

No. 637,608.

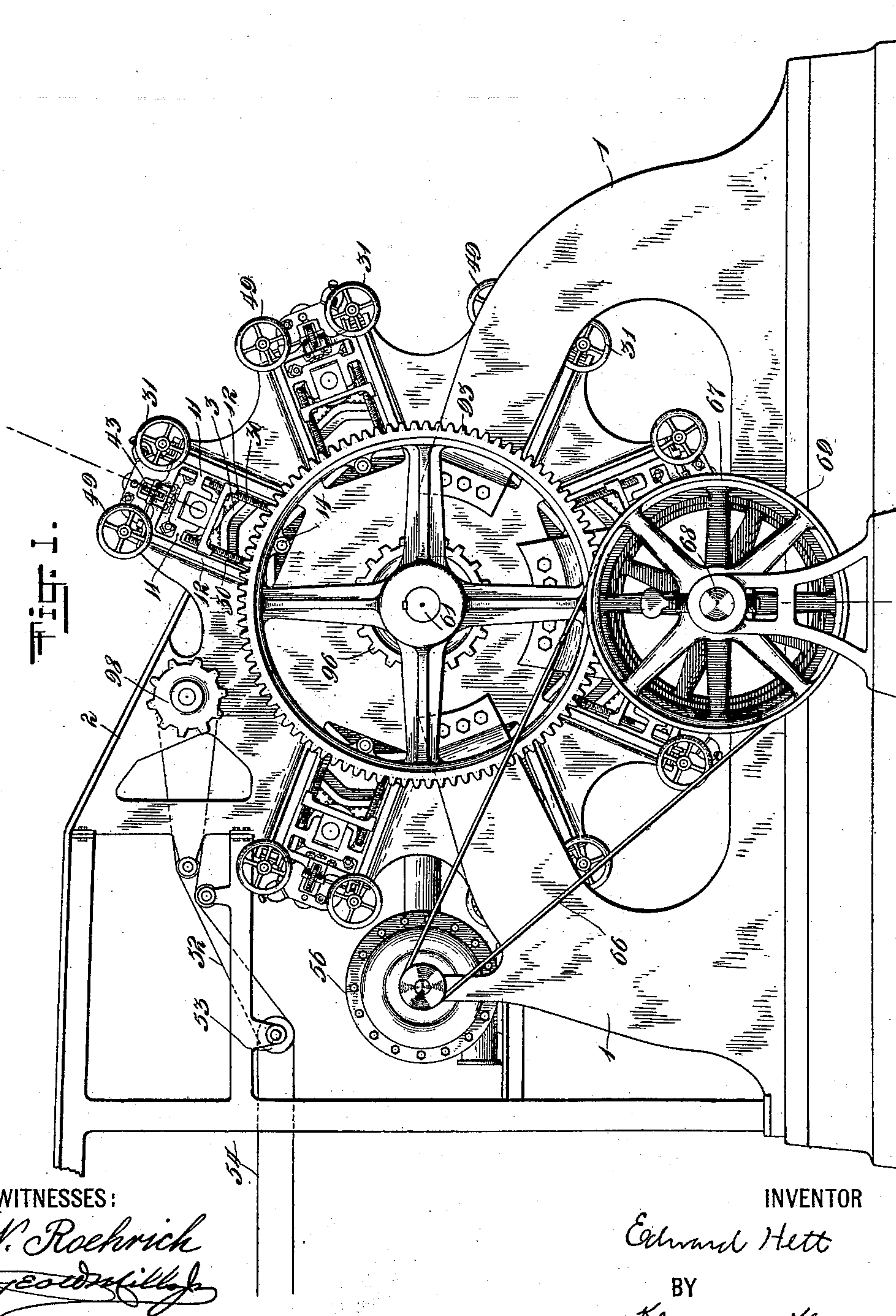
Patented Nov. 21, 1899.

E. HETT.
PRINTING PRESS.

(Application filed Mar. 13, 1899.)

(No Model.)

7 Sheets—Sheet 1.



WITNESSES:

F. N. Roehrich
Edward Hett

INVENTOR

Edward Hett

BY

Krugger & Krugger
ATTORNEYS

No. 637,608.

Patented Nov. 21, 1899.

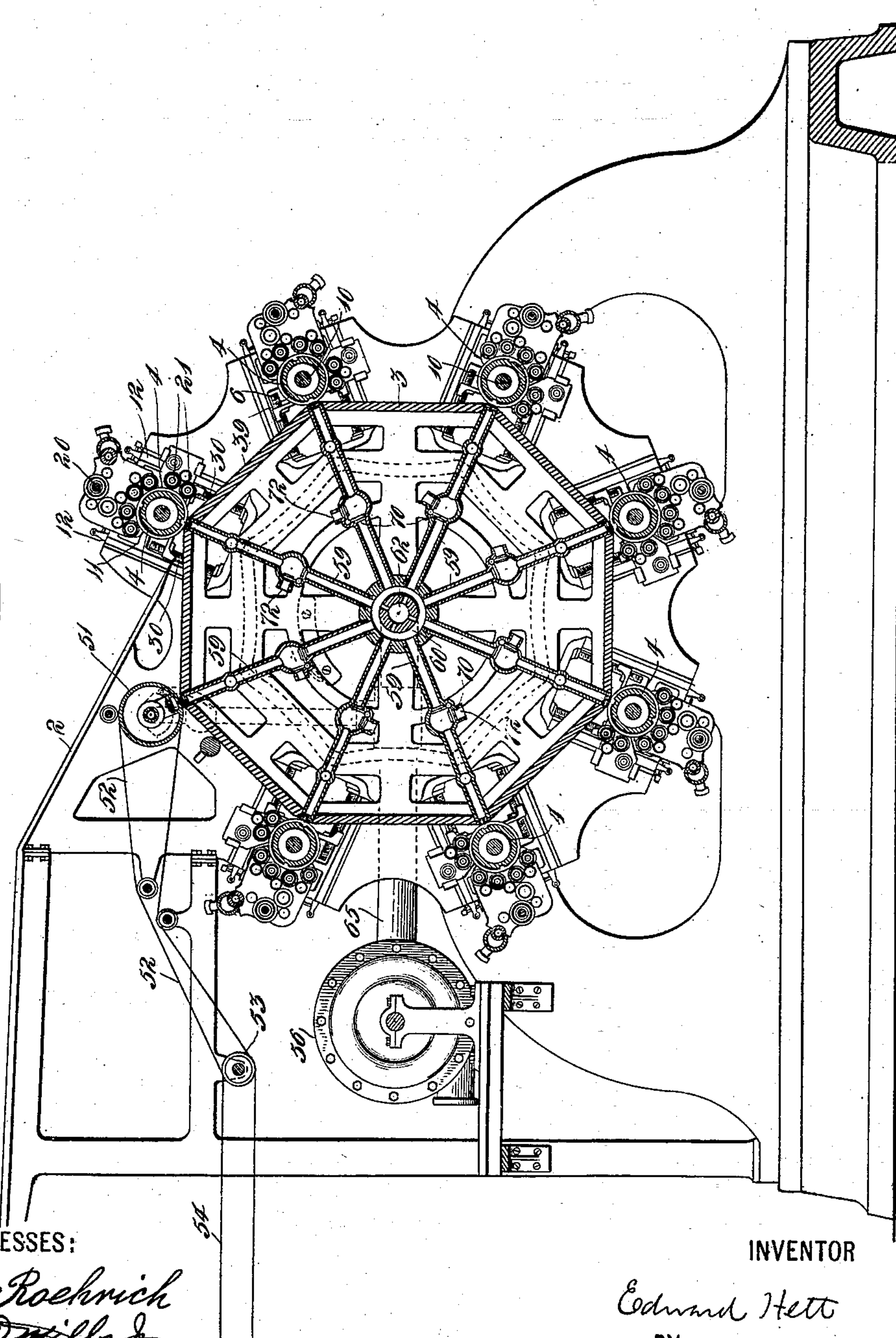
E. HETT.
PRINTING PRESS.

(Application filed Mar. 13, 1899.)

(No Model.)

7 Sheets—Sheet 2.

FIG. 2.



WITNESSES:

F. N. Roehrich
J. E. Old Mills, Jr.

INVENTOR

Edward Hett
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K. K. & K. K.
ATTORNEYS

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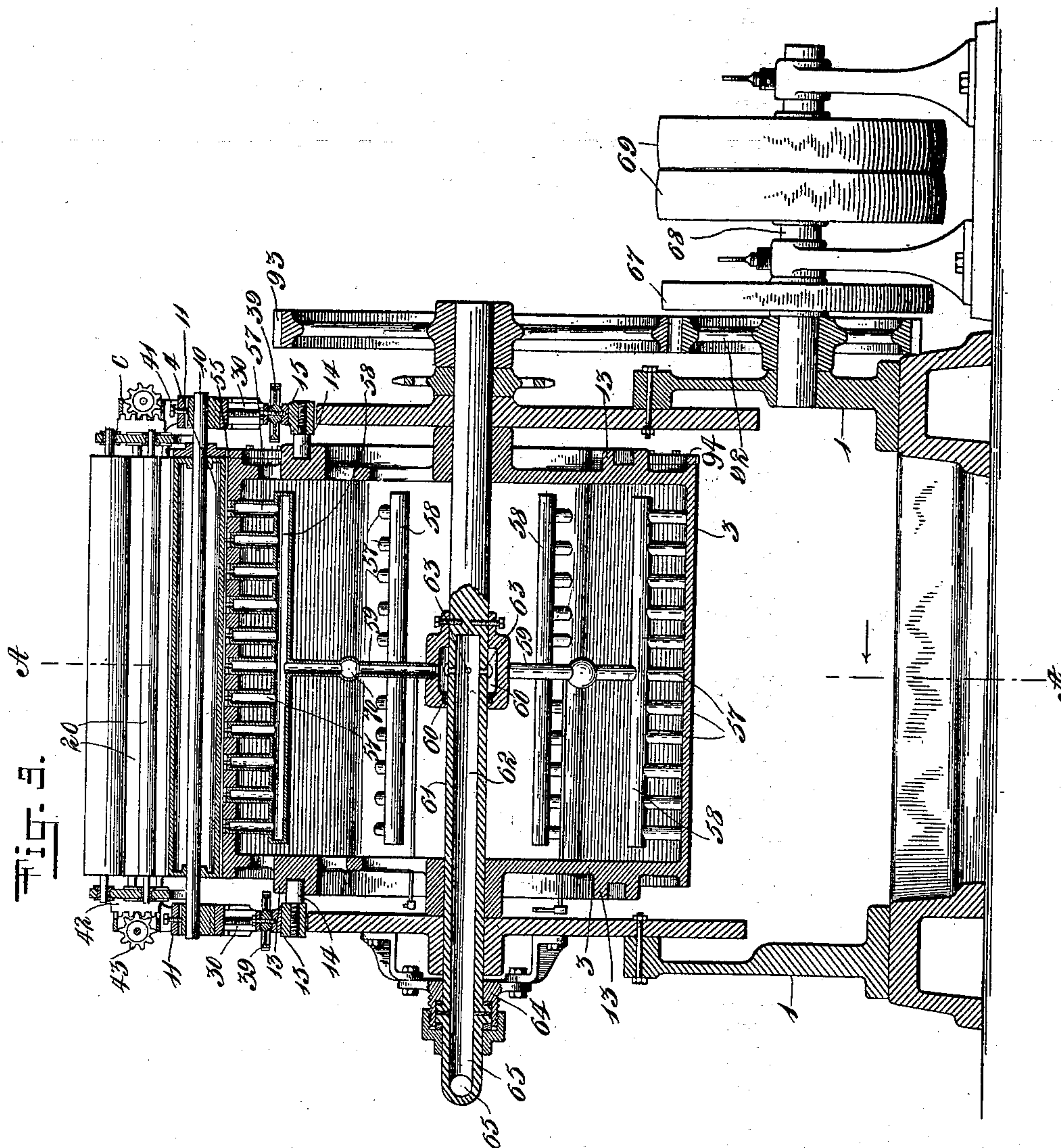
Patented Nov. 21, 1899.

E. HETT.
PRINTING PRESS.

(Application filed Mar. 13, 1899.)

(No Model.)

7 Sheets—Sheet 3.



WITNESSES:

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No. 637,608.

Patented Nov. 21, 1899.

E. HETT.
PRINTING PRESS.

(Application filed Mar. 13, 1899.)

(No Model.)

7 Sheets—Sheet 4.

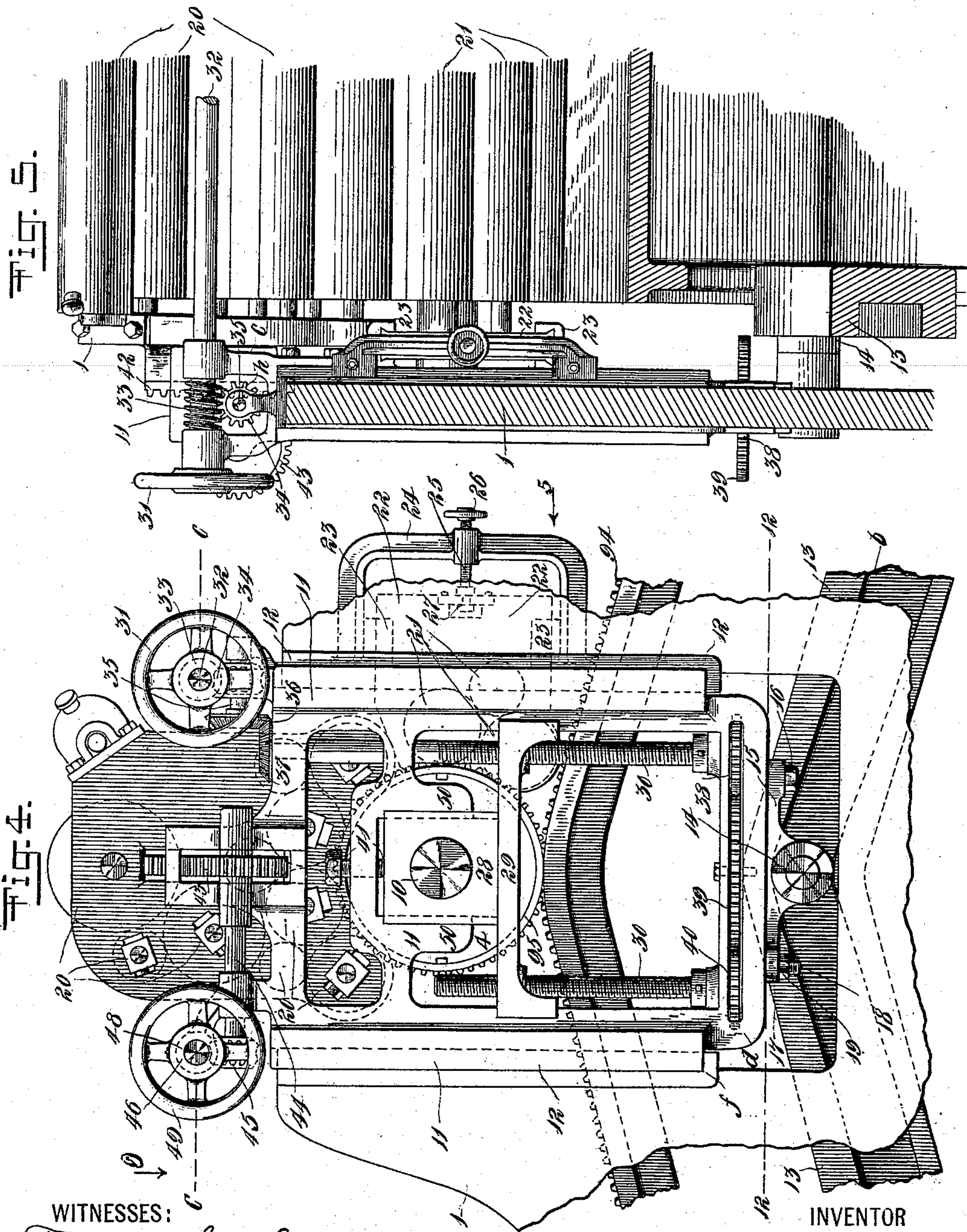


Fig. 4.

WITNESSES:

A. N. Roehrich
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Edward Hett

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No. 637,608.

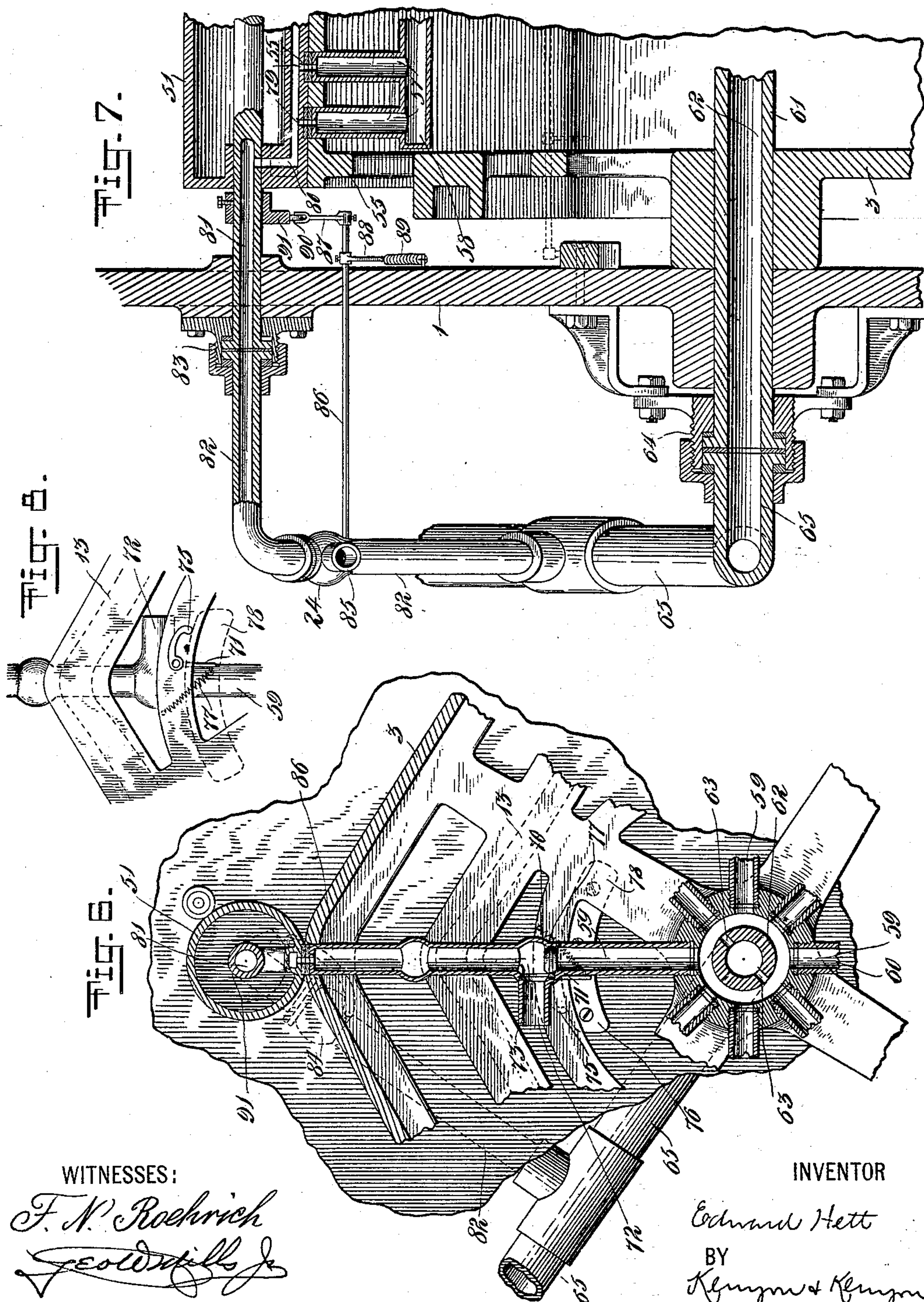
Patented Nov. 21, 1899.

E. HETT.
PRINTING PRESS.

(Application filed Mar. 13, 1899.)

(No Model.)

7 Sheets—Sheet 5.



WITNESSES:

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No. 637,608.

Patented Nov. 21, 1899.

E. HETT.

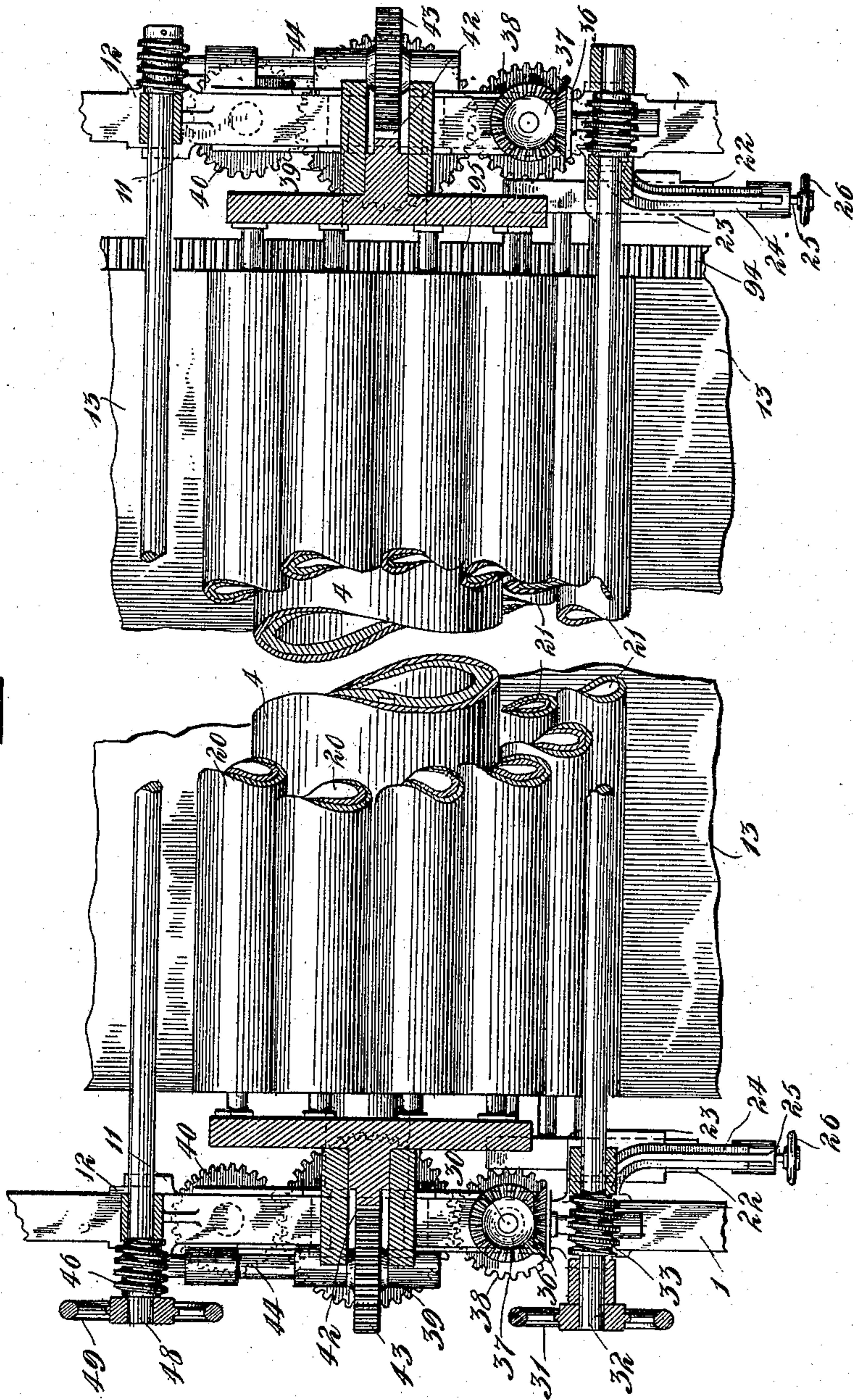
PRINTING PRESS.

(Application filed Mar. 13, 1899.)

(No Model.)

7 Sheets—Sheet 6.

Fig. 9.



WITNESSES:

F. N. Roehrich
George H. Hett

INVENTOR

Edward Hett

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ATTORNEYS

No. 637,608.

Patented Nov. 21, 1899.

E. HETT.
PRINTING PRESS.

(Application filed Mar. 13, 1899.)

(No Model.)

7 Sheets—Sheet 7.

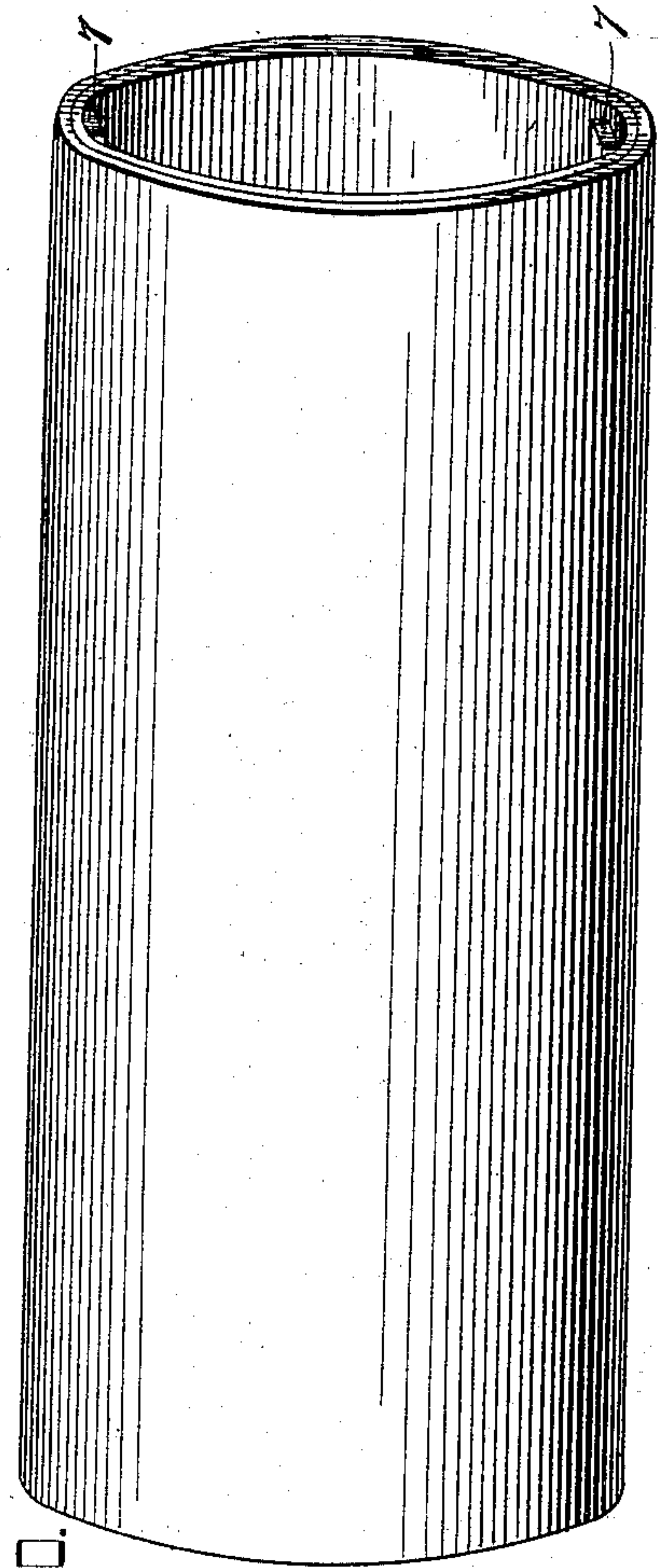


FIG. 10.

FIG. 12.

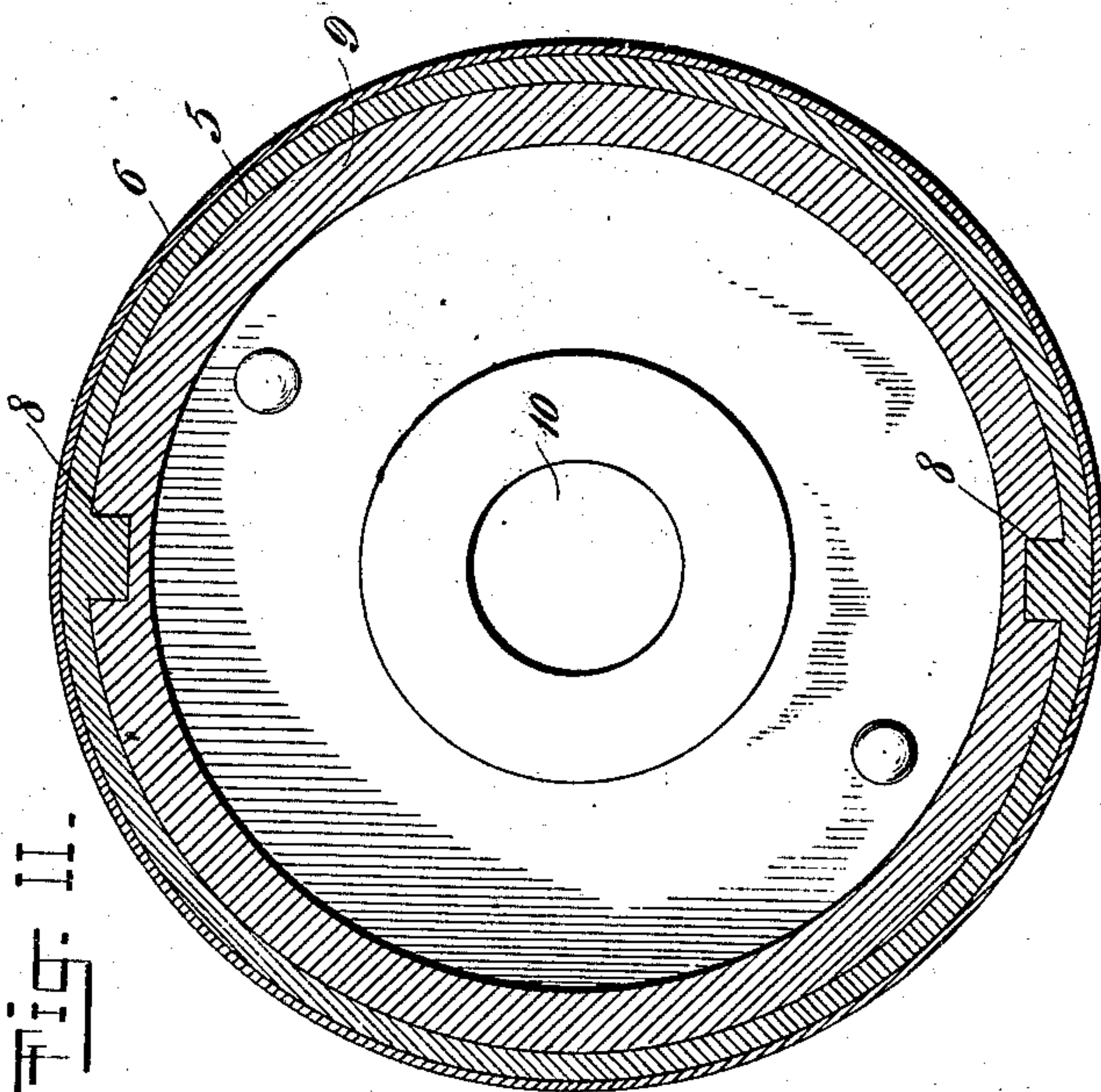
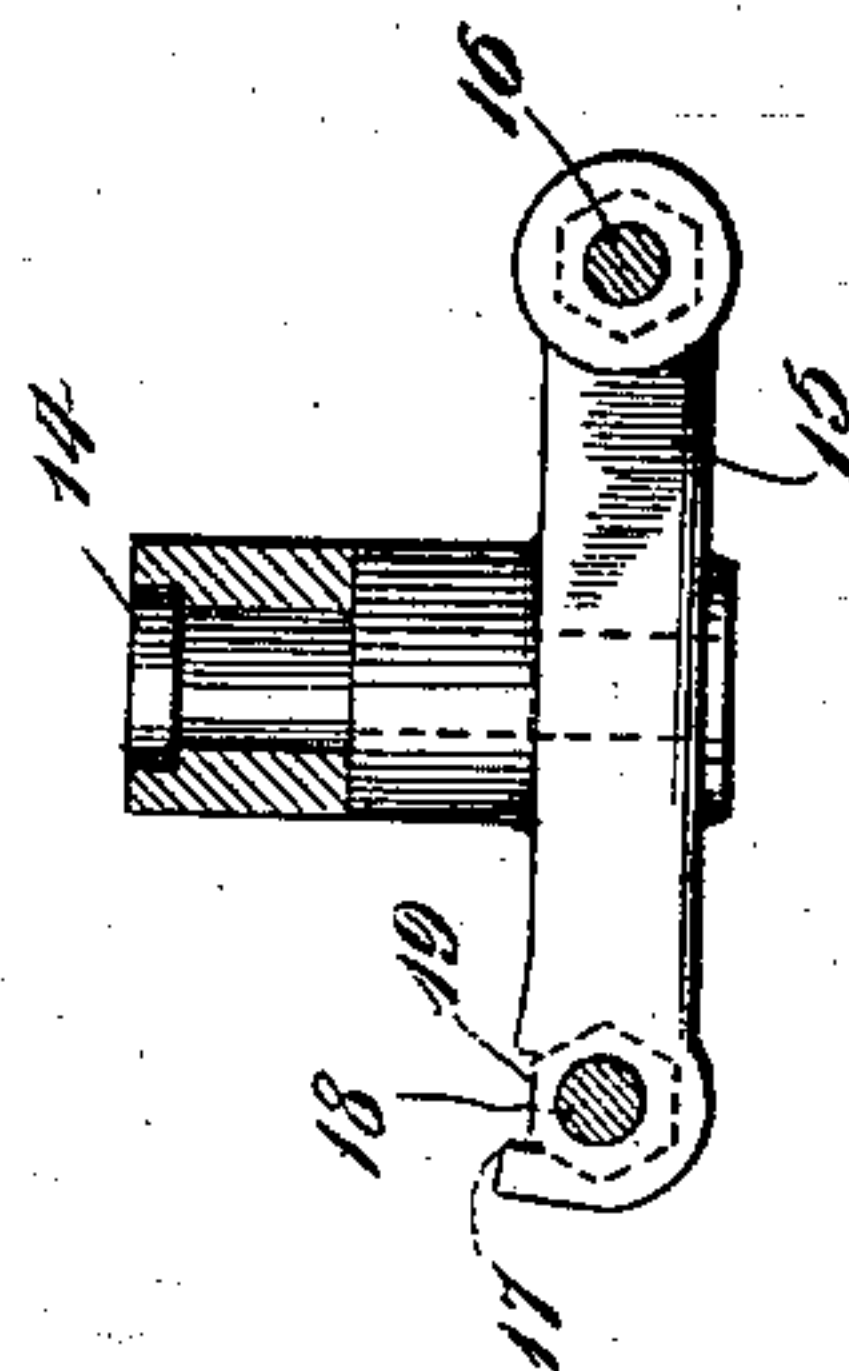


FIG. 11.

WITNESSES:

F. N. Roehrich
Leod M. Hall

INVENTOR

Edmund Hett

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Kenyon & Kenyon

ATTORNEYS

UNITED STATES PATENT OFFICE.

EDWARD HETT, OF NEW YORK, N. Y.

PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 637,608, dated November 21, 1899.

Application filed March 13, 1899. Serial No. 708,837. (No model.)

To all whom it may concern:

Be it known that I, EDWARD HETT, of New York, (New Dorp,) in the county of Richmond and State of New York, have invented
5 a new and useful Improvement in Printing-Presses, of which the following is a specification.

My invention relates to printing-presses.

It has for its object to provide new and improved impression-surfaces mounted upon a
10 polygonal drum, which impression-surfaces may or may not, as desired, be continuous with one another; also, to provide means for moving one or more curved printing-surfaces
15 radially inward or outward to keep such printing surface or surfaces in constant rolling contact with the impression-surfaces during the printing operation and to maintain at all times during such operation the same rela-
20 tive contact and pressure between the printing surface or surfaces and the impression-surfaces; also, to provide improved means for removing or replacing the printing-surfaces; also, improved means for regulating the pres-
25 sure between the printing surface or surfaces and the impression-surfaces, and also to provide improved means, preferably automatic in operation, for gripping the paper and hold-
30 ing it upon the impression-surfaces and upon the delivery-cylinder and for releasing it from said surfaces and said cylinder.

It consists in the improved devices herein shown and described.

In my improved device I use, in combination with a curved printing surface or surfaces of any suitable character, preferably a continuous inflexible tubular printing surface or surfaces each having an interior support, from which it is removable, a series of
40 flat impression-surfaces connected and supported in a series upon and forming the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, and
45 I also employ suitable mechanism to move the printing-surface radially inward and outward in order to maintain a constant rolling contact with the impression-surfaces during the printing operation and to maintain the
50 same relative contact and pressure between the said surfaces at all times during such operation.

In the drawings I have shown my invention as embodied in a multicolor lithographic rotary sheet-press. My invention, however, is
55 not limited to use in such a press, as it is obvious that it can be used in other presses—such, for example, as typographic presses or presses printing upon a web.

In the drawings accompanying this specification and forming part hereof, and in which similar reference characters and figures represent corresponding parts, I have shown and will now proceed to describe the preferred
60 form of my improved devices.

Figure 1 is a side elevation of a rotary sheet lithographic press embodying my invention. Fig. 2 is a vertical cross-section through the middle of the same, taken on the line A A of Fig. 3, as shown by the arrow. Fig. 3 is a
65 vertical longitudinal section taken on the line B B of Fig. 1. Fig. 4 is a side elevation of one of the movable carriages carrying a printing-cylinder with connecting parts, certain parts of the framework and other mechanism
70 of the press being broken away. Fig. 5 is a view of the parts shown in Fig. 4, viewed as shown by the arrow. Fig. 6 is a vertical cross-section through a part of the drum and delivery-cylinder to show the valves of the suc-
75 tion devices and their operating-cams. Fig. 7 is a vertical longitudinal section through parts of the drum and delivery-cylinder, showing parts of the tubes connecting with the exhaust device and the means for operating
80 the valve and the air-passages connecting with the delivery-cylinder. Fig. 8 is a detail of one of the cams for operating one of the valves on the drum. Fig. 9 is a horizontal section on the line C C of Fig. 4, viewed as
85 shown by the arrow 9. Figs. 10 and 11 are views of a portion of a tubular printing-surface and its internal support such as I prefer to use. Fig. 12 is a detailed view of the
90 roller for locking the movable carriage to the cam-track.

Referring to the embodiment of my invention shown in the drawings, 1 is the framework of the press, 2 the feeding-table, and 3 the impression-drum. The periphery of this
100 drum is polygonal in shape and is composed of a series of flat impression-surfaces preferably rigidly connected together in an endless series and supported and connected so

as to form the periphery of the polygonal drum. In connection with the impression-surfaces I use one or more curved printing-surfaces. These surfaces are preferably circumferentially-continuous curved printing-surfaces developed from a circumferentially-continuous curved planographic surface to which the design has been transferred in the lithographic or any suitable manner. As shown in the drawings, they consist of printing-cylinders 44, composed of tubular printing-surfaces having an interior support from which the tubular printing-surface is removable. The construction of the preferred form of my printing-surfaces is shown in detail in Figs. 10 and 11, in which the printing-tube is composed of a hollow tube 5 of copper, cast or prepared in any suitable manner, with an outer layer of zinc 6, placed thereon in any suitable manner, preferably by electrolysis. The tube has at each end ribs 7, which are adapted to take into grooves 8 in the sides of an interior support or mandrel 9. This interior support is adapted to be fitted upon the shaft 10 of the printing-cylinder. Each impression-surface corresponds to the printing-surface and is adapted to be driven positively therewith by suitable driving mechanism preferably connected with the driving mechanism of the press itself.

As it is necessary at all times during the printing operation to keep the printing surface or surfaces in continuous rolling contact with the impression-surfaces and to maintain at such times the same relative contact and pressure between the surfaces, I mount each printing-cylinder and its inking and damping devices upon a movable carriage, the carriage being adapted to move radially inward and outward in guides in the framework of the press and being controlled in this outward-and-inward movement by means of a guide or roller secured to the movable carriage engaging with a cam-track secured to the drum and revolving therewith and constructed so as to maintain such relative contact and pressure between the printing-surface and the impression-surfaces. This construction is shown in detail in Figs. 4 and 5. 11 is the movable carriage, adapted to slide radially inward and outward upon guides 12, secured to the framework 1 of the press. 13 is a cam-track secured to the drum and having a polygonal shape to correspond with the polygonal impression-surfaces of the drum and constructed so that the guide or roller will cause the same relative contact and pressure to be maintained between the printing-surfaces and the impression-surfaces throughout the entire revolution of the drum. In order to accomplish this, it is necessary to cause each side of the polygonal cam-track and the corresponding impression-surface of the impression-drum to slightly and continuously recede from each other toward the middle of each side of the cam-track and the impression-surface and to slightly and continuously

approach each other toward each end of the side of the cam-track and impression-surface. This I preferably accomplish by making each side of the polygonal cam-track slightly and continuously curved, with the middle of each side slightly nearer the axis of the drum than are the ends of each side, as shown in the drawings. 14 is a guide or roller mounted in an arm 15, secured at one end to movable carriage 11 by screw 16 and having a forked end 17, adapted to engage a screw 18 and to be locked thereon by nut 19. By these means roller 14 can be inserted in the groove of cam-track 13 and be locked therein, thus securing the movable carriage to the cam-track and causing the movable carriage to be moved outward and inward as the cam-track revolves with the rotation of the drum. The surface of the printing-cylinder is thus always kept in rolling contact with the impression-surfaces during the printing operation, and the contact and pressure between the surface of the printing-cylinder and the impression-surfaces are always kept the same. The movable carriage also carries the usual inking-rollers and inking devices 20. The inking-frame carrying the inking-rollers can be moved into or out of operative position in any suitable manner. Upon each inking-frame is a rack 42, with which meshes a gear-wheel 43, carried by a shaft 44, mounted in bearings in movable carriage 11 and having at its end a worm-wheel 45, which meshes with a worm 46 upon shaft 48. This shaft has at one end a hand-wheel 49. Shaft 48 runs across the press and has a worm 46 at its other end, which meshes with a similar worm-wheel 45 on shaft 44, the latter carrying a similar gear-wheel 43, meshing with a similar rack 42 on the corresponding inking-frame upon the other side of the press. Thus by turning hand-wheel 49 one way or the other the operator can raise or lower the inking-frames on both sides of the press. The movable carriage also carries suitable damping-rollers and damping mechanism 21. These are mounted upon a frame 22, which slides horizontally in guides 23 of bracket 24, the latter secured to the movable carriage 11. A screw 25, passing through the standard and having a hand-wheel 26, is fastened at its inner end 27 to frame 22. By turning hand-wheel 26 the damping-frames are moved away from or toward the printing-surface.

Where the printing-surface is a hollow tube having an interior support, from which it is removable, I provide the following means for removing it from its interior support or for placing it upon such support: The ends of shaft 10 of the printing-cylinder are mounted in suitable bearing-boxes 28, supported upon an arm 29. Each arm 29 has two cylindrical openings, screw-threaded on their interiors, through which pass screw-threaded shafts 30, secured to movable carriage 11. Arm 29, with its screw-threaded openings, acts as an end to shafts 30. Rotation is imparted to these

shafts at will by means of a hand-wheel 31 on a shaft 32, which runs across the press and which carries at each side of the press a worm 33, meshing with a worm-wheel 34 on a short shaft 35. Each shaft 35 has at its end a beveled wheel 36, meshing with beveled wheel 37 on the end of one of the shafts 30. Through gear-wheels 38, 39, and 40 similar rotation in the same direction is imparted to the other screw-shaft 30. Thus by turning hand-wheel 31 one way or the other the bearing-boxes 28 at each side of the press are moved radially inward or outward, carrying with them the printing-cylinder and either raising it up from the impression-surfaces or lowering it down upon them. By means of a set-screw 41 at each side of the press passing through part of the framework of movable carriage 11 and adapted to bear upon the said bearing-boxes the pressure between the printing-surface and the impression-surfaces can be regulated. When it is desired to remove a printing-tube from its interior support or shaft or place it upon the same, it is necessary, in the construction of the parts shown in the drawings, first to raise the movable carriage away from the impression-surfaces. Then hand-wheel 31 is turned in such a direction as to lower the bearing-boxes 28, so that the upper part of the printing-tube will clear the parts 50 of the movable carriage. The printing-tube can now be removed or be placed upon shaft 10 or its internal support. Before movable carriage 11 is moved outward it is of course necessary to unlock roller 14 and swing it outward from contact with cam-track 13.

The press shown in the drawings is a rotary sheet-press of any suitable mechanism and may be employed for supplying and controlling and delivering paper in sheets. I prefer, however, to use pneumatic devices for gripping and for holding the sheets upon the impression-surfaces during the printing operation and for gripping and holding the sheet upon the delivery-cylinder during a part of its rotation for the purpose of delivering the sheets, and I prefer to make these devices automatic in operation and actuated by the driving mechanism of the press as the printing operation proceeds. As shown in the drawings, these pneumatic gripping devices are applied to holding sheets upon the impression-surfaces or the delivery-cylinder. My invention in this feature is not limited, however, to sheet-presses, as it may be employed with suitable and obvious modifications to presses in which the printing is done upon a web. I will now proceed to describe these devices as shown in the drawings.

The sheets are fed into the press from feed-board 2, are seized and held in place upon the impression-surfaces during the printing operation by the pneumatic gripping devices presently to be described, which are automatic in their operation, and are automatically released when the sheets reach the delivery-cylinder 51. The sheets are then seized

and held upon the delivery-cylinder during part of its rotation by pneumatic gripping devices, presently to be described, which are preferably automatic in operation, and when the sheets have reached the proper point for discharge they are released from the delivery-cylinder automatically and are discharged from the press upon endless delivery-tapes 52, which pass around the delivery cylinder and roller 53 and upon delivery-tapes 54, to which they pass from endless tapes 52. Upon each impression-surface I provide at suitable distances a set of openings 55. These sets of openings may be made through the impression-surfaces or at their junction or may be in any suitable way connected with each impression-surface and the openings may be of any desired form. As shown in the drawings, they consist of a line of holes. Each set of openings is connected by air-passages with an exhaust device 56. As shown, these air-passages consist of short pipes 57, one for each hole, running to a common pipe 58, the latter being connected by a radial air-passage 59 with a common air-chamber 60, within or connected to the shaft 61 of the impression-drum. One-half of shaft 61 is made hollow, as at 62, the hollow space 62 extending from substantially the center of the shaft to one end. At the center of the shaft openings 63 connect hollow part 62 of the shaft with a common air-chamber 60. At its outer end shaft 62 is connected by an air-tight joint or stuffing-box 64 of any suitable construction with an air-pipe 65, which leads to exhaust device 56. This exhaust device may be of any suitable construction and may be operated by any suitable means. As shown, it is driven by belt 66, running over pulley 67 on the main driving-shaft 68 of the press. This main driving-shaft may be driven in any suitable way, as by a belt, (not shown,) from any suitable source of power running over pulley 69. The details of construction of the exhaust device are not shown, as they form no part of the present invention and will not be further described. As a sheet is fed into the press one edge of the sheet lies over the line of openings 55 of one of the impression-surfaces, and at this juncture the air is exhausted or partially exhausted through said openings 55 and the air-passages connecting them with the exhaust device. The edge of the sheet is thus firmly pressed down against the impression-surface and is firmly held in that position during the entire printing operation and until the edge of the sheet has reached the delivery-cylinder, where the sheet is released in the manner presently to be described.

The operation of exhausting the air to hold the sheet upon the impression-surface and of releasing the sheet is preferably done automatically by the following means: In each radial air-passage 59 is a valve 70, which is adapted to occupy either one of two positions, in one of which the openings connected with

said radial air-passage are connected with the exhaust device and the connection with the atmosphere is shut off and in the other position the connection with the exhaust device is closed and the openings are connected with the atmosphere. To accomplish this, I make valve 70 with a valve-face on each side. In radial air-passage 59 is a valve-seat 71 for one face of valve 70, and in a short pipe 72, connecting with radial air-passage 59, is a valve-seat 73 for the other face of valve 70, as shown in Fig. 6. Valve 70 is mounted upon a shaft 74. This shaft has an arm 75 and an arm 76, the said shaft and its two arms constituting a handle for the valve. A spring 77 is connected with arm 71, so as normally to hold valve 70 against valve-seat 73, thus normally keeping the connection between the line of openings and the exhaust device open and keeping the opening to the atmosphere closed. 78 is a cam which is placed upon the framework of the press, and it is so arranged that at the proper time arm 75 of the handle of the valve is adapted to strike and ride up on the cam, thus throwing valve 70 into its other position, closing the connection with the exhaust device and opening that to the atmosphere, thus releasing the sheet. This cam is so placed that the connection with the exhaust device will be shut off and that with the atmosphere opened after the printing operation has been completed and the sheet is ready for delivery to the delivery-cylinder, and so that the connection with the exhaust device will be renewed and that with the atmosphere shut off in time for the line of openings to seize and grip a sheet as the line of openings reaches the point where sheets are fed into the press.

When a sheet reaches the delivery-cylinder, it is automatically released, as above set forth, and is immediately gripped by pneumatic grippers connected with the delivery-cylinder. These consist of a similar line of openings 79 in the surface of the delivery-cylinder. These openings are connected by air-passages 80 and 81, connected with the delivery-cylinder itself and air-pipe 82, leading to air-pipe 65, and thence to the exhaust device. An air-tight stuffing-box 83 connects hollow-shaft 81 of the delivery-cylinder with pipe 82. A valve 84 is placed in pipe 82 at any suitable point. This valve is similar in construction to valve 70 and is similarly provided with two valve-seats, one in pipe 82 and the other in short pipe 85, connecting with the atmosphere, also with a handle, consisting of shaft 86, having two arms 87 and 88, the latter having a spring 89, connected to the framework of the press. Arm 87 carries a roller 90 at its end, which is adapted to make contact with a cam 91, secured to the shaft of the delivery-cylinder 51. Valve 84 is constructed so that normally it will rest against the valve-seat in pipe 82, thus normally connecting the line of openings in the delivery-cylinder with

the atmosphere and shutting-off connection with the exhaust device. Cam 91 is placed in such a position upon the shaft of the delivery-cylinder that just as the edge of a sheet is released from an impression-surface and as the edge of the sheet comes over the line of openings 79 in the surface of the delivery-cylinder the cam and handle of valve 84 will engage with each other, thus shifting the valve into its other position and connecting the said line of openings with the exhaust device and shutting off their connection with the atmosphere. The sheet will then be gripped and held upon the delivery-cylinder during part of its rotation and until cam 91 passes from under roller 90, when valve 84 will be thrown into its other position and the sheet will be released from the delivery-cylinder and will pass down and over the delivery-tapes. My devices for gripping and holding the sheet first upon the impression-surface and then upon the delivery-cylinder are thus automatic in operation.

Motion is imparted to the impression-drum by means of gear-wheel 92, mounted upon shaft 68 and meshing with gear-wheel 93 upon the shaft of the impression-drum. Motion is imparted from the drum to the printing-cylinder through gear or rack 94, mounted on the drum and gear-wheel 95, mounted on the shaft of the printing-cylinder. Motion is imparted to the delivery-cylinder by any suitable gearing (not shown) driven by the impression-drum at such a rate as to make the surface speed of the delivery-cylinder the same as that of the impression-drum. The other parts of my improved devices may be driven in any suitable manner, and as these form no part of my present invention they are not shown in detail and will not be further described.

Many modifications may be made in the devices shown in the drawings herein without departing from my invention. The impression-surfaces may be increased or diminished, one or more printing-surfaces may be used, as desired, and many other changes may be made therein without departing from my invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a circumferentially-continuous curved printing-surface developed from a circumferentially-continuous curved planographic surface to which the design has been transferred in the lithographic or any suitable manner, with a series of impression-surfaces rigidly connected together in an endless series and supported and connected as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, and suitable driving mechanism and suitable mechanism to move the printing-surface in and out, whereby the printing-surface prints by continuous rolling contact upon the

series of impression-surfaces, substantially as described.

2. The combination of a curved planographic-printing surface, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces, substantially as set forth.

3. The combination of a series of curved planographic-printing surfaces, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surfaces and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surfaces in and out, whereby the series of printing-surfaces print by continuous rolling contact upon the series of impression-surfaces, substantially as set forth.

4. The combination of a series of curved planographic-printing surfaces, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surfaces and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, whereby the series of printing-surfaces print by continuous rolling contact upon the series of impression-surfaces, and suitable mechanism for supplying and controlling and delivering paper in the sheet, substantially as set forth.

5. The combination of a tubular printing-surface having an interior support from which it is removable, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out; whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces, substantially as set forth.

6. The combination of a series of tubular printing-surfaces, each having an interior support from which it is removable, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surfaces and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surfaces in and out, whereby the series of printing-surfaces print by continuous rolling contact upon the series of impression-surfaces, substantially as set forth.

7. The combination of a tubular printing-

surface having an interior support from which it is removable, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces, and suitable mechanism for supplying and controlling and delivering paper in the sheet, substantially as set forth.

8. The combination of a series of tubular printing-surfaces having interior supports from which they are removable, with a series of impression-surfaces connected and supported in a series as a periphery of a polygonal drum, each impression-surface corresponding to the printing-surfaces and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surfaces in and out, whereby the series of printing-surfaces print by continuous rolling contact upon the series of impression-surfaces, and suitable mechanism for supplying and controlling and delivering paper in the sheet, substantially as set forth.

9. The combination of a tubular planographic-printing surface having an interior support from which it is removable, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surfaces and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces, substantially as set forth.

10. The combination of a series of tubular planographic-printing surfaces having interior supports from which they are removable, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surfaces and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surfaces in and out, whereby the series of printing-surfaces print by continuous rolling contact upon the series of impression-surfaces, substantially as set forth.

11. The combination of a series of tubular planographic surfaces having interior supports from which they are removable, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surfaces and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surfaces in and out, whereby the series of printing-surfaces print by continuous rolling contact upon the series of im-

pression-surfaces, and suitable mechanism for supplying and controlling and delivering paper in the sheet, substantially as set forth.

12. The combination of a curved inflexible printing-surface developed from a curved planographic surface to which the design has been transferred in the lithographic or any suitable manner, and having an interior support from which it is removable, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, whereby the printing-surface prints by rolling contact upon the series of impression-surfaces, substantially as set forth.

13. The combination of a series of curved inflexible printing-surfaces, each developed from a curved planographic surface to which the design has been transferred in the lithographic or any suitable manner, and having an interior support from which it is removable, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surfaces and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, whereby the series of printing-surfaces print by rolling contact upon the series of impression-surfaces, substantially as set forth.

14. The combination of a series of curved inflexible printing-surfaces, each developed from a curved planographic surface to which the design has been transferred in the lithographic or any suitable manner, and having an interior support from which it is removable, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out whereby the series of printing-surfaces print by rolling contact upon the series of impression-surfaces, and suitable mechanism for supplying and controlling and delivering paper in the sheet, substantially as set forth.

15. The combination of a curved planographic inflexible printing-surface developed from a curved planographic surface to which the design has been transferred in the lithographic or any suitable manner, and having an interior support from which it is removable, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and

out, whereby the printing-surface prints by rolling contact upon the series of impression-surfaces, substantially as set forth.

16. The combination of a series of curved planographic inflexible printing-surfaces, each developed from a curved planographic surface to which the design has been transferred in the lithographic or any suitable manner, and having an interior support from which it is removable, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surfaces in and out, whereby the series of printing-surfaces print by rolling contact upon the series of impression-surfaces, substantially as set forth.

17. The combination of a series of curved planographic inflexible printing-surfaces, each developed from a curved planographic surface to which the design has been transferred in the lithographic or any suitable manner, and having an interior support from which it is removable, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, whereby the series of printing-surfaces print by rolling contact upon the series of impression-surfaces, and suitable mechanism for supplying and controlling and delivering paper in the sheet, substantially as set forth.

18. The combination of a curved inflexible printing-surface developed from a curved planographic surface to which the design has been transferred in the lithographic or any suitable manner, and having an interior support from which it is removable, with a series of flat impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, whereby the printing-surface prints by rolling contact upon the series of flat impression-surfaces, substantially as set forth.

19. The combination of a curved printing-surface, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, openings connected with each impression-surface over which the paper is adapted to lie when fed into the press, air-passages connecting the openings with an exhaust de-

vice, and an exhaust device, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces and whereby the paper may be held in place upon the impression-surfaces during the printing operation.

20. The combination of a series of curved printing-surfaces, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surfaces in and out, openings connected with each impression-surface over which the paper is adapted to lie when fed into the press, air-passages connecting the openings with an exhaust device, and an exhaust device, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces and whereby the paper may be held in place upon the impression-surfaces during the printing operation.

21. The combination of a series of curved printing-surfaces, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surfaces in and out, openings connected with each impression-surface over which the sheet is adapted to lie when fed into the press, air-passages connecting the openings with an exhaust device, and an exhaust device, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces and whereby the sheet may be held in place upon the impression-surfaces during the printing operation, and suitable mechanism for supplying and controlling and delivering paper in the sheet.

22. The combination of a tubular printing-surface having an interior support from which it is removable, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surfaces and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, openings connected with each impression-surface over which the paper is adapted to lie when fed into the press, air-passages connecting the openings with an exhaust device, and an exhaust device, whereby the printing-surfaces print by continuous rolling contact upon the series of impression-surfaces and whereby the paper may be held in place upon the impression-surface during the printing operation.

23. The combination of a series of tubular printing-surfaces, each having an interior support from which it is removable, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surfaces and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surfaces in and out, openings connected with each impression-surface over which the paper is adapted to lie when fed into the press, air-passages connecting the openings with an exhaust device, and an exhaust device, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces and whereby the paper may be held in place upon the impression-surfaces during the printing operation.

ported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surfaces and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surfaces in and out, openings connected with each impression-surface over which the paper is adapted to lie when fed into the press, air-passages connecting the openings with an exhaust device, and an exhaust device, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces and whereby the paper may be held in place upon the impression-surfaces during the printing operation.

24. The combination of a series of tubular printing-surfaces, each having an interior support from which it is removable, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, openings connected with each impression-surface over which the paper is adapted to lie when fed into the press, air-passages connecting the openings with an exhaust device and an exhaust device, whereby the printing-surface prints by continuous rolling contact upon a series of impression-surfaces and whereby the paper may be held in place upon the impression-surfaces during the printing operation, and suitable delivery devices.

25. The combination of a curved inflexible printing-surface developed from a curved planographic surface to which the design has been transferred in the lithographic or any suitable manner, and having an interior support from which it is removable, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, openings connected with each impression-surface over which the paper is adapted to lie when fed into the press, air-passages connecting the openings with an exhaust device, and an exhaust device, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces and whereby the paper may be held in place upon the impression-surfaces during the printing operation.

26. The combination of a series of curved inflexible printing-surfaces, each developed from a curved planographic surface to which the design has been transferred in the lithographic or any suitable manner, and having an interior support from which it is removable, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surfaces and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surfaces in and out, openings connected with each impression-surface over which the paper is adapted to lie when fed into the press, air-passages connecting the openings with an exhaust device, and an exhaust device, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces and whereby the paper may be held in place upon the impression-surfaces during the printing operation.

driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, openings connected with each impression-surface over which the paper is adapted to lie when fed into the press, air-passages connecting the openings with an exhaust device, and an exhaust device whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces and whereby the paper may be held in place upon the impression-surfaces during the printing operation.

27. The combination of a series of curved inflexible printing-surfaces, each developed from a curved planographic surface to which the design has been transferred in the lithographic or any suitable manner, and having an interior support from which it is removable, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, openings connected with each impression-surface over which the paper is adapted to lie when fed into the press, air-passages connecting the openings with an exhaust device, and an exhaust device, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces and whereby the paper may be held in place upon the impression-surfaces during the printing operation, and suitable mechanism for supplying and controlling and delivering paper in the sheet.

28. The combination of a curved printing-surface, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, openings in each impression-surface over which an edge of the paper is adapted to lie when fed into the press, air-passages connecting the openings with an exhaust device, a valve in said air-passages, adapted when in one position to connect the passages with the exhaust device and when in another position to connect the openings with the atmosphere, means for automatically operating said valve, and an exhaust device, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces whereby the paper is held in place on the impression-surface during the printing operation and is released when the printing is done.

29. The combination of a curved printing-surface with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism, openings in the im-

pression-surface over which an edge of the paper is adapted to lie when fed into the press, air-passages connecting the openings with an exhaust device, a valve in said air-passages, adapted when in one position to connect the openings with the exhaust device, and when in another position to connect the openings with the atmosphere, a handle for said valve, a spring connected with the handle to hold the valve normally in one position, a cam upon the framework of the press against which the handle is adapted to strike as the drum rotates and by which the handle is made to move the valve into its other position and hold it there while the cam and handle are in engagement and an exhaust device whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces, and whereby the paper is held in place during the printing operation and then released, and suitable delivery devices.

30. The combination of a curved printing-surface with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism, openings in the impression-surface over which an edge of the paper is adapted to lie when fed into the press, air-passages connecting the openings with an exhaust device, a valve in said air-passages, adapted when in one position to connect the openings with the exhaust device, and when in another position to connect the openings with the atmosphere, a handle for said valve, a spring connected with the handle to hold the valve normally in the position to connect the openings with the exhaust device and to close their connection with the atmosphere, a cam upon the framework of the press against which the handle is adapted to strike as the drum rotates and by which the handle is made to move the valve into its other position to connect the openings with the atmosphere and to close the connection with the exhaust device and hold it there while the cam and handle are in engagement, the said cam being so arranged as to close the connection with the exhaust device and open that with the atmosphere, when the printing operation is completed and the sheet is ready for delivery, and an exhaust device whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces, and whereby the paper is held in place during the printing operation and is then automatically released, and suitable delivery devices.

31. The combination of a curved printing-surface, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mech-

anism to move the printing-surface in and out, suitable devices for gripping and holding the paper upon the impression-surfaces and for releasing the same therefrom, a delivery-cylinder having openings in its surface over which the paper is adapted to lie when released from the impression-surfaces, an exhaust device, air-passages connecting the openings with the exhaust device, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces and the paper will be held upon the delivery-cylinder during part of its rotation and means for releasing the paper from the delivery-cylinder.

32. The combination of a curved printing-surface, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, suitable devices for gripping and holding the paper upon the impression-surfaces and for releasing the same therefrom, a delivery-cylinder having openings in its surface over which the paper is adapted to lie when released from the impression-surfaces, an exhaust device, air-passages connecting the openings with the exhaust device, a valve in said air-passage and means for automatically opening and closing it, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces, and whereby the paper will be held upon the delivery-cylinder during part of its rotation and will then be automatically released from the cylinder.

33. The combination of a curved printing-surface, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, suitable devices for gripping and holding the paper upon the impression-surfaces and for releasing the same therefrom, a delivery-cylinder having openings in its surface over which the paper is adapted to lie when released from the impression-surfaces, an exhaust device, air-passages connecting the openings with the exhaust device, a valve in said air-passages adapted, when in one position, to connect the openings with the exhaust device and, when in another position, to connect the openings with the atmosphere, and means for automatically operating said valve, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces, and whereby the paper will be automatically held upon the delivery-cylinder during part of its rotation and will then be automatically released from the cylinder.

34. The combination of a curved printing-surface, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, suitable devices for gripping and holding the paper upon the impression-surfaces and for releasing the same therefrom, a delivery-cylinder having openings in its surface over which the paper is adapted to lie when released from the impression-surfaces, an exhaust device, air-passages connecting the openings with the exhaust device, a valve in said air-passages adapted, when in one position, to connect the openings with the exhaust device and, when in another position, to connect the openings with the atmosphere, a handle for said valve, a spring connected with said handle to hold the valve normally in one position, a cam upon the shaft of the delivery-cylinder adapted to engage with the said handle during a part of the rotation of the delivery-cylinder to move the valve into its other position and hold it there while the cam and handle are in engagement, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces and whereby the paper will be automatically held upon the delivery-cylinder after its release from the impression-surface and during part of the rotation of the delivery-cylinder, and will then be automatically released from the delivery-cylinder.

35. The combination of a curved printing-surface, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, suitable devices for gripping and holding the paper upon the impression-surfaces and for releasing the same therefrom, a delivery-cylinder having openings in its surface over which the paper is adapted to lie when released from the impression-surface, an exhaust device, air-passages connecting the openings with the exhaust device, a valve in said air-passages adapted, when in one position, to connect the openings with the exhaust device and, when in another position, to connect the openings with the atmosphere, a handle for said valve, a spring connected with said handle to hold the valve normally so as to connect the said openings with the atmosphere and to close their connection with the exhaust device, a cam upon the shaft of the delivery-cylinder adapted to engage with the said handle during a part of the rotation of the delivery-cylinder to move the valve so as to connect the said openings with the exhaust device and to close their connection with the atmosphere and to hold it there while the cam

and handle are in engagement, the said cam being so arranged to close the connection with the atmosphere and to open the connection with the exhaust device, when the sheet is released from the impression-surfaces, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces, and whereby the paper will be automatically held upon the delivery-cylinder after its release from the impression-surfaces and during part of the rotation of the delivery-cylinder, and will then be automatically released from the delivery-cylinder.

36. The combination of a curved printing-surface, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism and suitable mechanism to move the printing-surface in and out, suitable devices for gripping and holding the paper upon the impression-surfaces and for releasing the same therefrom, a delivery-cylinder having openings in its surface over which the paper is adapted to lie when released from the impression-surface, an exhaust device, air-passages connecting the openings with the exhaust device, a valve in said air-passages adapted, when in one position, to connect the openings with the exhaust device and, when in another position, to connect the openings with the atmosphere, a handle for said valve, a spring connected with said handle to hold the valve normally so as to connect the said openings with the atmosphere and to close their connection with the exhaust device, a cam upon the shaft of the delivery-cylinder adapted to engage with the said handle during a part of the rotation of the delivery-cylinder to move the valve so as to connect the said openings with the exhaust device and to close their connection with the atmosphere and to hold it there while the cam and handle are in engagement, the said cam being so arranged to close the connection with the atmosphere and to open the connection with the exhaust device, when the sheet is released from the impression-surfaces, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces, and whereby the paper will be automatically held upon the delivery-cylinder after its release from the impression-surfaces and during part of the rotation of the delivery-cylinder, and will then be automatically released from the delivery-cylinder.

37. The combination in a press of a curved printing-surface, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism therefor, a movable carriage adapted to carry in suitable bearings therein the curved printing-surface and suitable inking devices therefor, and

adapted to move radially inward and outward, guides in the framework of the press upon which the said carriage moves, a polygonal cam-track secured to the drum and revolving therewith, the cam-track and the impression-surfaces being so constructed and arranged relative to each other that each side of the cam-track and its corresponding impression-surface will slightly and continuously recede from each other toward the middle of such side and surface and slightly and continuously approach from each other toward their ends, a guide secured to the movable carriage and adapted to engage with the cam-track and to be moved radially inward and outward thereby, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces and is moved radially outward and inward with the movement of the impression-surface so as to keep at all times during the printing operation the same relative contact and pressure between the printing-surface and the impression-surfaces.

38. The combination in a press, of a curved printing-surface, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism therefor, a movable carriage adapted to carry in suitable bearings therein the curved printing-surface and suitable inking devices therefor, and adapted to move radially inward and outward, guides in the framework of the press upon which the said carriage moves, a polygonal cam-track secured to the drum and revolving therewith, the cam-track and the impression-surfaces being so constructed and arranged relative to each other that each side of the cam-track and its corresponding impression-surface will slightly and continuously recede from each other toward the middle of such side and surface and slightly and continuously approach from each other toward their ends, a roller secured to the movable carriage and adapted to engage with the cam-track and to be moved radially inward and outward thereby, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces and is moved radially outward and inward with the movement of the impression-surface so as to keep at all times during the printing operation the same relative contact and pressure between the printing-surface and the impression-surfaces.

39. The combination of a curved printing-surface having an interior support from which it is removable, a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism therefor, a movable carriage adapted to carry in suitable bearings the curved printing-surface and

suitable inking devices therefor, and adapted to move radially inward and outward, guides in the framework of the press upon which the said carriage moves, a polygonal cam-track 5 secured to the drum and revolving therewith and having each side slightly and continuously curved with the middle of the side slightly nearer the axis of the drum than are the ends of each side, a guide secured to the 10 movable carriage and adapted to engage with the cam-track and to be moved radially inward and outward thereby, means for locking and unlocking the guide and bringing it into and removing it from contact with the 15 cam-track, means for moving the movable carriage at will outward away from the cam-track and impression-surfaces or inward toward the same, bearing-boxes carried by nuts adapted to move up and down screw-threaded 20 shafts forming part of the movable carriage, means for rotating said shafts at will to raise or lower the printing-surface in the movable carriage, whereby the printing-surface prints by continuous rolling contact upon the series 25 of impression-surfaces and is moved radially outward and inward with the movement of the impression-surface so as to keep at all times during the printing operation the same relative contact and pressure between the 30 printing-surface and the impression-surfaces, and whereby the printing-surface may at will be placed upon or be removed from its interior support.

40. The combination of a curved printing-surface having an interior support from which it is removable, a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, 40 suitable driving mechanism therefor, a movable carriage adapted to carry in suitable bearings the curved printing-surface and suitable inking devices therefor, and adapted 45 to move radially inward and outward, guides in the framework of the press upon which the said carriage moves, a polygonal cam-track secured to the drum and revolving therewith and having each side slightly and continuously 50 curved with the middle of the side slightly nearer the axis of the drum than are the ends of each side, a guide secured to the movable carriage and adapted to engage with the cam-track and to be moved radially inward and outward thereby, means for locking 55 and unlocking the guide and bringing it into and removing it from contact with the cam-track, a rack secured to the framework of the press, a gear-wheel mounted upon a shaft carried in bearings on the movable carriage and means for rotating said shaft to 60 move the movable carriage at will outward away from the cam-track and impression-surfaces or inward toward the same, bearing-boxes carried by nuts adapted to move up and down screw-threaded shafts forming part of the movable carriage, means for rotating

said shafts at will to raise or lower the printing-surface in the movable carriage, whereby the printing-surface prints by continuous 70 rolling contact upon the series of impression-surfaces and is moved radially outward and inward with the movement of the impression-surface so as to keep at all times during the printing operation the same relative contact 75 and pressure between the printing-surface and the impression-surfaces, and whereby the printing-surface may at will be placed upon or be removed from its interior support.

41. The combination in a press, of a curved 80 printing-surface, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, 85 suitable driving mechanism therefor, a movable carriage adapted to carry in suitable bearings therein the curved printing-surface and suitable inking devices therefor, and adapted to move radially inward and outward, 90 guides in the framework of the press upon which the said carriage moves, a polygonal cam-track secured to the drum and revolving therewith and having each side slightly and continuously curved with the middle of the 95 side slightly nearer the axis of the drum than are the ends of each side, a guide secured to the movable carriage and adapted to engage with the cam-track and to be moved radially inward and outward thereby, bearing-boxes 100 carried by nuts adapted to move up and down screw-threaded shafts forming part of a movable carriage, means for rotating said shafts at will to raise or lower the printing-surface in the movable carriage, set-screws mounted 105 in the framework of the movable carriage and adapted to bear upon the said bearing-boxes for regulating the pressure, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces 110 and is moved radially outward and inward with the movement of the impression-surfaces so as to keep at all times during the printing operation the same relative contact and pressure 115 between the printing-surface and the impression-surfaces, and whereby the pressure between the printing and impression surfaces may be regulated at will.

42. The combination in a press, of a curved 120 printing-surface, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism therefor, a movable carriage adapted to carry in suitable 125 bearings therein the curved printing-surface and suitable inking devices therefor and means for moving the inking devices into and out of operative position, and adapted to move 130 radially inward and outward, guides in the framework of the press upon which the said carriage moves, a polygonal cam-track secured to the drum and revolving therewith

and having each side slightly and continuously curved with the middle of the side slightly nearer the axis of the drum than are the ends of each side, a guide secured to the
5 movable carriage and adapted to engage with the cam-track and to be moved radially inward and outward thereby, whereby the printing-surface prints by continuous rolling contact upon the series of impression-surfaces
10 and is moved radially outward and inward with the movement of the impression-surface so as to keep at all times during the printing operation the same relative contact and pressure between the printing-surface and the im-
15 pression-surfaces.

43. The combination in a lithographic press, of a curved printing-surface, with a series of impression-surfaces connected and supported in a series as the periphery of a polygonal
20 drum, each impression-surface corresponding to the printing-surface and driven positively therewith, suitable driving mechanism therefor, a movable carriage adapted to carry in suitable bearings therein the curved printing-
25 surface and suitable inking and dampening devices therefor, and means for moving the inking and dampening devices into and out

of operative position, and adapted to move radially inward and outward, guides in the framework of the press upon which the said
30 carriage moves, a polygonal cam-track secured to the drum and revolving therewith and having each side slightly and continuously curved with the middle of the side slightly nearer the axis of the drum than are
35 the ends of each side, a guide secured to the movable carriage and adapted to engage with the cam-track and to be moved radially inward and outward thereby, whereby the printing-surface prints by continuous rolling con-
40 tact upon the series of impression-surfaces and is moved radially outward and inward with the movement of the impression-surface so as to keep at all times during the printing operations the same relative contact and pres-
45 sure between the printing-surface and the impression-surfaces.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWARD HETT.

Witnesses:

EDWIN SEGER,

GEO. W. MILLS, Jr.