

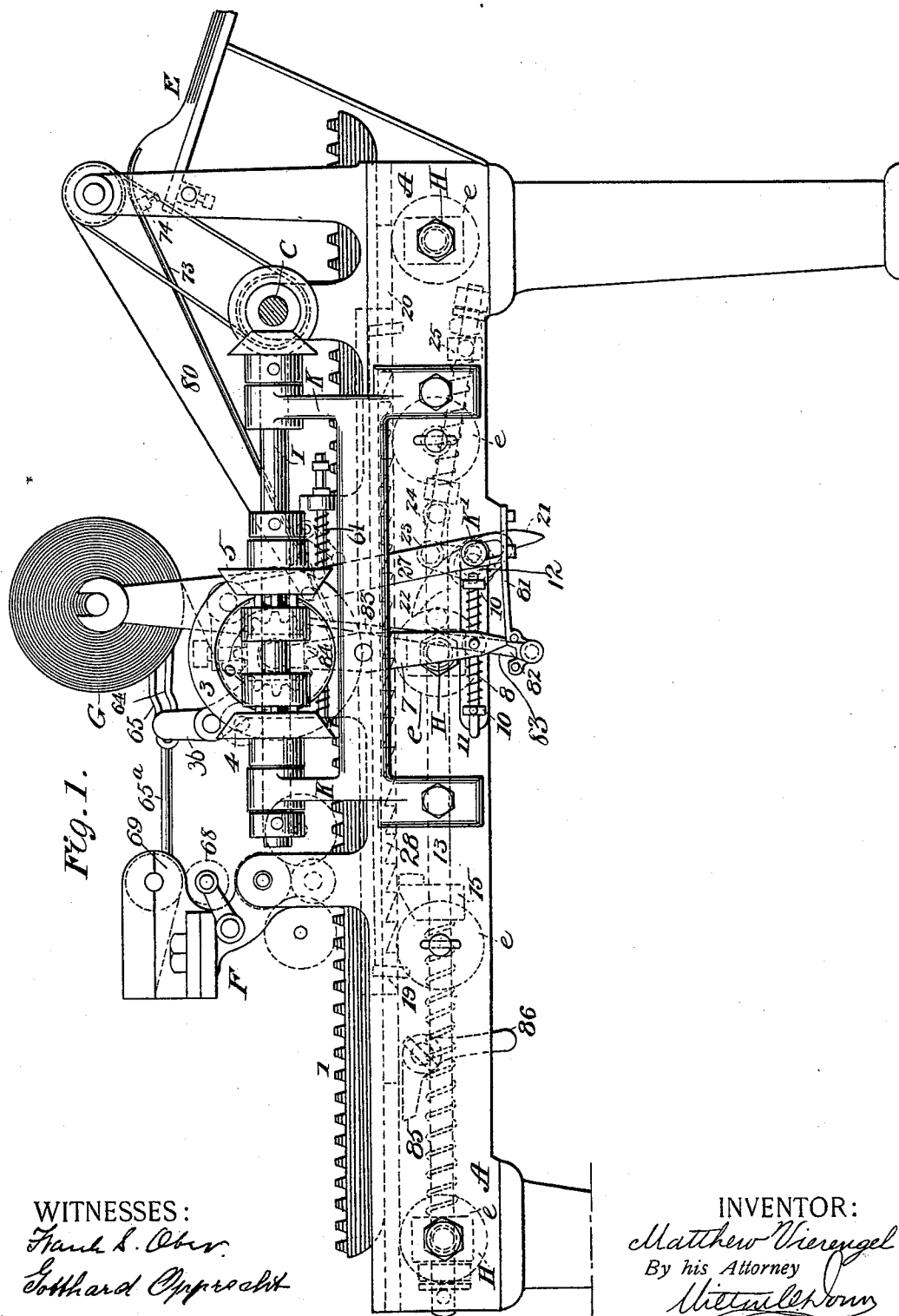
(No Model.)

6 Sheets—Sheet 1.

M. VIERENGEL.
PRINTING MACHINE.

No. 582,888.

Patented May 18, 1897.



WITNESSES:

Frank L. Ober.

Lothard Opprecht

INVENTOR:

Matthew Vierengel
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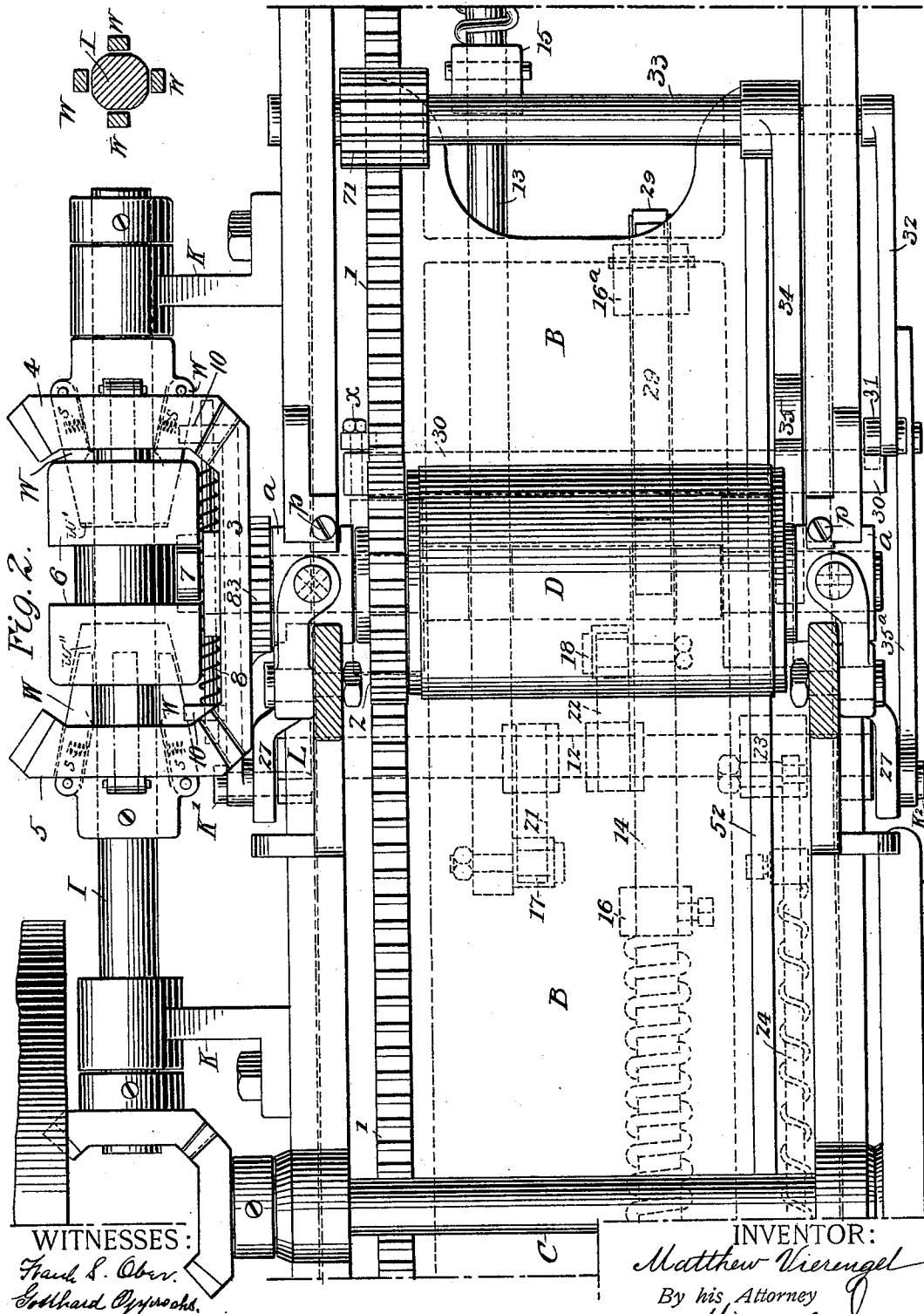
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6 Sheets—Sheet 2.

M. VIERENGEL.
PRINTING MACHINE.

No. 582,888.

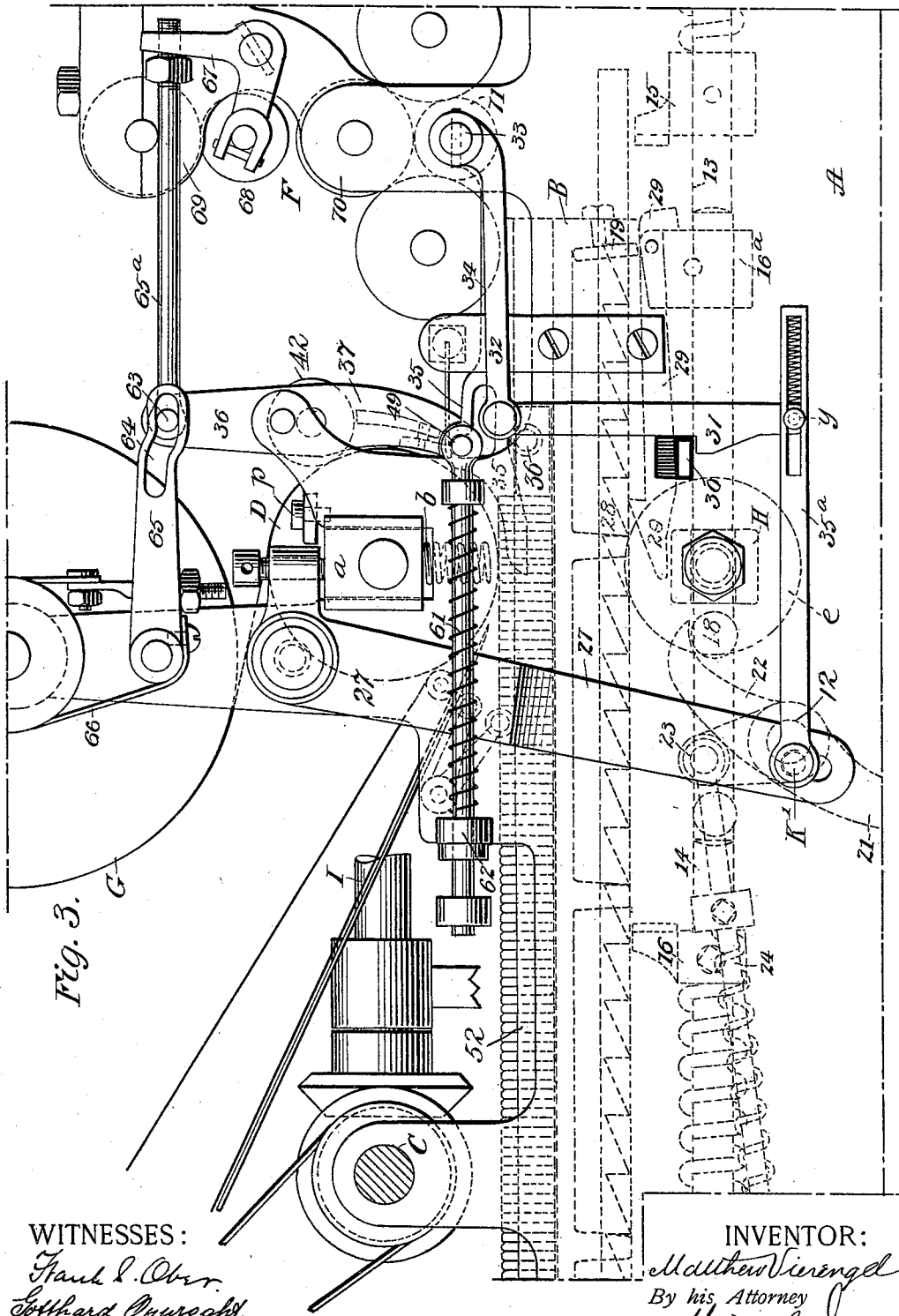
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M. VIERENGEL.
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No. 582,888.

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(No Model.)

6 Sheets—Sheet 4.

M. VIERENGEL.
PRINTING MACHINE.

No. 582,888.

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Fig. 4.

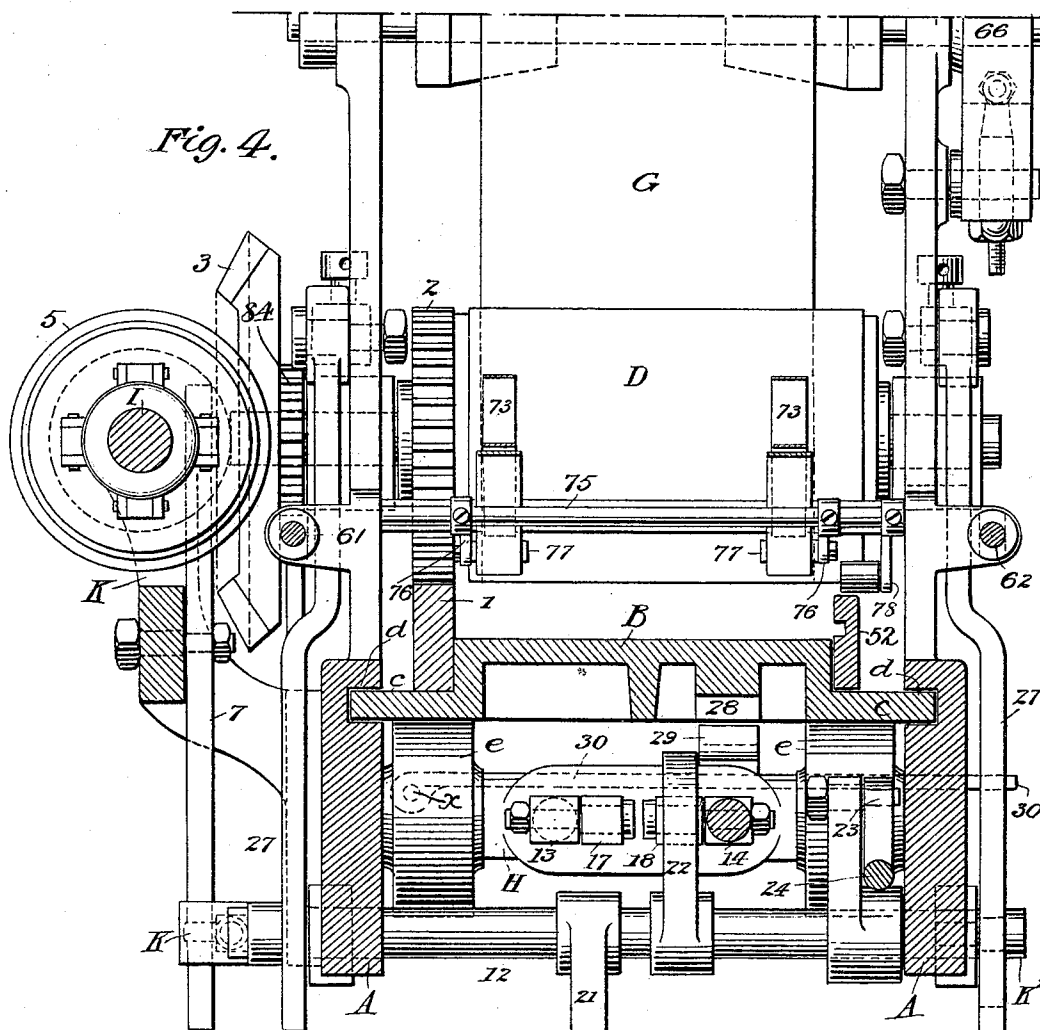
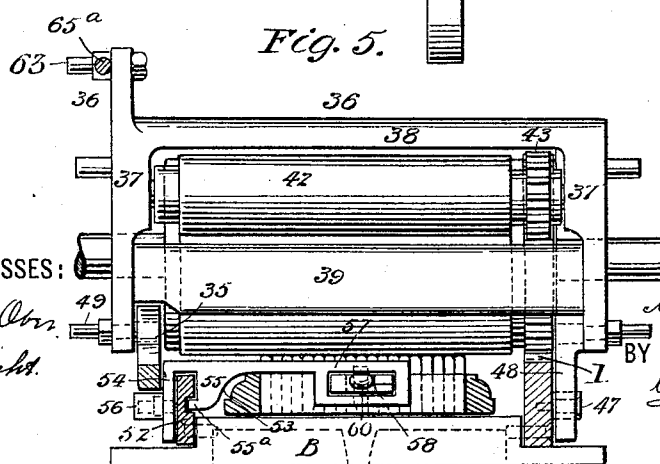


Fig. 5.



WITNESSES:

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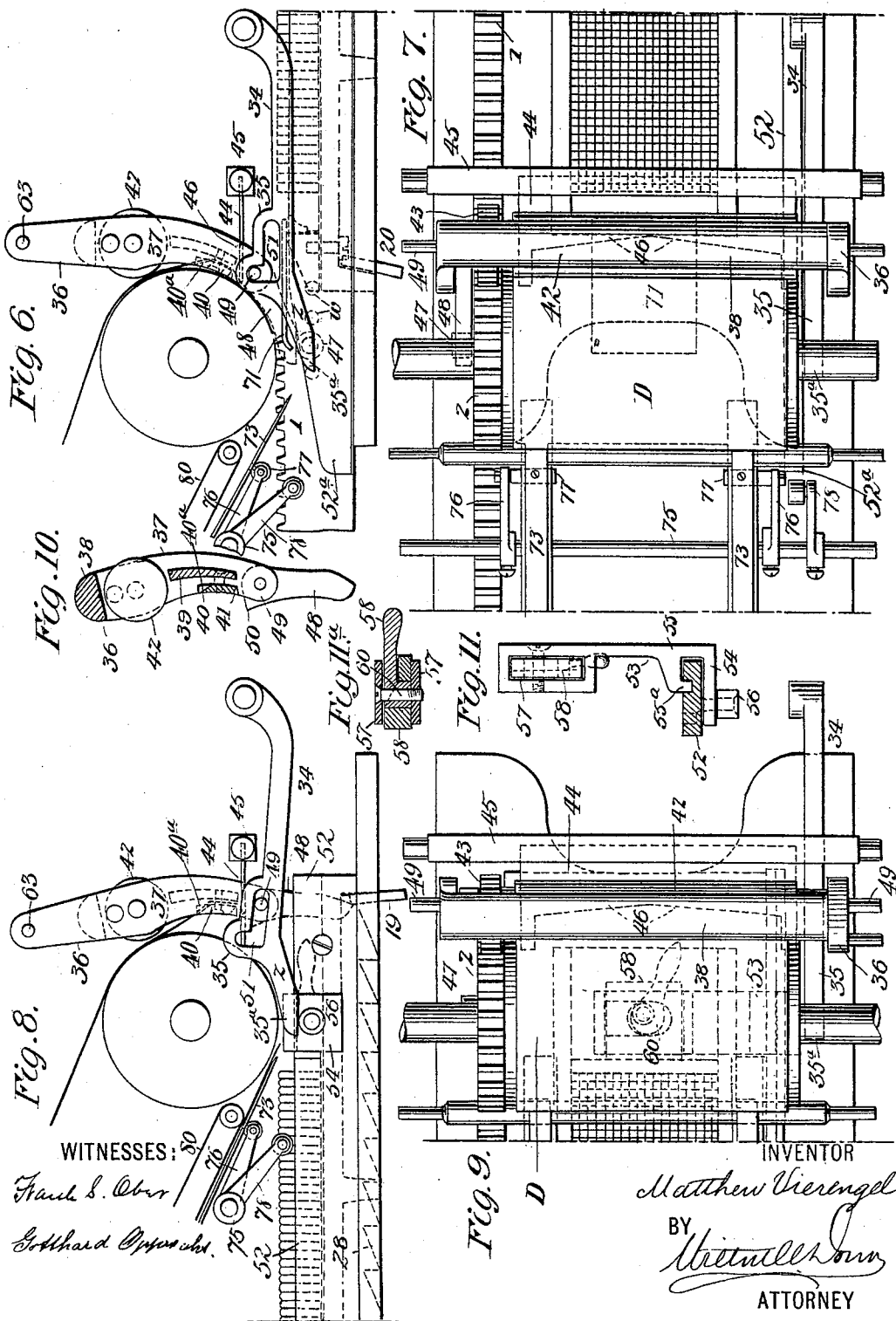
BY *Wretulles*

ATTORNEY

M. VIERENGEL.
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(No Model.)

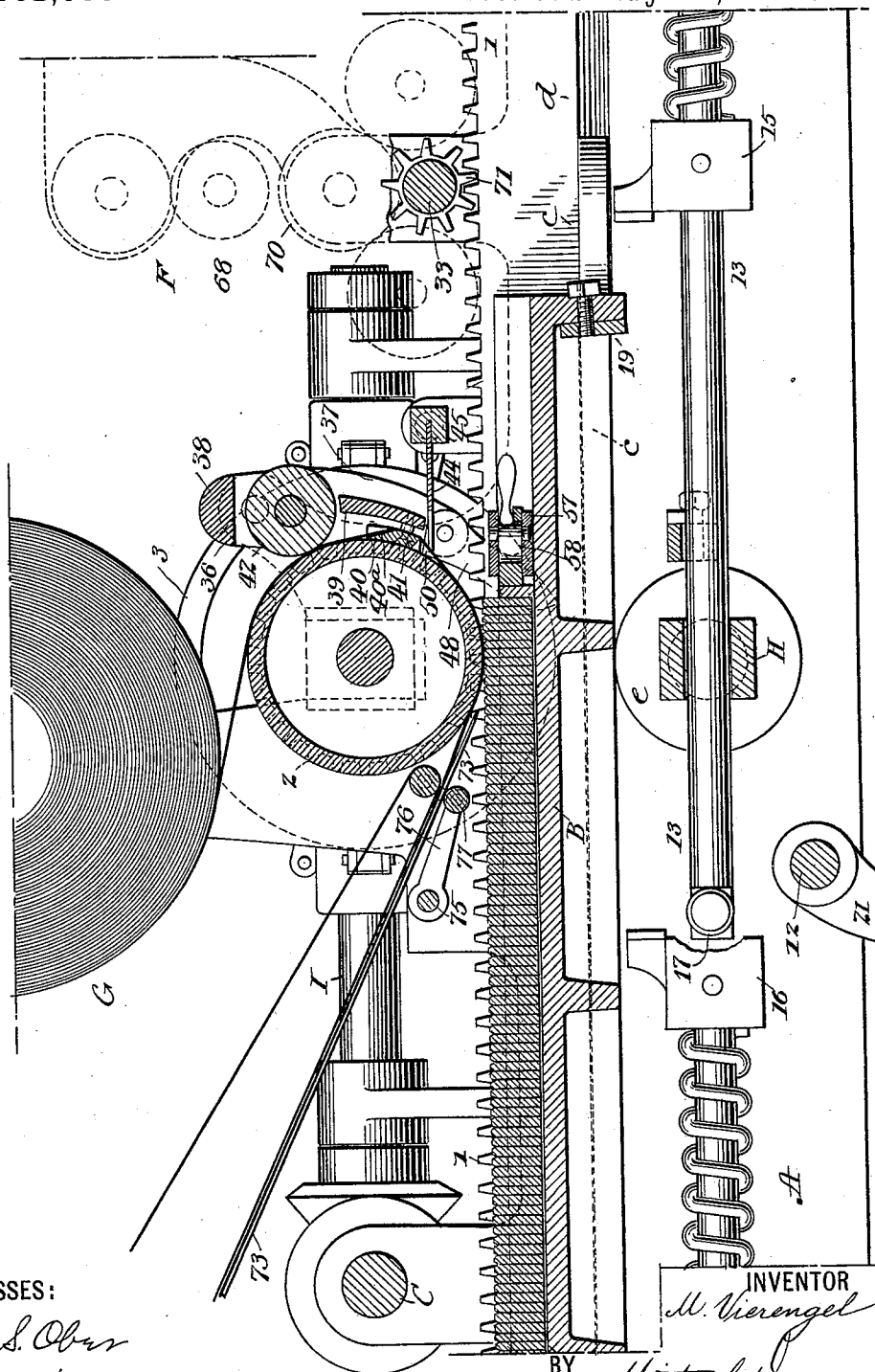
6 Sheets—Sheet 6.

M. VIERENGEL.
PRINTING MACHINE.

No. 582,888.

Patented May 18, 1897.

Fig. 12.



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UNITED STATES PATENT OFFICE.

MATTHEW VIERENGEL, OF BROOKLYN, NEW YORK.

PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 582,888, dated May 18, 1897.

Application filed May 29, 1896. Serial No. 593,680. (No model.)

To all whom it may concern:

Be it known that I, MATTHEW VIERENGEL, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Printing-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates more particularly to printing-machines designed for taking proof-impressions, but it also relates to improvements in the operative parts of the mechanism which are applicable to printing-machines for other special purposes and also for general use.

Specifically the invention relates to the regulation and control of the printing movement of the form-carrier, the operation of the feeding mechanism, the action of the cut-off, the adjustment of the tension, the inking of the form, and the delivery of the printed sheet.

The object of my invention is to make the length of the matter to be printed automatically determinative, first, of the distance the form-carrier is required to move to take an impression from the form; second, of the duration of the feeding of the paper; third, of the degree of tension applied to the paper; fourth, of the setting in action of the cutting-off mechanism to sever the printed sheet from the roll, and, fifth, of the quantity of ink taken from the fountain by the drop-roll to supply the form-rolls.

The invention consists in a contrivance for initiating the action of the devices which control and regulate the several parts and movements above referred to, which coacts with the form-carrier, and the position of which, whence it initiates the action of the said devices, is determined by a form-lock that is adapted to be adjusted to lock forms of any length within the limits of the carrier.

It further consists in means and appliances for transmitting the initiatory action of the said contrivance to the regulating and controlling devices and means and mechanism which coact with the form-carrier to adjust the feeding mechanism to feed the paper, to

relax the tension, and to carry the printed sheet into position to be taken by the delivery-tapes and carried to the delivery-table.

In the accompanying drawings, Figure 1 represents a side elevation of my improved printing-machine, the view being taken from the left-hand side of the machine where the power is transmitted to the cylinder; Fig. 2, a sectional top plan of the machine, showing all of the machine above the bed and to the top of the impression-cylinder except the extreme ends; Fig. 3, a sectional side elevation of the machine, the view being taken from the right hand or the side opposite to that illustrated by Fig. 1. Fig. 4 is a sectional rear end elevation of the machine. Fig. 5 is a rear elevation of the feed-roller and the swinging frame that carries the feed-roller and the movable cutting edge, also showing the form-lock and the contrivance by which the bed-stopping mechanism is set in operation. Fig. 6 is a side elevation, and Fig. 7 a plan, of the feeding, cutting-off, and delivery mechanism, together with the device which is engaged by the contrivance that initiates the operation of the mechanism which controls the movements of the several parts of the machine, these several parts being represented in the position they occupy at the moment the front end of the bed approaches the impression-cylinder. Fig. 8 is a side elevation, and Fig. 9 a plan, of the mechanism and devices that are shown in the previous figures, but representing them in the position they occupy when the impression is completed, after the movement of the devices that set in motion the controlling devices has been initiated. Fig. 10 is a detached sectional view of a part of the paper feeding and cutting-off devices with the frame in which they are mounted and the swinging arm by which the bed is caused to swing the frame toward the cylinder. Fig. 11 is a representation of the form-lock detached from the bed. Fig. 11^a represents a cross-section of the form-lock. Fig. 12 represents a longitudinal vertical section of the printing-machine, showing the buffers and reversing mechanism in full lines and the cutting and feeding mechanism in section.

Referring to the drawings, A A designate the side frames of the machine; B, the form-bed; C, the driving-shaft; D, the impression-

cylinder, the shaft of which is journaled in vertically-sliding boxes *a a*, held in slotted upward extensions of the side frames and resting on lifting-springs, (only one, *b*, Fig. 3, being shown;) E, the delivery-table; F, the inking apparatus; G, the paper roll.

The bed B is supported by its laterally-extended flanges *c c*, sliding in longitudinal grooves *d d* in the side frames, and by rollers *ee*, loosely mounted on transverse shafts, and braces H, that connect the side frames.

I is the shaft, that transmits the power of the driving-shaft to the cylinder and which is supported in bearings held in the upwardly-projected members of the bracket K, bolted to the side frame on the left-hand side of the machine.

The bed-motion.—The bed carries a rack 1, which is engaged by the spur-wheel 2 in the cylinder, whereby a reciprocating motion is given to the bed. The cylinder-shaft also carries a beveled gear-wheel 3 outside the right-hand frame which engages the oppositely-placed beveled pinions 4 5, mounted loosely on the shaft I. On shaft I between the pinions is a movable clutch member 6, which makes a clutch connection with either one of the pinions 4 5, and thus causes the clutched pinion to partake of the motion of the shaft and thereby drive the cylinder. The clutch member 6 is controlled by a lever 7, fulcrumed on a stud in the bracket K and pivotally attached at its lower end to a pin inserted in a connecting-rod 8, supported in projections 10 10 of a bar 11, which at its rear end connects with a crank-pin K' on a shaft 12. Spiral springs are placed on the rod between the pin to which the lever is pivoted and the projections 10 10, so that the movement of the crank-pin K' and bar 11 retracts one or the other of the springs. The shaft 12 is mounted transversely in suitable bearings, and it is given a rocking motion equal, say, to about one-half of an entire revolution by means of the following mechanism: Between the side frames under the bed and at both ends of the machine are oppositely-positioned spring-buffers 13 14, (the former at the front end of the machine and the latter at the rear end.) The buffer-bars are passed through suitable openings in the cross-braces II, and the respective buffer-springs are held between the end braces II and collars 15 16 on the bars. The buffer-bars also carry at their inner ends rollers 17 18 on studs passed through the bars. Lugs 19 20 are fixed to the under side of the bed in alinement with the collars 15 16, these collars serving as buffer-disks to receive the impact of the lugs and by the compression of the buffer-springs arrest the motion of the bed when it makes an entire forward movement, but if it is to be arrested at the end of an impression other mechanism is brought into action, which will be referred to presently.

On the shaft 12, in vertical alinement with the rollers 17 18, are oppositely curved and positioned fingers 21 22, connected therewith

by means of suitable collars. A crank-pin 23 on shaft 12 is connected with a vibrating spring-bar 24, the opposite end of which is pivoted to the side frame in a bracket 25, so that the bar can vibrate freely in a vertical direction. By the sequent action of the fingers and vibrating spring-bar 24 the shaft 12 is rocked about one-half a revolution. Thus when the bed, driven by the cylinder, approaches the front or positive reversing-point its motion is gradually arrested by the lug 20 coming in contact with the buffer-disk 15 and compressing the buffer-spring. Just before the bed arrives at its dead-center the roller 17 bears against the finger 21 and turns the same with the shaft 12 about a quarter-revolution, thereby compressing the spring of the vibrating bar 24 until the crank-pin 23 passes its dead-point, whereupon the spring-bar reacts, and by means of the crank turns the shaft 12 another quarter-revolution, thereby turning the finger 21 downward and the finger 22 upward, as shown in Fig. 1, in the path of the roller 18 when the bed is moving in the opposite direction. By the half-revolution which the shaft 12 gives to the crank-pin K' the connecting-rod 8 is drawn back, and the lever 7 thereby caused to shift the movable clutch member 6 preparatory to engaging the pinion 4 by which the cylinder is revolved in the direction to make the impression, but the engagement is not made directly, as shown in Fig. 1, but after the bed has been started on its return movement by recoil of the buffer-spring, and the expansion of the buffer springs, in order to avoid the jar which would be caused by the immediate reversal of the cylinder. The means by which the lever is controlled for this purpose will be described hereinafter, the lever being represented in Fig. 1 as shifted the entire distance to put the movable clutch member into engagement with the pinion 4 to facilitate understanding the further description of the bed-movement.

To arrest the bed when printing at any desired point, it is provided on its under side with longitudinal ratchet 28, which is in alinement with the buffer 14 and the collar 16 thereon, which has its upper side formed into jaws in which is pivoted an upturned hook 29, whose free end rests, when idle, on the center brace II. This hook when lifted engages the teeth of the rack 28, and when so engaged, being drawn along with the bed, it compresses the buffer-spring and thereby arrests the motion of the bed when an impression is completed at any point determined by the length of the matter in the form. The hook is lifted by a transverse bar 30, located under the hook and which has one end pivoted at *x* to a part of the side frame, and the opposite end passed through an opening in the side frame in position to be engaged by a perpendicular hook 31, suspended from the end of an arm 32, which is rigidly connected with the end of a transverse shaft 33. Inside of the frame is another arm 34, which is fixed

at one end to the shaft 33 and at the free end terminates with a trip 35, which by means of a contrivance on the bed is caused to give the initial movement to the mechanism that stops the action of the operative parts of the machine, as will be presently described. The lifting of the hook 29 into engagement with the rack 28 is accomplished by the perpendicular hook 31 simultaneously with the completion of an impression from the form by the action on the trip 35, which is caused to act by a contrivance on the bed whose position is determined by the form-lock.

The hook 31 is connected at its lower end by means of a pin y with a slot in the end of a bar 35^a, the opposite end of said bar being mounted on the crank K². The pin y bears against a spring placed in the said slot, as shown. When the crank is in the position shown in Fig. 3, as is the case when an impression is being made, the hook 31 is held by the bar 35^a in position to engage the bar 30 and lift it when an impression is completed to cause it to raise the hook 29 into position to engage and stop the bed; but when the crank K² is in the opposite position from that shown in Fig. 3—that is, its position at the beginning of the return movement of the bed—the bar 35^a moves back and carries the hook 31 from under the bar 30, which is thereby permitted to drop, and thus allow the pawl or hook 29 to disengage itself from the bed. The hook 31 remains in its upraised position as the trip 35, which is connected with the same shaft 33 as the arm 32, to which the hook 31 is suspended, is held up by the end of the rod 49, which at this stage is in the horizontal part of the slot 51, as shown in Fig. 8. Now when the bed begins its backward motion to make another impression the trip 35, as hereinafter explained, drops, and, the hook 31 being thereby carried downward, the spring in the slot in the rod 35^a yields sufficient to permit the hook 31 to swing back far enough to pass the bar 30 and then forces it under the said bar and holds it in the position it occupies in Fig. 3.

The cylinder-movement.—The shaft 12 carries on the end opposite crank-pin K' a similar crank-pin K². These crank-pins engage the slotted ends of the long arms of the bell-crank levers 27, which are fulcrumed on studs projecting from upward extensions of the side frames and whose short arms extend over the top of the cylinder-boxes and are fitted with adjusting-screws which bear against the boxes. The springs $b\ b$ bear up against the cylinder-boxes, and thus raise the cylinder clear of the bed when returning after an impression has been made, the turning of the shaft 12 to shift the clutch member also causing the bell-crank lever 27 to lift the adjusting-screws and thereby permit cylinder to be raised by the springs; but when the shaft 12 is oscillated on the opposite direction to cause the cylinder to reverse and make an impression the cranks K' K², being simulta-

neously moved, cause the levers 27 27 to press the cylinder down and bear on the form.

The paper feeding and cut-off mechanism.— In front of the cylinder is a swinging frame 36, supported on pivots in arms projecting from the side frames. This swinging frame is preferably a single casting composed of side members 37 37, which are curved approximately to parallelism with the face of the cylinder, and transverse members 38 39, the latter a concave plate in front of which is a knife-plate 40, fastened at the ends to the concave plate by screws in position to lie close to the face of the cylinder when the frame is in the feeding position. At the bottom of this plate 40 is a knife-edge 41, turned toward the front of the machine. Between the side members, above the concave plate, is the paper-feeding roller 42, mounted on a shaft which is journaled in the said side members and one end of which carries a toothed wheel 43, which is in gear with the spur-wheel 2 on the cylinder, by which the feed-roller is rotated. A fixed knife-plate 44 is fastened to a transverse bar 45, supported by the side frames just forward of the swinging frame, and the knife-edge 46, which is concave, as indicated by the dotted lines in Fig. 9, projects between the sides of the swinging frame just below the plane of the movable knife-edge 41, and when the frame is moved or swung away from the impression-cylinder the edge 41 shears across the concave edge 46, as indicated in Fig. 7. The swinging frame is moved toward the cylinder by the bed when making its printing movement. For this purpose the bed-rack carries on one side a roller 47, mounted on a stud projecting from the side of the rack, and the swinging frame carries on the same side an arm 48, which is hung on one end of a rod or stud 49. This arm is in the path of the roller 47, which, being near the forward end of the bed when making its printing movement and ahead of the form, it passes under the arm, the under edge of which is inclined, and by lifting the arm until its shoulder 50 strikes against the edge of the knife-plate 40 and bearing against the inclined under edge moves it forward and swings the frame toward the cylinder, thereby pressing the feed-roller against the paper which lies between the two surfaces and is fed downward, being carried over the beveled top edge 40^a of the knife-plate 40, thence between the knife-edge 41 and knife-plate 44, and thence to the bed. When the roller 47 passes the arm after the frame is swung far enough to cause the feed-roller to bear against the paper, it (the arm) drops to a swinging position, as shown in Figs. 8 and 10, so that on the return movement of the bed the arm will move out of the way of the roller to allow it to pass. The feed-roller and swinging frame are locked in the feeding position during the printing by the following-described mechanism: On the side of the swinging frame opposite the arm 48 is the trip 35 on the end of the bar 34. This trip

contains a right-angular slot 51, into which the end of the rod 49 (or it may be a stud fixed in the frame) projects, and from this slot the end of the trip extends downward and forms a toe 35^a, the under edge of which is inclined downward. When the swinging frame is moved against the cylinder, the end of the bar 49 travels along the horizontal part of the slot to the end, whereupon the catch drops and the end of the bar enters the vertical part of the slot, and thus locks the swinging frame in position, with the feeding-roller against the cylinder, as shown in Fig. 6. The frame is released by the following means:

To the side of the bed opposite the rack is fixed a longitudinally-grooved bar 52, with which is connected a sliding adjustable form-lock plate 53, the connection being made by inserting the bar 52 between the right-angular flange 54 and a lug 55, having a lip 55^a, which enters the groove in the bar, as shown in Fig. 11. On a stud projecting from the side 54 of the form-lock is mounted a roller 56. The form-lock just in the rear of and in line with the form has a rectangular opening 57, in which is inserted a movable block 58, having an elongated hole 59 to receive an eccentric 60, fitted with a small handle, by means of which the block is forced against the end of the form and locks it to the bed, and, by the force thus exerted on the sides 54 and lug 55 of the form-lock plate which bear against the bar 52 and are much shorter than the sides extending to the eccentric, the plate is clamped against the bar and the form-lock thus prevented from slipping back when the form-lock is turned against the end of the form by the eccentric. The form-lock thus constructed is adapted by its connection with the bar 52 to slide the entire length of the bed, and can therefore be adjusted to any length of form that it may be required to print from. The roller 56 is in vertical alinement with the end of the trip 35 and passes under the toe 35^a of the same when the rear end of the form passes under the impression-cylinder—that is, when the sheet is fully printed—and by so doing lifts the trip and thereby releases the swinging frame, which is thrust back suddenly and quickly by a spring-bar 61, that has one end coupled to the end of the bar (or stud) 49, which projects through the slot in the trip far enough for that purpose, and is otherwise supported in a bearing formed in a standard 62, rising from the side frame.

When the frame is swung toward the cylinders and locked by the trip 35, the spring-bar is retracted, and when the form-lock roller 56 lifts the trip and releases the frame the spring-bar reacts suddenly and thereby stops the feeding and also cuts off the printed sheet from the web of paper as the paper passes through the knife-plate and is fed downward between the fixed and movable knife-edges. As heretofore stated, the perpendicular hook 31 is connected with the arm 32, which is fast

on the shaft 33, on which the arm 34 of the trip 35 is also fastened. Hence when the form-lock roller lifts the catch at the end of the impression it also lifts the hook 31, and this in turn, by means of the cross-bar 30, raises the latch 29 into engagement with the rack 28 and by the resistance of the buffer-spring stops the bed, which is thus limited in its printing movement to the exact distance required to make an impression from the form. The position of the form-lock therefore, which depends upon the length of the form, regulates the feed, the cut-off, and also the length of the movement of the bed to make an impression. By the same means, furthermore, the tension device and the ink-feed are controlled. To this end one side of the swinging frame is extended above the pivots and carries a pin 63, which engages a cam-slot 64 in a lever 65, which is fulcrumed to one of the standards that carry the paper-roll shaft. To this lever is attached the ends of a friction-strap that passes over a pulley in the paper-roll shaft and forms the tension device 66. The pin 63 also makes a pivotal connection with the end of a bar 65^a, which at the opposite end is pivoted to an arm 67 on a shaft that carries, by means of two other bifurcated arms, the drop-roller 68 of the inking apparatus. When the frame 36 is swung against the impression-cylinder to feed the paper, the pin 63 moves down the cam-slot 64 and thereby relaxes the tension and permits the paper to be fed freely, and at the same time the bar 65^a is caused to move the carrying-roller 68 in contact with the fountain-roller, from which it takes a supply of ink. Now when the impression is completed, the swinging frame being released and thrust back, the pin 63 is moved up the slot 64 and the bar 65, being pulled down, tightens the tension and prevents the paper from running slack, and at the same time the drop-roller 68 is moved from the fountain-roller to the ink-roller 70 and transfers a supply of ink thereto. The ink-fountain roller 69 may be driven by any suitable means, while the form-rollers are driven by a pinion 71, mounted loosely in the shaft 33.

It will be understood from the foregoing description that the tension, the cut-off, the paper-feed, and the ink-supply are all controlled and their initiatory movement brought about by the form-lock roller 56, whose position is determined by the length of the form. It is evident that where the matter to be printed varies in length the action of the said devices cannot be continuous, or, rather, at regular intervals, without wasting time and material, and when the movement of the bed is limited by the length of the form their continuous regular performance of their several functions would not be practicable; but by controlling their movements and harmonizing them with that of the bed the feeding and cutting off of the paper will be subject to the length of the movement of the bed to make an impression from the form, and the supply-

ing of the ink will be governed by the exact requirements of the matter, a greater or less quantity of ink being taken from the fountain-roller, according as the matter is longer or shorter.

The sheet-delivery.—On the forward end of the bed is fixed a plate 71, just over to the form head-block 72, which coacts with a set of metal strips to lift the sheet into position to be taken by the delivery-tapes. These metal strips 73 73 have their rear ends fastened to a cross-bar 74, supported in the standards at the rear end of the machine, and they are carried downward and their ends held just in the rear of the impression-cylinder and below the level of the plate 71, as shown in Fig. 6. A shaft 75, at the rear of the impression-cylinder, is supported in suitable standards or brackets on the side frames and carries arms 76 76, and these arms are fitted with wrist-pins 77, to which the metal strips 73 73 are fastened by screws, rivets, or other suitable devices. The shaft 75 also carries an arm 78, having on its end a roller. The forward end of the bar 52 is an inclined plane 52^a, so that when the bed is at its extreme forward position the roller is below the level of the top of bar 52 and in line with the incline plane 52^a, but when the forward end of the form passes the impression-cylinder and the printing commences the roller passes up the incline to the top of the bar 52, and by this movement the arms 76 76 are raised, and by them the ends of the strips 73 73 are lifted above the level of the plate 71, say to about the position shown in Fig. 8. The plate 71, on which the head of the sheet rests, as it is fed forward coincident with the movement of the bed passes the ends of the strips with the head of the sheet just before the strips are lifted. Consequently the sheet is raised by them to the delivery-tapes 80, when it is taken by the tapes and carried to the delivery-table.

The shifting lever 7 is prevented from causing an abrupt reversal of the cylinder by the following mechanism. (See Fig. 1.) The lower end of said lever bears on a spring-pawl 81, attached to the under side of the adjacent side frame and having a notch 82 at the end. To this notched end is pivoted an arm 83, having its upper end in position to be engaged by a toothed wheel 84, mounted on the cylinder-shaft adjoining the beveled wheel 3. (See Figs. 1 and 4.) The notch 82 is intended to hold the lever in a middle position and the clutch member 6 out of engagement with the pinions 4 5. The operation of this device is as follows: Suppose the bed to have been moving toward the rear of the machine on its printing movement, as represented in Fig. 1, with the lever 7 in the position shown in Fig. 1. When the bed is arrested, the lever-shifting mechanism would tend to throw the lever 7 over to the opposite position, with the clutch in gear with wheel 5 to reverse the motion of the cylinder and drive the bed back, but the

end of the lever dropping into the notch 82 the clutch member remains midway between the pinions; but by the recoil of the buffer-spring the bed is caused to begin its return movement, and its toothed rack reverses the motion of the cylinder slowly. When the reversal takes place, the toothed wheel 84 takes into the end of the pawl 83 and forces it over to the opposite position from that shown in Fig. 1, whereby the spring 81 is forced down until the end of the lever is clear of the notch 82 and the lever is free to be moved by the retracted spring on rod 8 to shift the clutch member into engagement with the pinion 5. When the bed reaches its reversing point, the shaft 12 was moved and the connecting-bar 11 thrust to the left by the crank-pin K', and as the lever was stopped by falling into the notch 82 the coiled spring on the rod 8 to the right of the lever became retracted. The releasing of the lever from the notch permits the spring to react, and thereby throws the lever over to the opposite position from that shown in Fig. 1, and thereby shifts the clutch member into engagement with the pinion 5, after which the cylinder is driven positively.

If the movement of the bed is to be stopped entirely at the end of a printing movement while the remainder of the mechanism continues in motion, a pawl 85 is arranged to be put into engagement with the rack 28 just after the bed has reached its dead-center and before commencing its return movement, whereby, as no reverse motion is given to the bed and cylinder, the pawl is not shifted and the lever remains in the notch 82 and the clutch member in its midway position; but by disengaging the pawl the recoil of the bed starts the cylinder and the release and shifting of the lever and the clutch member follows, as heretofore described. The pawl 85 is mounted on a rod held in brackets connected with a side frame, and it is operated by means of a hand-lever 86 outside of the frame.

The roller 47, which coacts with the swinging arm 48 to move the swinging frame 36 toward the cylinder, is intended to be adjustable to a greater or less distance from the head of the form, in order that by acting on the arm 48 at a longer or shorter interval after the bed begins its printing movement the margin at the head of the sheet may be increased or diminished; and to this end additional holes should be made in the bed to receive the stud of the roller, as indicated by the dotted circles at *ww*, Fig. 6. The upward movement of the cylinder-boxes is limited by plates *pp*, fastened to the frame by screws, and projecting over the tops of the boxes and adapted, by means of the screws, to be adjusted up or down to alter the distance the cylinder can be raised by the springs under the boxes.

The means herein described by which the bed is arrested and started when reversing may be departed from and other mechanism substituted capable of effecting the same or

similar results when the initiatory movement which brings about the control of the bed is derived from a contrivance whose position is determined by the length of the matter to be printed, so that unnecessary movement of the bed shall be avoided and the action of feeding, cutting off tension, and inking mechanism shall be regulated by the same contrivance and their period of action shall be limited by the movement of the bed.

The clutch represented in the drawings for putting the cylinder in gear with the driving mechanism of the press is of novel construction, which peculiarly adapts it to shift the power quickly and positively without noise or jar. It consists of wedge-pieces *W W*, &c., pivoted to the hubs of the pinions at one end and having their other ends inserted in slots formed through the hubs, so that the under sides of the said wedge-pieces, which are inclined or beveled, can be forced down on the shaft *I*. The shaft *I*, in line with the inclined under sides of the wedge-pieces, is made prismatic, with an equal number of sides—say four, six, eight, or other even number—so that when the wedge-pieces are forced down they will clamp opposite flat sides of the shaft. The wedge-pieces of one pinion are prevented from clamping the shaft when the other pinion is engaged by springs *s*, seated in the hub and bearing against their under sides, which hold the free ends up when the clutch is not in operation. To cause the wedge-pieces to clamp the shaft, the movable member *G* is provided at each end with a conical socket *w'*, into which when moved toward one or the other of the pinions the ends of the wedge-pieces enter and are thereby forced down against the shaft. Thus when the movable member is moved toward pinion 4 to put the latter in motion the sides of the conical socket *w'* bear upon the ends of the wedge-pieces, force them down, and cause them to clamp the flat faces of the shaft and thereby put the pinion in gear with the shaft. When the movable member is shifted to the opposite pinion or to a middle position, the socket being moved away from the wedge-pieces, they are released, and, the springs forcing them up, the pinion and shaft are disconnected without jar or noise.

I claim—

1. In a printing-machine, the combination of an impression-cylinder, a form-bed, mechanism for stopping the printing movement of the bed when an impression is completed, and a contrivance, adjustable relatively to the end of the form, for initiating the operation of the mechanism by which the printing movement of the bed is limited to the length of the matter on the form, substantially as specified.

2. The combination of an impression-cylinder, a form-bed, a paper-feeding mechanism, means by which the feeding mechanism is put in position to feed the paper, means for putting it out of said position and a contrivance adjustable relatively to the end of the

form for initiating the operation of the means by which the paper-feeding mechanism is put out of its operative position, substantially as specified.

3. The combination of an impression-cylinder, a form-bed, a cutting-off appliance, means for setting the same preparatory to cutting off the printed sheet, means for releasing the cutting-off mechanism and a contrivance adjustable relatively to the end of the form for initiating the movement of the mechanism by which the cutting-off mechanism is released to cut off the printed sheet when an impression is completed, substantially as specified.

4. The combination of an impression-cylinder, a form-bed, a tension device, means for causing the said device to release the tension when the paper is fed, and a contrivance, adjustable relatively to the end of the form, for initiating the movement of the mechanism by which the tension device is caused to apply tension to the paper when an impression is completed, substantially as specified.

5. The combination of an impression-cylinder, a form-bed, an ink-carrying roller, and a contrivance, adjustable relatively to the end of the form, for initiating the movement of the mechanism by which the carrying-roll is carried away from the fountain-roll when an impression is completed, substantially as specified.

6. The combination of an impression-cylinder, a form-bed, suitable mechanism for stopping the movement of the bed, a form-lock, a roller whose position is determined by the end of the form when held by the form-lock, and mechanism which is set in motion by the said roller for causing the bed-stopping mechanism to engage the bed and stop its printing movement, substantially as specified.

7. The combination of an impression-cylinder, a form-bed, suitable mechanism for stopping the movement of the bed, and a form-lock carrying a roller whose position is determined by the end of the form when held by the form-lock and mechanism, which is set in motion by the said roller, for causing the bed-stopping mechanism to engage the bed and stop its printing movement at the end of an impression, substantially as specified.

8. The combination of an impression-cylinder, a form-bed fitted with a grooved bar, a form-lock plate connected by means of a flange and lip with the grooved bar, a roller pivoted to the flange of the plate, a form-lock composed of a block and an eccentric to hold the form and clamp the plate against the grooved bar, mechanism to engage and stop the printing movement of the bed, and a device adapted to be engaged by the roller on the form-lock plate and operated to cause the bed-stopping mechanism to stop the bed when an impression is completed, substantially as specified.

9. The combination of an impression-cylinder, a form-bed fitted with a grooved bar on

its upper side and a rack on its under side, a form-lock mechanism for stopping the motion of the bed, a hook which is adapted to be put into engagement with the rack on the under side of the bed to bring the bed-stopping mechanism into action, a device for putting the hook into engagement with the rack an arm connected with the said device that extends over the bed and terminates with a finger, and an adjustable contrivance on the bed whose position is determined by the end of the form, whereby when an impression is completed the said contrivance actuates the finger and by means of the intermediate device and hook, causes the bed to be arrested, substantially as specified.

10. The combination of an impression-cylinder, a form-bed, a swinging frame carrying a feed-roller, an arm carried by the swinging frame which is engaged by a device on the forward end of the bed and caused to move the swinging frame toward the cylinder and against the paper, and a catch which engages a stud on the swinging frame and locks it in place with the feed-roller against the paper on the impression-cylinder, substantially as specified.

11. The combination of an impression-cylinder, a form-bed, a swinging frame carrying a paper-feeding roller, means for swinging the frame toward the cylinder to carry the feed-roller against the paper, a catch for locking the frame in that position, a finger connected with the catch and an adjustable contrivance on the bed, whose position is determined by the length of the form, which, when an impression is completed, causes the finger to release the catch, and means for swinging the frame back when the catch is released, to stop the feeding of the paper, substantially as specified.

12. The combination of an impression-cylinder, a form-bed, a swinging frame carrying a movable knife-edge, means for swinging the frame toward the cylinder, a fixed knife-edge, means for throwing the swinging frame back and away from the cylinder, a catch for holding the frame, a finger connected with the catch, and an adjustable contrivance on the bed whose position is determined by the length of the form, which, when an impression is completed, causes the finger to release the catch whereby the frame is thrown back and the movable knife-edge and fixed knife-edge coact and sever the paper between them, substantially as specified.

13. The combination of an impression-cylinder, a form-bed, a swinging frame carrying a paper-feeding roller and a movable knife-edge, means for swinging the frame toward the cylinder, a fixed knife-edge, a spring-bar connected with the swinging frame to throw it back from the cylinder to stop the feeding of the paper and cause the knife-edges to cut off the printed sheet, a catch for holding the swinging frame, a finger connected with the catch, a form-lock and a roller connected with

the form-lock and adjustable thereby to a position determined by the length of the form, which, when an impression is completed, causes the finger to release the catch, whereupon the spring-rod forces the swinging frame back and the feeding of the paper is stopped and the printed sheet cut off by the knife-edges substantially as specified.

14. The combination of an impression-cylinder, a form-bed, a swinging frame, a lever connected at one end with a tension device for applying tension to the paper-roll, and at the opposite end provided with a cam-slot which is engaged by a pin on an arm of the swinging frame, means for moving the swinging frame toward the cylinder, and causing the pin to move down the cam-slot to lessen the tension on the paper, and means for throwing the swinging frame back to cause the pin to move up the cam-slot and increase the tension on the paper when the feeding is stopped substantially as specified.

15. The combination of an impression-cylinder, a form-bed, a swinging frame connected by means of a rod with the carrying-roll of the inking apparatus, means for swinging the frame toward the impression-cylinder at the beginning of the printing movement of the bed whereby the carrying-roll is moved in contact with the fountain-roll, means for throwing the said frame back toward the carrying-roll to the form-roll, a catch by which the swinging frame is caused to hold the carrying-roll against the fountain-roll, a finger connected with the said catch, a form-lock provided with a roller positioned to act on the said finger when an impression is completed and cause it to release the catch, whereby the frame is thrown back, thus limiting the supply of ink taken by the carrying-roller from the fountain-roller to the requirements of the form, substantially as specified.

16. The combination of a form-bed, means for driving the same, mechanism which is automatically brought into action for stopping the printing movement of the bed when an impression is completed, and buffers at each end of the machine for gradually arresting the motion of the bed, substantially as specified.

17. The combination of an oscillating cylinder, a beveled wheel on its shaft, loose pinions mounted on a shaft geared to the main driving-shaft, said pinions in mesh with the beveled wheel on the cylinder-shaft, a movable clutch member for changing the motion of the cylinder, a rock-shaft, a crank thereon, and a lever operated by the said crank, fingers fixed to the said rock-shaft, buffers at each end of the machine carrying rollers in line with the fingers on the shaft, a spring-bar, a crank on the rock-shaft connected with the spring-bar, and a reciprocating form-bed provided with lugs and a rack which coact with the buffers to stop the motion of the bed, whereby when the bed approaches the end of its movement in either direction the rollers

on the buffers bear against the fingers which coact with the spring-rod to give about a half-revolution to the rocking shaft and thereby cause the lever to shift the clutch member and transfer the power from one pinion to the other, substantially as specified.

18. In combination with a reciprocating form-bed and buffers which both arrest and reverse its motion, and a lever for shifting the clutch member, of a spring-controlled rod, a rock-shaft having a pin thereon with which the spring-controlled rod is connected, a spring-pawl provided with a notch to receive and hold the end of the shifting lever when the rock-shaft is turned to shift the lever, and means for releasing the lever from the notch of the pawl, whereby the clutch member is retained in its midway position between the driving-pinions and sudden change of the cylinder's motion is avoided, substantially as specified.

19. In combination with the shifting lever, its spring-controlled connecting-rod and the notched spring-pawl which receives and holds the shifting lever, of a toothed wheel on the cylinder-shaft, a bar connected at one end to the spring-pawl and having its other end in engagement with the toothed wheel, the buffer-springs, the spring on the connecting-rod, the cylinder driving-pinion and the impression-cylinder, whereby when the cylinder is reversed by the recoil of the buffer-springs, the toothed wheel engages the bar and causes it to force the spring-spawl down and release the lever, which is therefore moved by the retracted spring on the connecting-rod and puts the clutch member into engagement with the pinion by which the cylinder is caused to drive the bed on its next movement, substantially as specified.

20. The combination with an impression-cylinder and the form-bed, and the delivery-tapes of a plate fixed to the forward end of

the bed, metal strips having their ends below the impression-cylinder, a shaft having arms provided with wrist-pins to which the said strips are fastened, a crank-arm fixed to the said shaft and a bar on the bed in line with the crank-arm, said crank having its forward end inclined downward, whereby when the bed is making its printing movement the crank-arm moves up on the bar and thereby causes the shaft to lift the ends of the metal strips and carry the end of the printed sheet to the delivery-tapes, substantially as specified.

21. In a clutch the combination of a pinion or other mechanical element to which motion is to be given, wedge-pieces connected therewith, a shaft having prismatic sides or faces, springs for holding the wedge-pieces out of engagement with the shaft, and a movable member of a clutch provided with sockets in the ends and adapted to receive the ends of the wedge-pieces to clamp them against the prismatic faces or sides of the shaft, substantially as specified.

22. In combination with the cylinder and driving mechanism of a printing-machine, a clutch for reversing the motion of the cylinder consisting of wedge-pieces pivoted to the driving-pinions, the shaft on which the said pinions are mounted having prismatic faces in position to be engaged by the wedge-pieces, springs for holding the wedge-pieces out of contact with the shaft and the movable member of the clutch provided with conical sockets at the ends for engaging the wedge-pieces and clamping them against the prismatic faces of the shaft, substantially as specified.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

MATTHEW VIERENGEL.

Witnesses:

FREDK. HAYNES,
CHAS. E. PETERS.