

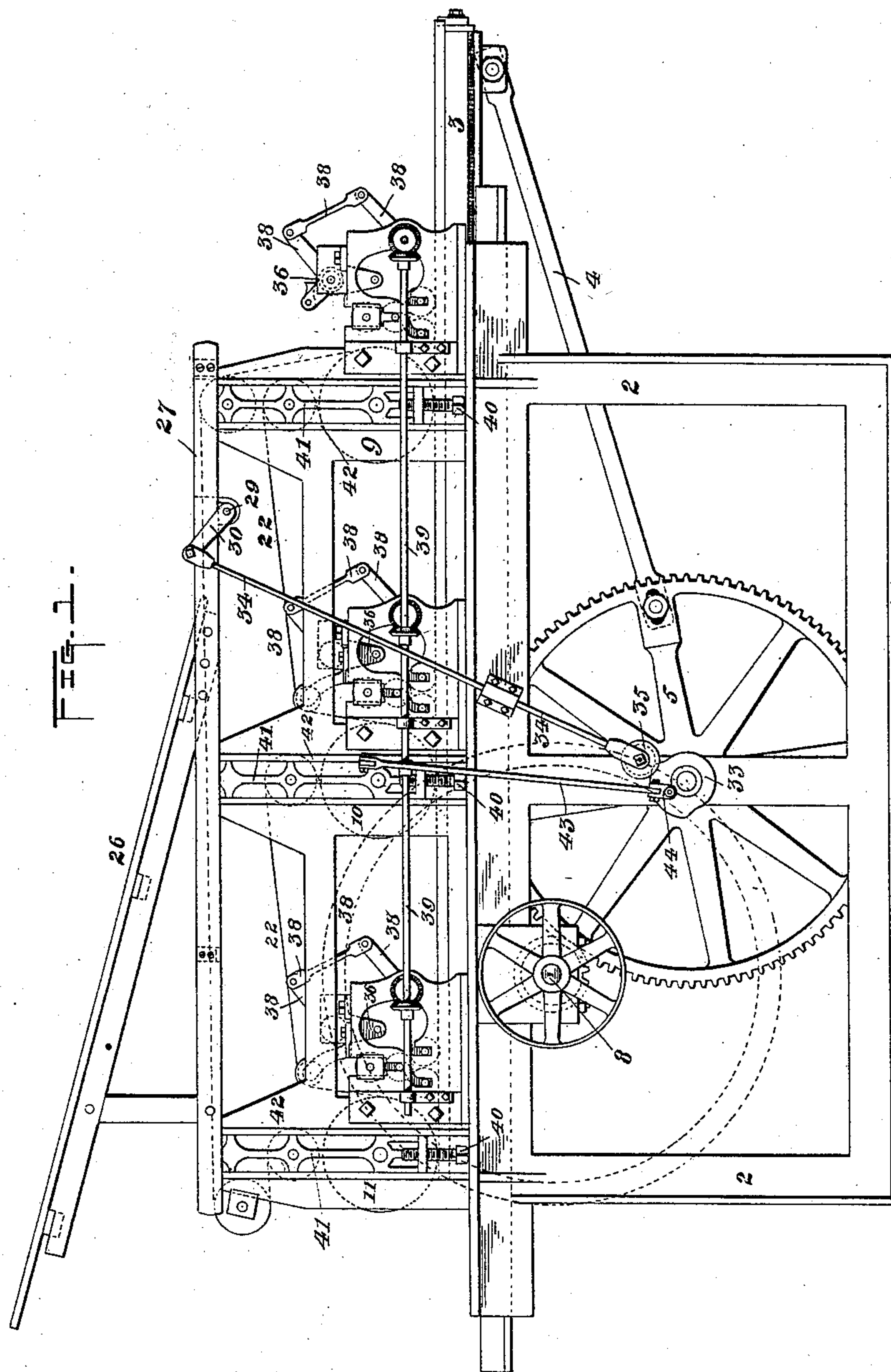
(No Model.)

3 Sheets—Sheet 1.

W. H. FULLER.  
COLOR PRINTING MACHINE.

No. 389,561.

Patented Sept. 18, 1888.



Witnesses

L. G. Conner Jr.  
S. J. Severance.

Inventor

William H. Fuller  
by W. B. Russell & Son  
his Attorneys

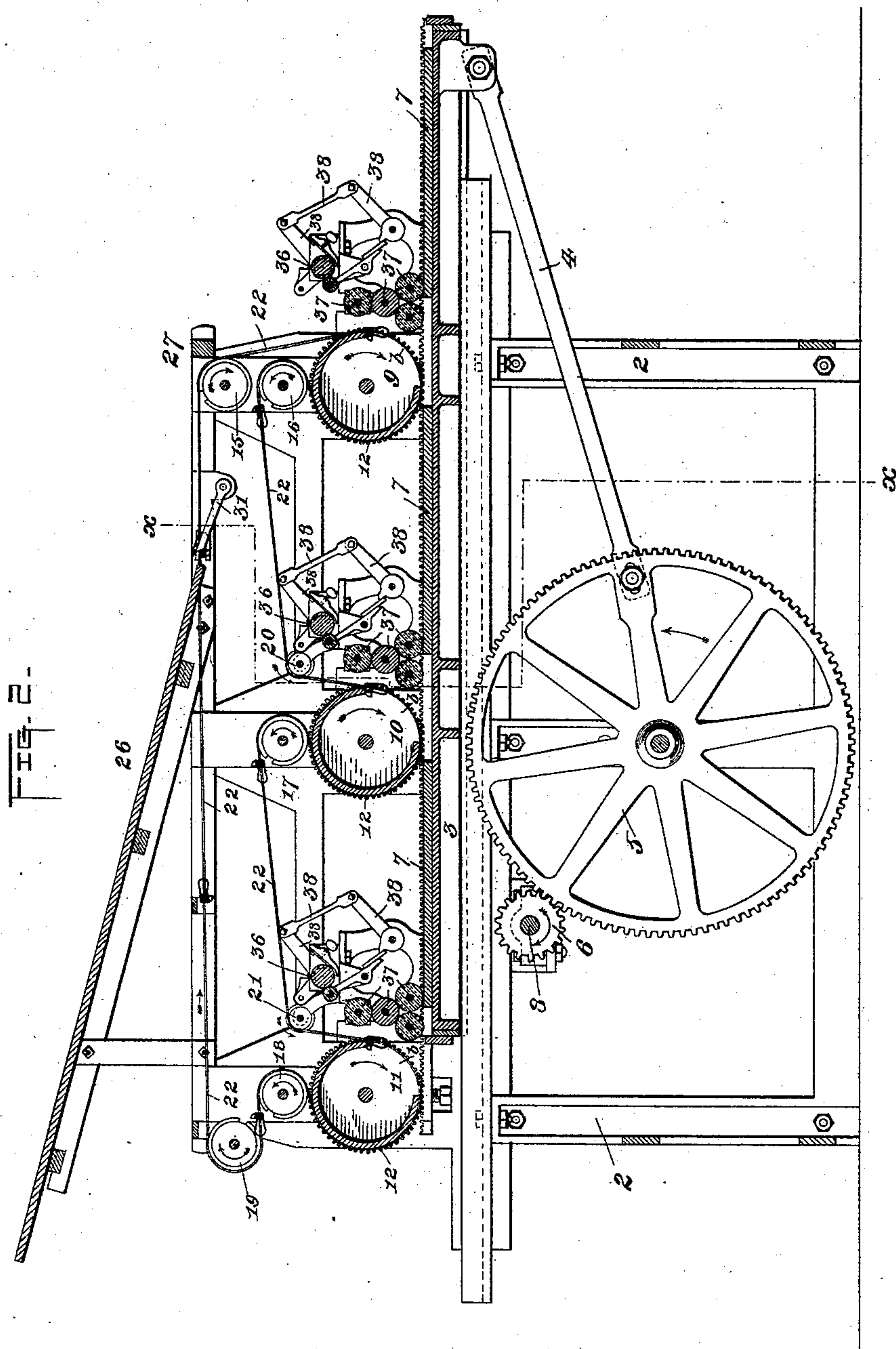
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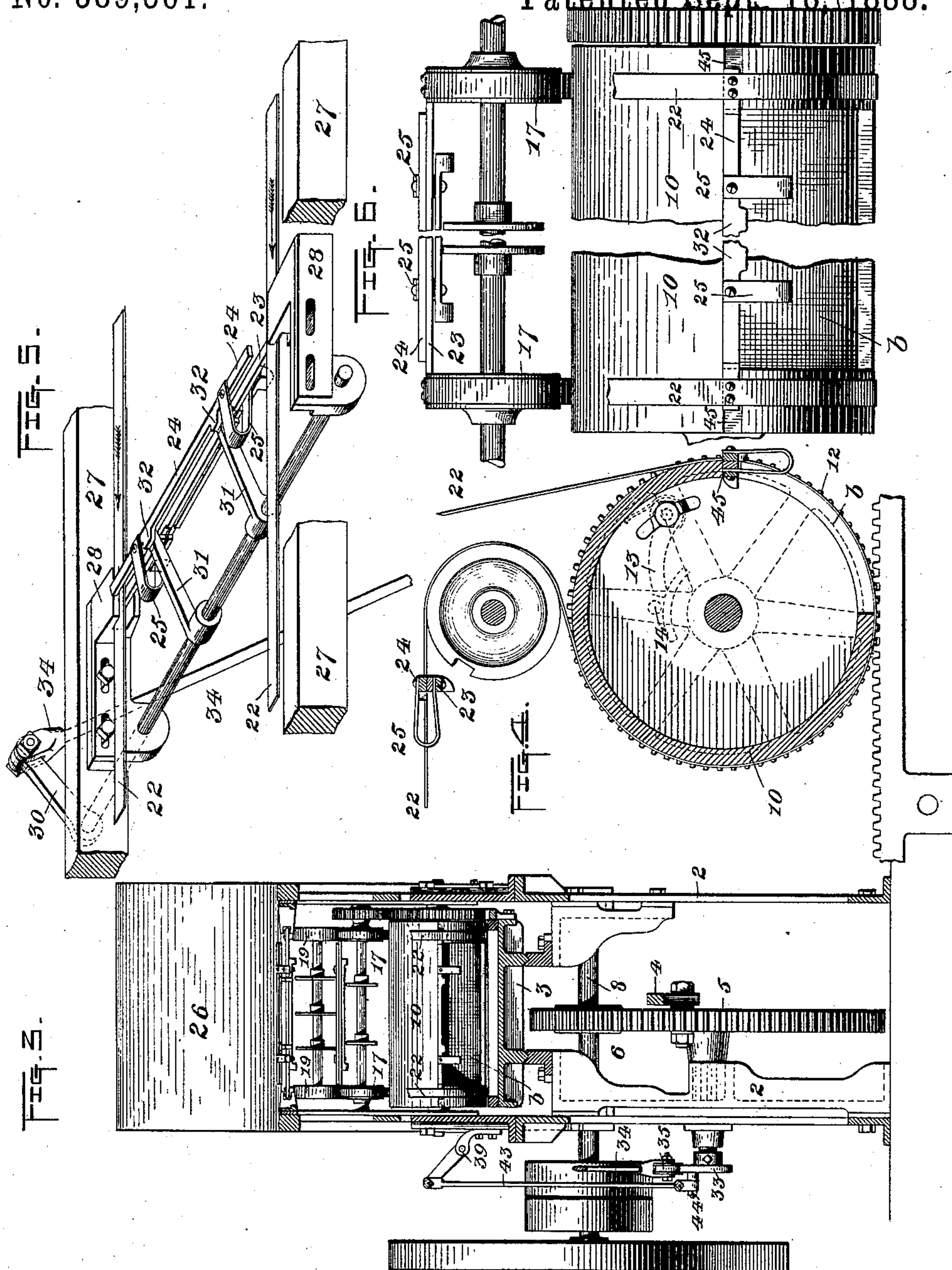
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# UNITED STATES PATENT OFFICE.

WILLIAM H. FULLER, OF PITTSBURG, PENNSYLVANIA.

## COLOR-PRINTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 389,561, dated September 18, 1888.

Application filed September 16, 1887. Serial No. 249,849. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM H. FULLER, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Color-Printing Machines; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to an improvement in chromatic-printing presses of the sort which prints on a sheet of paper at one feeding in inks of two or more colors.

The object of my invention is to produce a cheap, efficient, and simple chromatic-printing press of that class employing reciprocating flat beds, in combination with impression-cylinders and sheet-carrying mechanism, so as to bring the same within the reach of printers having small capital and limited office-room; and to this end the main feature of the invention consists in the combination, with a series of flat beds, impression-cylinders, and sheet-carrying mechanism therefor, of inking mechanism interposed between any two or more of the impression-cylinders of the series, and, secondarily, in particular features of construction and special combinations thereof, all substantially as will hereinafter more fully appear.

I show my invention clearly in the accompanying drawings, wherein—

Figure 1 is a side view of my improved machine. Fig. 2 is a vertical longitudinal section through the center thereof. Fig. 3 is an irregular vertical cross section on the line  $x x$  of Fig. 2. Fig. 4 is an enlarged vertical cross-section through one of the impression-cylinders, showing also the rack by which it is driven, part of one of the endless bands with its grippers, and one of the idler-wheels. Fig. 5 is an enlarged perspective view of parts of the bands shown in connection with the mechanism which I employ for opening the grippers for the purpose of grasping and releasing the paper. Fig. 6 is a front view of one of the impression-cylinders, showing also some of the idler-wheels, and illustrating the course of the endless bands.

Like symbols of reference indicate like parts in each.

In the machine illustrated in the several figures of the drawings, 2 is the frame of the machine, and 3 is the horizontal flat bed, which is

arranged to have a longitudinally-reciprocating motion similar to that of the bed in the ordinary cylinder-press. The bed is thus driven by a pitman, 4, connecting the bed with a crank-wrist on a cog-wheel, 5, which is suitably driven by power transmitted through a pinion-wheel, 6, on the power-shaft 8, or otherwise, Figs. 2 and 3. The bed 3 is divided into spaces corresponding to the number of the colors which the machine is adapted to print.

The machine shown in the drawings is arranged to be capable of printing three colors, and the bed is therefore divided into three spaces or compartments, in each of which is put the proper type-form, lithograph-stone, and stereotype or electrotpe plates 7. Above the moving bed of the machine and journaled transversely thereto are the impression-cylinders 9, 10, and 11, Fig. 2, corresponding in number with the number of type-forms or plates on the bed. These cylinders are placed at regular distances apart, corresponding to their diameter and the length of the type-forms or plates which the machine is adapted to accommodate. The cylinders have suitable gear-wheels, 12, loosely journaled on their axes beside them, which mesh with a toothed rack on the side of the bed 3, and therefore as the bed moves back and forth, as before explained, it correspondingly rotates these gear-wheels, and by means of a pawl arrangement, shortly to be described, the gear-wheels rotate the impression-cylinders during the forward motion of the bed, but do not move them during its opposite and backward motion. This arrangement of mechanism is shown in Fig. 4.

Each impression-cylinder has on the inside, next to the gear-wheel, a pivoted spring-actuated pawl, 13, and the gear-wheel 12 has a corresponding stud or boss, 14, which, when the gear-wheel is turning in response to the forward motion of the rack and bed, engages the pawl and through it rotates the impression-cylinder, but when the gear-wheel is turning in the opposite direction, in response to the backward motion of the rack and bed, the stud or boss 14 passes freely under the pawl and does not turn the impression-cylinder. The rack and its driving mechanism are so arranged and timed relatively to the gear-wheels 12 that each forward motion of the bed and rack shall give just one complete revolution to each cylinder. When the cylinders are re-



volving during the forward motion of the bed and rack, their surfaces are in contact, or substantially so, with the forms or plates on the flat bed, but during the periods of rest of the cylinders, while the bed is moving backward, the cylinders are prevented from coming into contact therewith by a very simple device, which I show in Figs. 2 and 4. The cylinders are made hollow, and those portions of their peripheries which are opposite to the bed during the periods of rest of the cylinders are cut away, as at *b*, so that they shall not touch the bed. The idler-wheels and the impression-cylinders are upheld by and have their bearings in frames 41, which are vertically movable in slideways 42, and by means of set-screws 40, which bear on the bottoms of the frames, the cylinders may be adjusted vertically, so as to make a heavy or light impression, as desired.

Above the impression cylinders are the several idler-wheels 15, 16, 17, 18, 19, 20, and 21, Figs. 1 and 2, suitably disposed and journaled for the passage of the endless bands or chains 22, which carry the grippers. As shown in the different figures of the drawings, there are two of these bands, and their course is as follows: over the wheel 15, around cylinder 9, wheels 16 and 20, cylinder 10, wheels 17 and 21, cylinder 11, and wheels 18 and 19. Each of the grippers consists of two cross bars or pieces, 23 and 24, which extend across between the bands, one of the bars, 23, being fixed to the band, while the other bar, 24, is held in contact with its companion by means of springs 25. (See the figures on the third sheet of the drawings.) There are a suitable number of the grippers depending on the length of the endless bands or chains 23.

I shall now describe the mechanism by which the paper is fed to the machine and seized by the grippers.

26 is the usual inclined feeding-table, on which the paper sheets are laid and fed to the machine. At the foot of the table is an arrangement of mechanism which engages the grippers after they have come opposite thereto and during the periods of rest of the impression-cylinders, and opens them so as to cause the discharge of the sheets of paper which have already been carried through the machine, and to receive fresh sheets delivered from the feeding-table. This arrangement of mechanism is shown in Fig. 5.

The horizontal top rails, 27, of the machine have adjustably fixed to them forked guides 28, between which the bands 22 pass. The lower bars, 23, of the grippers extend from one band to the other, and therefore pass through the guides 28, but the other bars, 24, are shorter and do not pass between these guides. The guides 28 are arranged at the foot of the feeding-table 26, and just in advance of them there is a rock-shaft, 29, having at its outer end a lever, 30, and provided also with fingers 31, which are adapted to rise when the shaft 29 is rocked, and by engaging projections 32 on the upper

cross-bar, 24, to raise this cross-bar, while the lower cross-bar is held by the guides 28. The shaft 29 is thus actuated by means of a cam, 33, on the axis of the wheel 5, which bears upon a friction-roller, 35, at the end of a connecting-rod, 34, joined to the end of the lever 30, Figs. 1 and 5. The parts are so timed that one of the grippers shall come to and stop in the guides 28 at each revolution of the wheel 5, and shall remain in the guides during the period of rest of the impression cylinders and gripper-bands, and the cam 33 is so set that it shall move the rod 34 to open the grippers, as before described, when the grippers are in the guides. When the grippers are open, the sheet of paper which was formerly held by them drops out from the grippers onto a table immediately below, and a fresh sheet is fed between the grippers from the feeding-table. Before the impression-cylinders start again the cam allows the fingers 31 to drop, so as to release the upper gripper-bar, and then the bars 23 and 24 spring together and hold the newly-introduced sheet.

The forms or plates 7 are supplied with ink by means of any suitable inking mechanism. The devices which I show for the purpose in Figs. 1 and 2 are of the well-known form. In front of each cylinder 9, 10, and 11 is an ink-fountain, 36, and below it are inking-rollers 37, the lowest of which are adapted to bear upon the surfaces of the plate or form 7. The gates or valves of the fountains 36 are operated by levers 38, which receive their power from a horizontal rock-shaft, 39, connecting-rod 43, and crank 44.

It will be noted that the arrangement of an inking mechanism in front of each impression-cylinder results in the interposition of inking mechanism between every two impression-cylinders of the series, and while the particular construction of the inking mechanism is immaterial the arrangement specified is a material matter.

I shall now indicate generally the operation of the machine, referring principally to Fig. 2. Each of the three inking-fountains is supplied with ink of a different color, and as the bed 3 moves back and forth each form or plate 7, coming into contact with only one set of the inking-rollers, receives only that one color of ink, as will be readily understood. Suppose one of the grippers to be at the foot of the feeding-table 26. A sheet of paper is attached to the grippers, as before described, and when the machine is set in motion the rotation of the impression-cylinders, drawing with them the endless bands 22, carries the paper over the idler-wheels 15 and around the impression-cylinder 9. The grippers are so spaced on the bands 22 that when they reach the cylinders they shall be engaged by the slot 45 at the rear of the cut-away portions *b*, as shown in Figs. 2 and 4, so that the cylinders draw the bands forward with a positive movement and the several grippers are thus kept constantly at uniform distances from each



other and prevented from getting out of register. As before explained, the cylinders only revolve during the forward motion of the bed, and when it is thus carried forward the paper, which is held by the grippers, is subjected by the cylinder to contact with the first form or plate 7, and is thereby printed with an impression in ink of the first color. The complete forward motion of the bed carries the paper around the cylinder and past the first type-form or plate and brings the cut-away portion of the cylinder opposite to the bed. The cylinder then stops, and as the bed recedes the cylinders, the gripper-bands, and the paper remain motionless. During this period of rest the next set of grippers, which have stopped between the guides 28 at the foot of the feeding-table, is opened and another sheet of paper is fed thereto. Then the successive periods of motion of the impression-cylinders carry the paper in succession around the cylinders 10 and 11 and cause them to be imprinted by the second and third type-forms or plates with the different colors supplied thereto by the inking-rollers. Each gripper as it halts at the foot of the feeding-table is supplied with a sheet of paper, and when the machine is fairly in motion, all the grippers being supplied with paper, each single forward motion of the bed and consequent revolution of the impression-cylinder carries one sheet of paper around each cylinder, imprinting it with the proper color of ink, and delivers one sheet completely printed with the three colors at the foot of the feeding-table. In this way the operation of the machine is very rapid, and by reason of the positive motion of the gripper-bands, before explained, the sheets cannot get out of register, and perfect impressions are the result.

Without at all altering the principle of the machine, it may be adapted to print four or any additional number of colors at one feeding by a simple increase of the number of impression-cylinders and of the length of the bed, so as to adapt it to accommodate the necessary number of type-forms or plates, and so, if desired, the machine may be limited in its capacity to printing only two colors by omitting one of the impression-cylinders. I am enabled thus to print three or more colors by reason of the use of the endless chains or bands 22, which enable the impression-cylinders to be set far enough apart to accommodate the inking mechanism, which is interposed between the several cylinders. The parts may be greatly varied in their mechanical construction and arrangement without departing from the principles of my invention—*e. g.*, instead of making the endless bands 22 of the flexible strips of steel, chains or belts may be used. It is possible, also, to arrange the flat bed 3 in a vertical instead of a horizontal position, and many other changes will suggest themselves to the skilled mechanic. When I speak of a flat bed for the type-forms or plates, I do not mean that the bed shall necessarily be in a sin-

gle horizontal plane, but only that the bed shall be adapted to hold flat type-forms or plates; and therefore, instead of having the bed in a single piece, the forms or plates may be set at different levels, the only necessary change in the other parts of the machine being a corresponding alteration in level of the impression-cylinders and their driving mechanism.

The machine which I have shown in the drawings is adapted principally for printing with flat type-forms and stereotype or electrotype plates, as this class of machine is used more extensively than any other; but it may be adapted, without substantial change, for use as a lithographic press, in the construction of which the different color-compartments on the bed for the stones should be made to rise and fall, so as to be accommodated for stones of different thicknesses, and should be fitted with wetting appliances of the kind now in common use.

In the drawings and in the foregoing specification I have shown and described an operative printing-machine which is complete in itself; but, for the sake of clearness, I have laid particular stress only on those parts which are of my invention, and desire it to be understood that many accessory appliances which are commonly used in the best presses, and which will suggest themselves to the skilled printer, can be applied to the machine without substantial change in any of the parts.

I claim—

1. In a color-printing machine, the combination of a flat bed, a series of impression-cylinders, interposed inking mechanism, and sheet-carriers adapted to transfer the sheets from cylinder to cylinder, substantially as and for the purposes specified.

2. In a color-printing machine, the combination of a series of flat beds, a series of impression-cylinders, interposed inking mechanism, and gripper-bands which convey the sheets from cylinder to cylinder, substantially as and for the purposes specified.

3. In a color-printing machine for printing two or more colors at a single feeding, the combination, with a flat bed carrying plates, forms, &c., of two or more rotary impression-cylinders, endless gripper-bands passing around the cylinders, said cylinders having grooves or shoulders which engage projections on the bands and impart a positive motion thereto, substantially as and for the purposes described.

4. In the feeding mechanism of a printing-press, the combination, with the endless bands, of pairs of gripper-bars moving therewith, guides for holding one of the bars, and a lever which separates the bars, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 31st day of August, A. D. 1887.

WILLIAM H. FULLER.

Witnesses:

W. B. CORWIN,

THOMAS W. BAKEWELL.