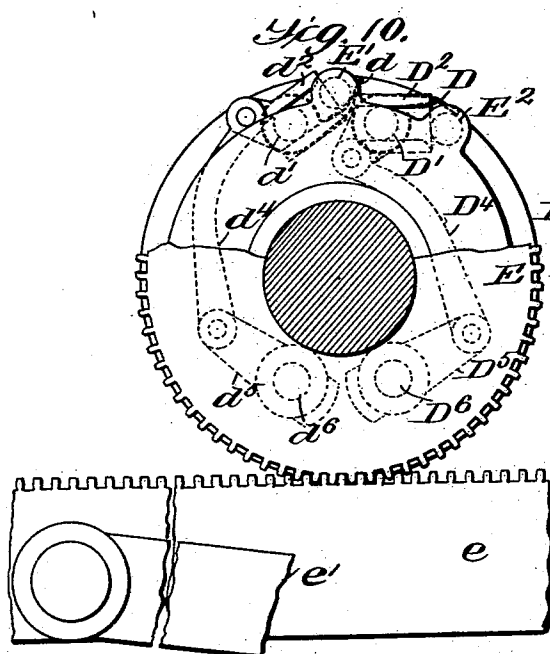
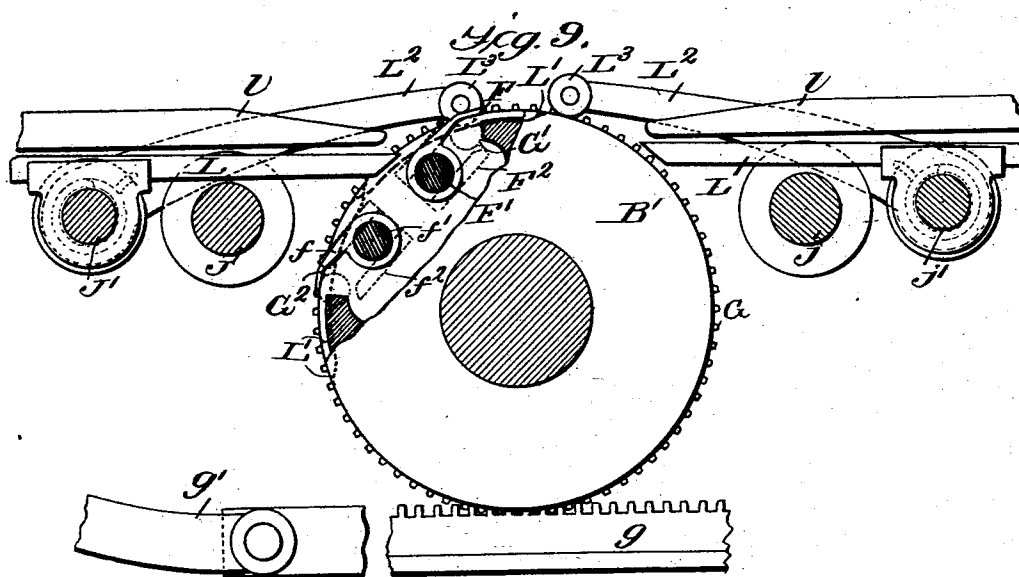
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9 Sheets—Sheet 8.

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No. 569,081.

Patented Oct. 6, 1896.



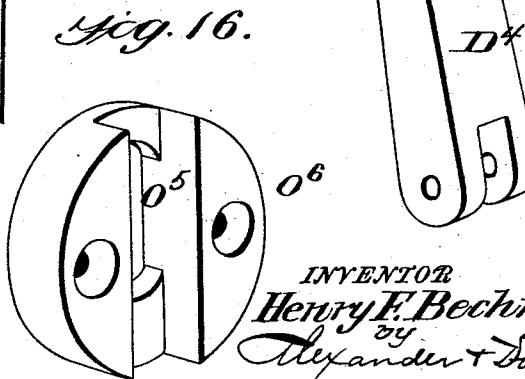
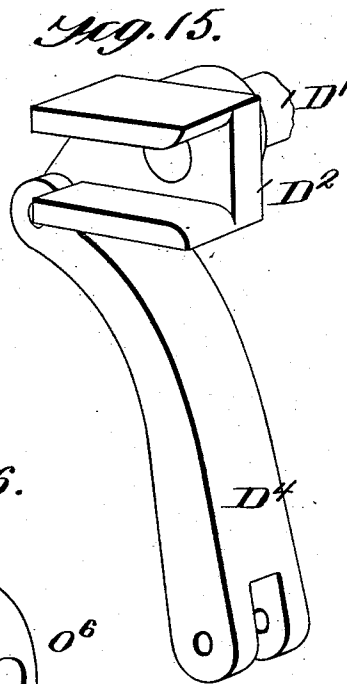
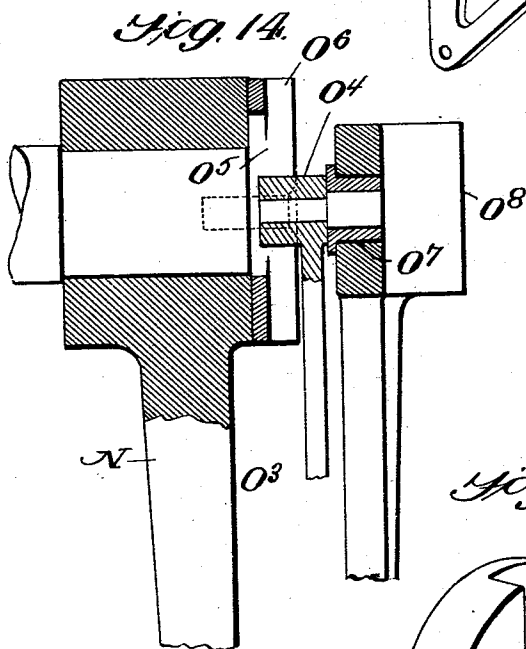
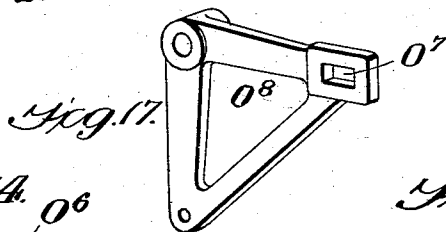
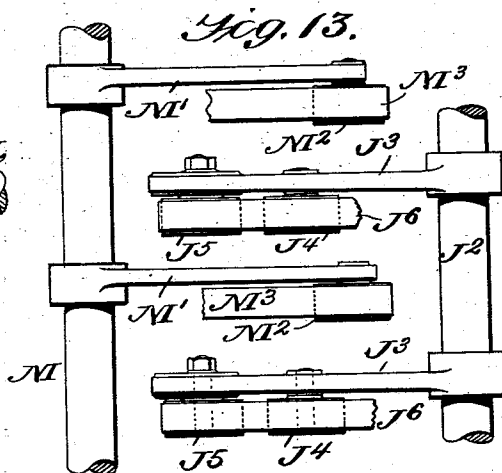
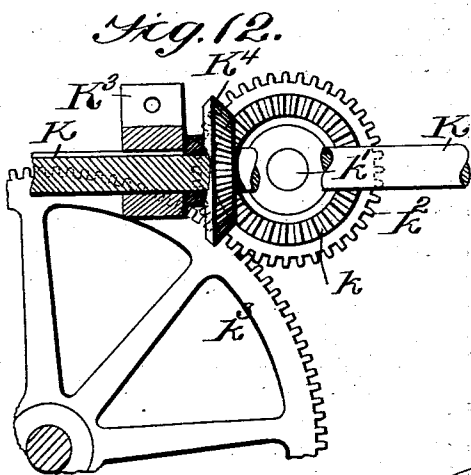
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UNITED STATES PATENT OFFICE.

HENRY F. BECHMAN, OF BATTLE CREEK, MICHIGAN, ASSIGNOR TO THE
DUPLEX PRINTING PRESS COMPANY, OF SAME PLACE.

PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 569,081, dated October 6, 1896.

Application filed April 20, 1896. Serial No. 588,215. (No model.)

To all whom it may concern:

Be it known that I, HENRY F. BECHMAN, of Battle Creek, in the county of Calhoun and State of Michigan, have invented certain new and useful Improvements in Printing-Presses; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

This invention is an improvement in stationary-bed and locomotive-cylinder sheet-printing perfecting-presses of the type disclosed in my application for patent, Serial No. 567,020, filed October 26, 1895.

The objects of this invention are, first, to simplify the sheet-transferring devices by substituting for transfer-reels vibratory sheet-carriers; second, to obviate the reciprocation of either bed; third, to improve the sheet-delivery mechanism; fourth, to provide improved and novel gripper-actuating devices; finally, fifth, to improve the press in various other details, all of which objects I accomplish by the means hereinafter described, and which are illustrated in the accompanying drawings, forming part of this application.

Referring to the drawings, Figures 1^a and 1^b represent longitudinal side elevation and section of the complete press, the drive-side frame being removed and the beds broken away to shorten the figures. Fig. 2 is a vertical transverse section through the press slightly enlarged on line 2 2, Fig. 1^a. Fig. 3 is an enlarged side view of the sheet holding and transfer mechanism. Figs. 4, 5, and 6 are longitudinal sectional diagrams of the press, showing the various transfers of sheets passing through the press. Fig. 7 is a side elevation of the complete press. Fig. 8 is a detail vertical transverse section through the crank-wheels and side frames. Fig. 9 is an enlarged detail view of the upper cylinder and the mechanism for operating the stripping-fingers L². Fig. 10 is a detail end view of cylinder B, showing the gripper-operating devices. Fig. 11 is a vertical section through Fig. 10. Fig. 12 is a detail view of the driving mechanism for shaft K. Fig. 13

is a detail plan view of the sheet-delivery tapes and carriers on the frame and carriage, respectively. Fig. 14 is a detail sectional view of the gripper-tripping devices of the vibrating sheet-transfer mechanism. Figs. 15 and 16 are detail views of parts D⁴ and O⁶ detached. Fig. 17 is a detail view of lever O⁸.

In the following description the "drive" side means that side of press on which are located the driving pulleys and shaft, the opposite side being referred to as "plain" side. "Crank" or "rear" end means the end where the large crank-wheels for driving the cylinder-carriage are located, and the other end of press is designated as "front" end.

A A' are the type-beds, secured rigidly between the side frames of the press and preferably arranged horizontal and parallel, one directly over the other.

B B' are gripper impression-cylinders adapted to operate on beds A A', respectively, journaled in a reciprocating carriage formed of sliding cross-heads C, which are supported and guided on the side frames and are moved horizontally back and forth to travel the cylinders back and forth over the beds by means of pitmen C', connected to crank-wheels C² C⁴ on the main drive-shaft C³ at the crank end of press, the cross-heads, pitmen, and crank-wheels being exterior to the side frames, as shown. On one end of the upper cylinder B' is fixed a gear b, which meshes with a stationary cylinder-rack b', as usual. On the corresponding end of cylinder B is a gear b², which meshes with a cylinder-rack b⁴, which is slidably mounted on the side frame and is shifted endwise at the proper times by means of a connecting-rod b⁵, crank-lever b⁶, and cam b⁷ on crank-wheel C², as shown. The object of this is to give an additional amount of rotation to the cylinder B, as hereinafter explained.

The lower cylinder B is provided with two sets of oppositely-disposed gripping-fingers D d, mounted on transverse shafts D' d', on the ends of which are the "T-heads" D² d², which are connected by links D⁴ d⁴ to arms D⁵ d⁵ on the ends of shafts D⁶ d⁶ within the cylinder, on which shafts are springs D⁷, that tend to rotate the shafts in one direction, and thereby will hold the gripper-fingers open or

closed, according as they are shifted by the movement of the T-heads. On the shaft of cylinder B, just opposite the T-heads, is a loose gear E, to which are secured tumbling-pins E' E², respectively adapted to engage T-heads d² D², as indicated in the drawings. Gear E meshes with a movable rack e on the side frame beside the inking-roller rack and is moved at the proper times by means of a rod e', connected to cam-lever e² and a cam e³ on crank-wheel C⁴. (See Figs. 2 and 8.) The upper cylinder B' is also provided with two adjoining but opposite sets of gripper-fingers F f, mounted on shafts F' f', provided at one end with T-heads F² f². Said shafts may be controlled by spring mechanism like the grippers on cylinder B, or in other suitable manner. On the end of the shaft of cylinder B', opposite T-heads F² f², is a loose gear G, to which are attached tumbling-pins G' G², respectively adapted to engage T-heads F² f², as indicated in the drawings. The grippers on the upper and lower cylinders are actuated and operated substantially as described in my application aforesaid. Gear G meshes with a movable rack g, which is shifted at proper times by means of a connecting-rod g', cam-lever g², and cam g³ on shaft C³.

The operation of the gripper mechanism is hereinafter described.

At each side of each impression-cylinder is a set I of distributing and form-inking rollers suitably journaled in the cross-heads and reciprocated therewith back and forth over the beds, ink being supplied thereto from stationary fountains I', as shown.

At each side of the upper impression-cylinder and traveling therewith is a pair of parallel shafts J J' and j j', respectively, which are journaled in the cross-heads above the inking-rollers I, and upon which are mounted tape-pulleys, as shown. Beside shaft J' is a shaft J², also journaled in the cross-heads C and carrying a series of radial, horizontally-disposed arms J³, upon each of which arms are mounted tape-pulleys J⁴ J⁵, the latter (outermost) of which may be adjustable to enable the tapes J⁶, which run thereover, to be tensioned. Beside shaft j' is a shaft j², also journaled in the cross-heads and carrying a series of horizontal arms j³, on each of which are mounted tape-pulleys j⁴ j⁵, said tape-wheels supporting tapes j⁶, as shown.

Bevel-gears J⁸ and j⁸ are fixed on the outer ends of shafts J j and mesh with bevel-gears K' on a rotatable shaft K, which is journaled in bearings K², attached to the cross-heads, and in a bearing K³, attached to the side frame, and splined on the rear end of shaft K, beside journal K³, is a bevel-gear K⁴, meshing with a bevel-gear k, mounted on a stub-shaft k', journaled in the side frame, which stub-shaft is driven by a train of gears k² k³ from the feed roll or cylinder T, hereinafter referred to. By this construction the shafts J j are (during the operation of the press) con-

tinuously rotated in one direction, so as to cause the upper parts of tapes J⁶ j⁶ to travel away from the cylinder B'. Obviously the shaft K has a reciprocating as well as rotary motion.

On shafts J' j' are mounted stripping-fingers L, which are caused to raise and lower alternately at the proper times by means of crank-arms L² on the ends of shafts j' J, having rollers L³ on their ends, which bear upon the periphery of one of the bearers of cylinders B' and enter cam-grooves L' in the bearer at the moment it is necessary to lower fingers L. (See Fig. 9.)

Overlying each set of tapes J⁶ j⁶ is a board l, attached to the cross-heads, as shown.

At points beyond the limits of travel of cylinder B' and in about the same plane as shafts J' j' shafts M m are mounted on the main frame, said shafts carrying arms M' m', having tape-wheels M² m², over which run endless tapes m³ M³, which are adapted to lead sheets back to the folding mechanism located at each end of press. Wheels M² on arms M' are so arranged as to pass by and between wheels J⁵ on arms J⁴, so that a sheet of paper coming from the impression-cylinder on tapes J⁶ passes onto tapes M³ and is delivered thereby into the folding mechanism, as indicated in the drawings, which, however, needs no description herein. Wheels m² on arms m' are adapted to similarly coact with tapes j⁶.

The sheets are transferred from cylinder B to cylinder B' at each end of the press by the following means: At each end of bed A' is a vibrating or swinging sheet-transferring mechanism. The rear transferring mechanism consists of two or more arms N, which are roughly triangular and pivoted at one corner to brackets A² on the rear end of bed A', as shown. These arms N are connected by transverse bars N' N², to which bars are attached a series of curved fingers N³, which bend approximately on the arc of a circle having the pivots of the arms as its center. One arm N is connected by a link N⁴ to a sliding bar N⁵, which is reciprocated at the proper time by a pitman N⁶, connected to a crank-arm N⁷ on a stub-shaft N⁸, journaled in the side frame on the drive side of press, said stub-shaft being driven by gears N⁹ N¹⁰ from shaft C³. In the arms N, adjoining and parallel with bar N', is a gripper-shaft O, carrying fingers O', and on one end of shaft O is a crank O², to which is connected one end of a rod O³, the upper end of which has a boss O⁴, which engages a slot O⁵ in a plate O⁶, attached to the hub of the adjoining arm N, and which boss also engages a slot O⁷ in one end of a bell-crank lever O⁸, pivoted to the side frame and vibrated by means of pitman O⁹, connecting it with a cam-lever O¹⁰, engaging a cam O¹¹ on shaft N⁸. These devices are adapted to open the gripper-fingers O' at the proper times, the fingers being closed by springs O¹⁹ on shaft O. At the opposite end

of bed A' is a duplicate sheet-transferring mechanism, which is in every way identical with that already described. The parts of this second transferring device, lettered $n n'$ 5 $n^2 n^3 n^4 o o' o^2 o^3 o^4 o^5 o^6 o^7 o^8 o^9 o^{10}$, correspond in construction, arrangement, and mode of operation with corresponding parts lettered N, N', N², N³, N⁴, O, O', O², O³, O⁴, O⁵, O⁶, O⁷, O⁸, O⁹, and O¹⁰, above described, and detailed 10 description of the front transferring mechanism is therefore unnecessary. The cam-lever o^{10} , however, is actuated by a cam O¹² on a shaft O¹³, driven by gears O¹⁴ from the cutting-roll t' . Further, the forward set of trans- 15 ferring devices are reverse to the rear set, and as arms N rise arms n descend, and vice versa, as indicated in the drawings.

The transfer-arms N n do not deliver the sheets directly to the upper cylinder, but to 20 superimposed sheet-holders arranged as follows:

I will describe the rear sheet-holder first. P P designate hangers pivoted to cranks P', attached to a transverse shaft P², journaled 25 in brackets P³, adjustably attached to upper extensions of the side frames, as shown, and provided with adjustable stop-bolts P⁴ P⁵ for regulating and arresting the vibrations of arms P' when shaft P² is rocked (at the proper 30 times) by a pitman Q, connected to a crank Q' on the outer end of shaft P², which pitman connects with a cam-lever Q², pivoted on the plain side of press and operated by a cam Q³ on a stub-shaft Q⁴, driven by gears Q⁵ from 35 shaft C³, as shown. When the shaft P² is rocked, hangers P are raised or lowered, as indicated in Fig. 3.

On the inner sides and lower parts of hangers P are ribs P⁶, which engage a pivoted 40 guide P⁷, having a pivot P⁸, journaled in the side of casting P³, as shown in Fig. 2, so that when the hangers are raised and lowered they will also be oscillated and guided to move accurately. On the lower ends of hangers P 45 is a transverse gripper-bar R, beside which is a gripper-shaft R', carrying fingers R², adapted to be closed against the bar by means of springs R³ on shaft R', or otherwise suitably arranged. On shaft R' is a short 50 arm R⁴, having a roller R⁵ on its end, which is adapted to be engaged by the inclined lower end of a trip-lever S, depending from a horizontal rod S', journaled in hangers P. The trip-levers can be drawn backward, so as 55 to force down arm R⁴ and cause it to rock shaft R' and open fingers R² by means of a slide S², mounted in a guide-casting S³, attached to casting P³, said slide projecting past the trip-lever and having a roller S⁴ on its inner end, which engages the lever when the slide is drawn backward. The slide S² can be reciprocated by means of a connecting-rod S⁵, attached to a pivoted lever S¹⁵, 65 having a roller S⁶ on its lower end engaging a cam S⁷ on shaft Q⁴.

The front sheet-holder consists of parts arranged, constructed, and operated like those

of the rear sheet-holder. The parts $p p' p^2 p^3 p^4 p^5 p^6 p^7 p^8 q q' q^2 q^3 r r' r^2 r^3 r^4 r^5 r^6 s s' s^2 s^3 s^4 s^5 s^6 s^7$ of the front holder correspond 70 with parts P P' P² P³ P⁴ P⁵ P⁶ P⁷ P⁸ Q Q' Q² Q³ R R' R² R³ R⁴ R⁵ R⁶ S S' S² S³ S⁴ S⁵ S⁶ S⁷ of the rear sheet-holder, and further description thereof is unnecessary. The cam q^3 is mounted on the outer end of a stub-shaft q^7 , 75 journaled in the plain side frame and driven by gears $q^8 q^9$ from the cutting-cylinder t' , as indicated in the drawings, and the cam s^7 is also mounted on shaft q^7 . The front sheet-holder, however, is reverse to the rear sheet- 80 holder to operate properly in conjunction with the front sheet-transfer mechanism.

In the press shown the lower cylinder is fed with sheets at each end of its travel, which sheets are supplied from a web. At 85 the rear end of press the web W is led to two cutting-cylinders T T', between the main shaft C³ and the beds, the female cutting-cylinder T being driven by a train of gears N⁹ $k^4 k^3$ from shaft C³. (Indicated in dotted lines, 90 Fig. 7.) This cylinder also serves as a feed-cylinder, a set of feed-tapes T³ and suitable tape-rollers T⁴ being employed in connection therewith. From the cylinders T T' the web W or sheet passes between tapes T⁵ and 95 guides T⁶, arranged as shown in the drawings, onto adjustable fingers T⁹, whereby its edge is presented in position to be caught by the grippers d on cylinder B when the latter is at the end of its rearward travel. At the 100 front end of the press the web is led to a pair of similar cylinders $t t'$, feed-tapes t^3 , and presenting tapes and guides $t^5 t^6$ to fingers t^9 , by which the sheets are presented in position to be caught by fingers D on cylinder B when 105 it is at the front end of its travel. The cylinders T T' and $t t'$ are intergeared, and cylinder t' may be driven from cylinder T' by means of a bevel-gear T⁹ on the end of cylinder T', meshing with a bevel-gear T⁷ on a 110 horizontal shaft T⁸, which is journaled on the driving side of the frame and extends back through the boss of the cross-head (see Figs. 1 and 7) to the rear cutting-cylinder, a bevel-gear t' on shaft T⁸ meshing with a bevel-gear 115 t^9 on cylinder t' , driving the latter. By this means the action of the feed mechanism at both ends of press is made synchronous.

However, I do not confine myself to the particular means for imparting movement to the 120 parts herein shown and described.

Operation: The cutting-cylinders are geared so as to make one revolution to one revolution of main crank-shaft C³. Shaft N⁸ revolves once for each revolution of the main 125 shaft C³, thereby shifting bar N⁵ horizontally and causing the front and rear sheet-transferring devices to rise and fall, and fall and rise, respectively.

For simplicity of explanation I will trace 130 the passage of one sheet through the press, indicating its position at various stages by letters. Supposing the parts to be in the position shown in Fig. 1^a, where the cylinders

are at or about the rear end of their stroke. As cylinder B starts forward grippers *d* take a sheet from the fingers *T*⁹, and it is printed on one side from the forms on bed A before the cylinders reach the forward end of their stroke. At the forward end of their stroke fingers *d* on cylinder B release the sheet and the grippers on front transfer-arms *n* close thereupon. While the cylinders move backward, arms *n* lift the printed sheet up, and, as the cylinders reach the end of their back stroke, surrender the sheet to the front sheet-holders *p*. During the next forward stroke of the cylinders the front board *l* passes beneath the sheet hanging from holders *p*, and said sheet is laid upon the board *l* smoothly and evenly, and while the cylinders are at the forward end of their stroke the holders *p* are lowered to the position shown in dotted lines, Fig. 3, and the sheet surrendered to the grippers *F* of cylinder B'. Then at the next backward stroke of the cylinders the sheet is printed and perfected upon the forms on bed A', and before the cylinders reach the rear end of stroke the sheet is partly delivered onto the tapes *J*⁶. This operation is alike for each sheet taken from fingers *T*⁹, and the same operations are performed by the cylinders, transfer-arms *N*, holder *n*, board *l*, and tapes *J*⁶ for each sheet taken from fingers *T*⁹.

Briefly the function of each mechanism is as follows: The holders *p* take a sheet of paper from the front transfer-arms *n* when the impression-cylinders are at crank end of stroke and transfer-arms *n* are at their highest position and transfer the sheet to upper cylinder B' when it is at front end of stroke. The holders *P* take the sheet of paper from the rear transfer-arms *N* when the impression-cylinders are at front end of stroke and arms *N* are at their highest position and afterward delivers the sheet to upper impression-cylinder B' when it is at the rear end of stroke. Rear transfer-arms *N* take a sheet of paper from lower impression-cylinder B when it is at crank end of stroke and deliver it to holders *P* when impression-cylinders are at front end of stroke. Front transfer-arms *n* take a sheet of paper from impression-cylinder B when it is at front end of stroke and transfer the sheet to holders *p* when impression-cylinders are at rear end of stroke. Both impression-cylinders B B' travel the same distance, and both would therefore naturally rotate the same amount; but a proper rotation for the upper impression-cylinder is not enough for the lower impression-cylinder, as the grippers on lower impression-cylinder carrying a sheet must be advanced farther to deliver said sheet to the transfer-arms. This extra rotation of cylinder B' is accomplished by the sliding rack *b*⁴, above described. This extra rotation takes place after a sheet has been printed and before the cylinder has reached the end of the travel, both at the crank and front end of stroke, and is

rotated back to its position proper for printing after having delivered one sheet and taken on a new one. From the roll of paper at the crank end of press the web *W* is led over the idler-roll *W'*, around the female cutting-cylinder *T*, thence between the cutting-cylinders *T* and *T'*, whereby a sheet of paper is partially (only three or four narrow strips of paper holding it) severed from the web. The partially-severed sheet is then carried down by the carrier-tapes *T*⁵ (which run slightly faster than the web, so as to keep the sheet straight and smooth) to the lower impression-cylinder B. The gripper *d* (shown closed in Fig. 1) then closes on the incoming sheet and firmly holds it, and as the impression-cylinder B starts on the forward stroke the remaining narrow strips of paper, which hold the sheet to the web, are broken and the sheet is carried around by the impression-cylinder, passing over the type, where one side of the paper is printed. Impression-cylinder D upon arriving at the forward end of its stroke transfers the sheet just printed to transfer-arms *n*, which are at their lowest position, as previously explained. This transfer of sheet is effected by the cylinder-grippers *d* opening and the transfer-arm grippers *o'* closing on said sheet, as hereinbefore described. Lower impression-cylinder B then starts upon its backward stroke, its opposite grippers *D* closing upon a sheet of paper at feeding-fingers *T*⁹ at front end of press, and during the back stroke of cylinders transfer-arms *n* rise to their upper position, as shown in Fig. 1. In this position the transfer-arms *n* surrender the sheet of paper to the holders *p*, and at the same time impression-cylinder B is transferring the sheet of paper taken from the web at the front end of the press to transfer-arms *N*.

Once more the impression-cylinders B and B' travel to the forward end of their stroke. Thus the following operations occur: First, the sheet of paper held by holders *p* is transferred to upper impression-cylinder B'; second, the sheet of paper held by transfer-arms *N* is surrendered to holders *P*, and, third, the sheet of paper held by lower impression-cylinder B is surrendered to transfer-arms *n*. An instant later, when lower impression-cylinder B has started on its backward stroke, a new sheet is taken by it from feed-fingers *T*⁹ at front end of press, it being understood that the lower impression-cylinder takes a sheet of paper from opposite ends of the press at every revolution of crank-wheels, thereby securing a printed sheet every time the impression-cylinder passes over the type.

When the impression-cylinders are on their backward travel about the middle of the stroke, and at a time when the advanced edge of the sheet being printed upon the upper impression-cylinder B' is just above stripping-fingers *L*, grippers *F* open and the sheet is switched out upon delivery-tapes *J*⁶. Then when impression-cylinders are again at crank

end of stroke, the following transfers take place: First, the sheet of paper on delivery-tapes J⁶ is transferred to folder-tapes M³; second, the sheet of paper held by holder P is surrendered to cylinder B'; third, the sheet of paper held by transfer-arms N is transferred to upper holder p, and, fourth, the sheet of paper on lower impression-cylinder B is surrendered to transfer-arms N. On the next forward stroke of impression-cylinders the same takes place, the sheet on upper impression-cylinder B' being delivered to front folder-tapes M³ and transfers of all other sheets in the press taking place, as previously described.

I do not limit myself to the employment of the vibrating sheet-transfers with the particular construction or arrangement of printing mechanisms herein shown, for obviously, for instance, the transfer mechanism would be useful in a press wherein the beds and cylinders were both reciprocated, and therefore I refer to the following claims for the definitions and limitations of my invention and the novel and useful parts and combinations of parts involved therein and useful in printing-machines.

I would remark that grippers on top impression-cylinder are not open, as shown in Figs. 4 and 6, except when taking or delivering sheet of paper, and it is not necessary, nor do I contemplate, having the grippers of cylinder B tumble entirely over, but just open enough to take or deliver sheets. Indeed, practically no grippers on press tumble entirely over, except those on lower impression-cylinder, but in the diagrams especially I have shown the grippers tumbled fully for sake of clearness.

Having thus described my invention, what I therefore claim as new, and desire to secure by Letters Patent thereon, is—

1. The combination of two type-beds, a reciprocating gripper-cylinder for and coacting with each bed and mechanisms for feeding sheets of paper to one cylinder at each end of its stroke; with a vibrating sheet-transferring mechanism substantially as described, at each end of the bed adapted to take printed sheets from one cylinder, and deliver them to the other cylinder, as and for the purpose set forth.

2. In a printing-press, the combination of a pair of beds and a pair of coacting reciprocating gripper-cylinders substantially as described, with mechanism for taking a printed sheet from the upper side of one cylinder and delivering it to the upper side of the other cylinder, substantially as described.

3. In a printing-press the combination of a pair of beds and a pair of coacting reciprocating gripper-cylinders substantially as described, with mechanism at each end of the press for taking a printed sheet from the upper side of one cylinder and delivering it to the upper side of the other cylinder, substantially as described.

4. In a printing-press, the combination of a pair of beds, and a pair of coacting reciprocating gripper-cylinders substantially as described; with means for feeding sheets of paper to one cylinder at one end of press, and mechanism substantially as described for taking a printed sheet from the upper side of the first cylinder and delivering it to the upper side of the other cylinder, substantially as described.

5. In a printing-press, the combination of a pair of beds and a pair of coacting reciprocating gripper-cylinders substantially as described, with mechanism at each end of press for taking a printed sheet from the upper side of one cylinder and delivering it to the upper side of the other cylinder, and mechanism for feeding sheets to the first cylinder at each end of press, substantially as described.

6. In a printing-press, the combination of a pair of beds and a pair of coacting reciprocating gripper-cylinders substantially as described, with mechanism for taking a printed sheet from the upper side of one cylinder and delivering it to the upper side of the other cylinder; with delivery mechanism for removing the printed sheets from the second cylinder, substantially as described.

7. In a printing-press the combination of a pair of beds and a pair of coacting reciprocating gripper-cylinders substantially as described, with mechanism at each end of the press for taking a printed sheet from the upper side of one cylinder and delivering it to the upper side of the other cylinder; with delivery mechanism for removing the printed sheets from the second cylinder, substantially as described.

8. In a printing-press, the combination of a pair of beds, and a pair of coacting reciprocating gripper-cylinders substantially as described; with means for feeding sheets of paper to one cylinder at one end of press, and mechanism substantially as described for taking a printed sheet from the upper side of the first cylinder and delivering it to the upper side of the other cylinder, and mechanism for removing the perfected sheets from the second cylinder, substantially as described.

9. In a printing-press, the combination of a pair of beds and a pair of coacting reciprocating gripper-cylinders substantially as described, with mechanism at each end of press for taking a printed sheet from the upper side of one cylinder and delivering it to the upper side of the other cylinder, and mechanism for feeding sheets to the first cylinder at each end of press, and mechanism for removing the perfected sheets from the second cylinder, substantially as described.

10. In a printing-press the combination of a pair of type-beds, a pair of reciprocating impression-cylinders, and a vibrating sheet-transferring device at one end of the press, substantially as described.

11. The combination of a pair of type-beds,

a pair of reciprocating impression-cylinders coacting with said beds, and a vibrating sheet-transferring device at each end of the press, substantially as described.

5 12. The combination of a pair of type-beds, a pair of impression-cylinders, an intermittently-vibrating sheet-holder adapted to deliver sheets to one cylinder; and mechanism for transferring sheets from the other cylinder to said holder, substantially as described.

10 13. In a printing-press the combination of a pair of type-beds, and a pair of coacting impression-cylinders, a sheet-holder at each end of one bed adapted to deliver printed sheets to the cylinder coacting with said bed, and a sheet-transferring mechanism at each end of the other bed adapted to remove printed sheets from the other cylinder and deliver them to the sheet-holders, substantially as described.

15 14. In a printing-press the combination of a pair of parallel type-beds, a pair of coacting cylinders, with a swinging or vibrating sheet-transferring mechanism at one end of the beds for transferring sheets from one cylinder to the other, substantially as described.

20 15. The combination of a pair of parallel type-beds, and a pair of coacting cylinders; with a vibrating sheet-transferring mechanism at each end of the press adapted to transfer sheets from one cylinder to the other, substantially as described.

25 16. The combination of a pair of parallel type-beds, a reciprocating grip-cylinder, for and coacting with, each bed; a vibratory sheet-holder at each end of the upper bed, and a vibrating sheet-transferring mechanism at each end of the beds, adapted to take sheets from the lower cylinder and deliver them to the holders, substantially as described.

30 17. In a printing-press the combination of a type-bed, a reciprocating cylinder, a sheet-holder, and a table or fly moving with the cylinder adapted to lay out the sheet suspended by the holder prior to its delivery to the cylinder, substantially as described.

35 18. The combination of a type-bed, a reciprocating cylinder, a set of sheet-delivery tapes beside and traveling with the cylinder, and means for driving said tapes independently of the reciprocation of the cylinder, substantially as described.

40 19. The combination of a stationary bed and reciprocating gripper-cylinder, and vibratory sheet-holders with vibrating sheet-transferring arms at each end of the bed, adapted to take printed sheets from the cylinder, and deliver them to said holders and means for simultaneously vibrating said transfer-arms, in opposite directions, substantially as described.

45 20. The combination of a pair of parallel type-beds, a reciprocating gripper-cylinder for each bed, a vibratory sheet-holder suspended above and opposite the end of the upper bed, and vibrating sheet-transferring arms N below the holder adapted to transfer

sheets from the lower cylinder, to the holder, substantially as described.

50 21. The combination of a pair of parallel type-beds, a reciprocating gripper-cylinder for each bed, a vibratory sheet-holder suspended above and opposite each end of the upper bed; and vibrating arms below each holder adapted to transfer sheets from the lower cylinder to the holders, and means for simultaneously vibrating said arms in opposite directions, substantially as described.

55 22. The combination of a pair of parallel type-beds, a reciprocating gripper-cylinder for each bed, a sheet-holder at each end of the upper bed, and a sheet-transferring mechanism at each end of the press adapted to take sheets from the lower cylinder, and give them to the holders; with the systems of carrier-tapes beside and moving with the upper cylinder, the tables above the tapes; and the folder-tapes at each end of press into which the printed sheets are delivered by the cylinder carrier-tapes when the cylinders are at the ends of their strokes, substantially as described.

60 23. The combination with the sheet-holder consisting of the hangers P, and gripper-shaft R', the lever S, and the slide S², with means for raising and lowering said hangers, and means for reciprocating slide S², for the purpose and substantially as described.

65 24. The combination of the shaft P², the hangers P suspended from arms on said shaft, the guide P', the gripper-shaft R' in said hangers, the lever S, and slide S²; with means substantially as described for reciprocating said slide, and means for oscillating shaft P², all substantially as and for the purpose described.

70 25. The combination of the stationary bed and reciprocating cylinder, having a gripper-shaft, the shafts J, J' beside the cylinder and traveling therewith, the shaft J² carrying arms J³, tape-wheels J⁵ on said arms, and tapes J⁶ arranged substantially as described; with the stripping-fingers L on shaft J', and means for oscillating said shaft, so as to cause the fingers to strip the sheets from the cylinder into the tapes during the travel of the cylinder, the delivery-tapes, and the arms M' for the purpose and substantially as described.

75 26. The combination with the stationary bed, and reciprocating cylinder, the shafts J, and J² beside and traveling with the cylinder, the arms J³ on shaft J² carrying tape-wheels J⁴, and the tapes J⁶ arranged substantially as described; and means for driving the tapes in one direction; with the stationary shaft M, carrying arms M' with rollers M², and the tapes M³, substantially as described, adapted to receive the sheets from tapes J⁶ when the cylinder is at the end of its stroke, all substantially as described.

80 27. The combination with the cylinder B having gripper-shafts, provided with T-heads, D², d², the spring-controlled shafts D⁶, d⁶, having arms D⁵, d⁵, and the links D⁴, d⁴ connect-

ing said arms to the T-heads, with the loose gear E carrying pins E' E² respectively adapted to engage said T-heads, and means for regulating the rotation of said gear, independent of its travel with the cylinder, all substantially as and for the purpose set forth.

28. In a printing-press the combination of a type-bed, a reciprocating gripper-cylinder, a device adapted to temporarily suspend the sheets substantially as described; and means for transferring printed sheets from the cylinder to the holder, and mechanism for removing the sheets from the holder, substantially as and for the purpose described.

29. In a printing-press the combination of a type-bed, a reciprocating gripper-cylinder, and a sheet-holder above the bed; with a vibrating sheet-transferring mechanism adapted to take printed sheets from the cylinder and deliver them to the sheet-holder; and mechanism for removing the sheet from the holder, substantially as and for the purpose described.

30. The combination of a stationary bed and reciprocating gripper-cylinder; with vibrating sheet-transferring arms at each end of the bed, adapted to take printed sheets from the cylinder; means for simultaneously vibrating said transfer-arms, in opposite directions; and means for removing the sheets from the said arms, substantially as and for the purpose set forth.

31. In a printing-press the combination of a type-bed; a reciprocating cylinder; sheet-

delivery tapes mounted on the cylinder-carriage, and adapted to receive the sheets from the cylinder; and means for driving said tapes; a fixed set of tapes beyond the range of travel of the cylinder, but projecting into the path of travel of the moving tapes, so as to alternate therewith when the cylinder is at the end of its stroke, whereby the printed sheets are transferred from the cylinder-tapes to the fixed tapes while the cylinder is at the end of its stroke, substantially as described.

32. In a printing-press the combination of a type-bed; a reciprocating cylinder; sheet-delivery tapes mounted on the cylinder-carriage, and adapted to receive the sheets from the cylinder; stripping-fingers also moving with the cylinder adapted to direct the sheets onto the tapes; and means for driving said tapes; a fixed set of tapes beyond the range of travel of the cylinder, but projecting into the path of travel of the moving tapes so as to alternate therewith when the cylinder is at the end of its stroke, whereby the printed sheets are transferred from the cylinder-tapes to the fixed tapes while the cylinder is at the end of its stroke, substantially as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

HENRY F. BECHMAN.

Witnesses:

FRANK W. DUNNING,
EDWARD D. AUSTIN.