(No Model.)

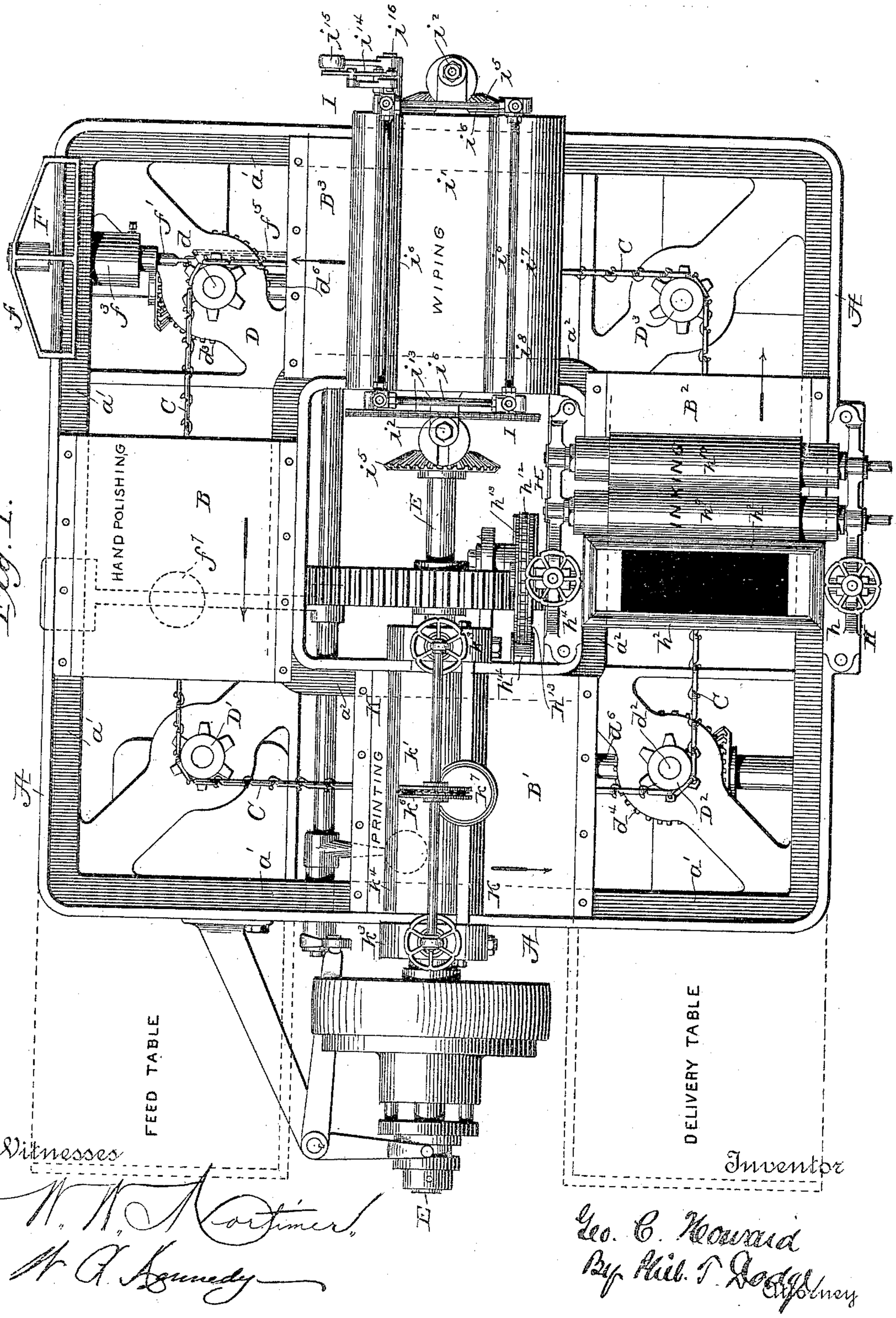
6 Sheets—Sheet 1.

G. C. HOWARD.

PLATE PRINTING PRESS.

No. 446,635. Patented Feb. 17, 1891.

Fig. 1.



Witnesses

W. W. Mortimer

A. A. Kennedy

Inventor

Geo. C. Howard

By Phil. T. Dodd

Attorney

(No Model.)

6 Sheets—Sheet 2.

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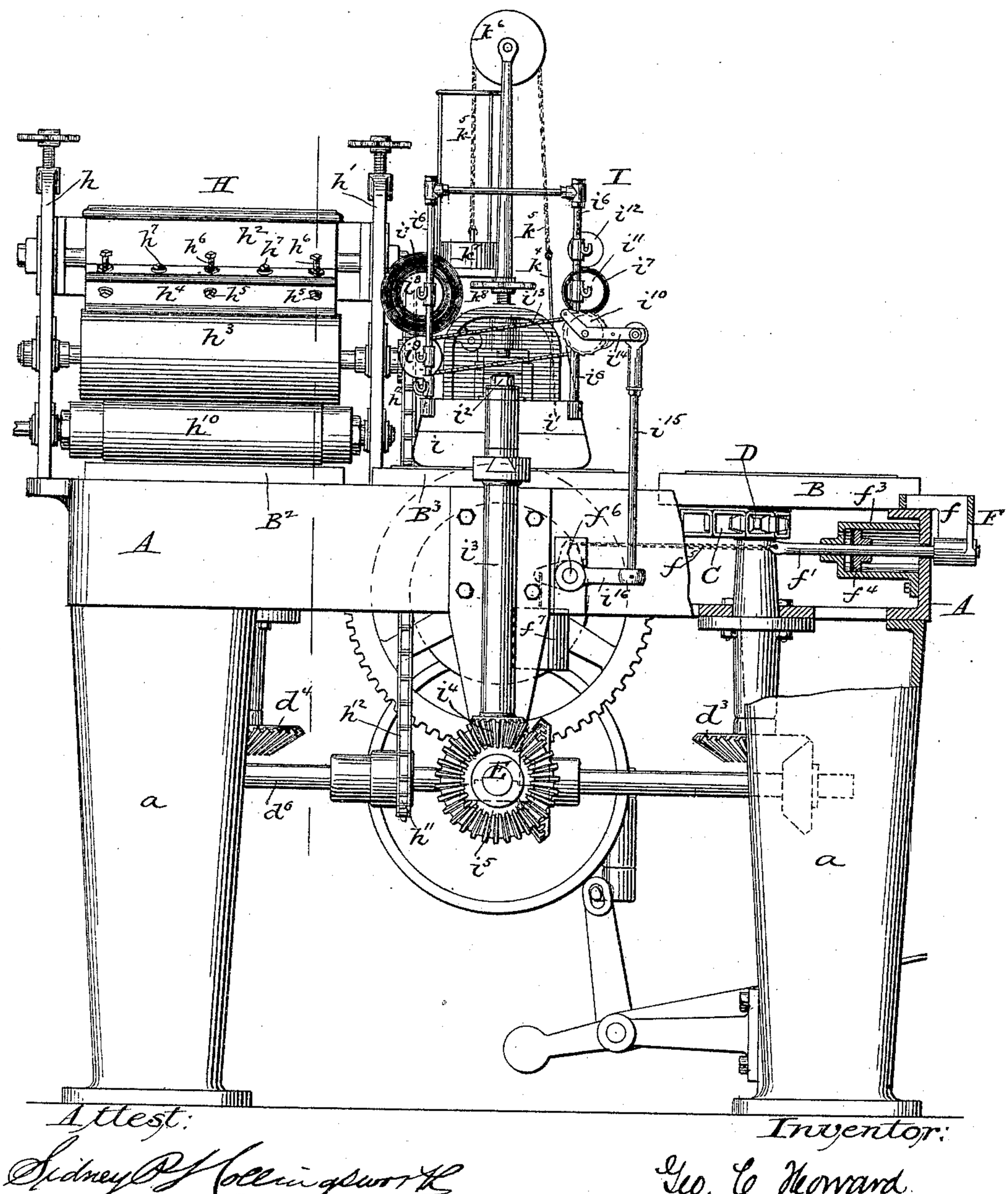
Fig. 2.



Attest:

Sidney D. Collingwood
H. R. Kennedy.

Inventor:

Geo. C. Howard.
By his atty
Phil. T. Dodge.

(No Model.)

6 Sheets—Sheet 3.

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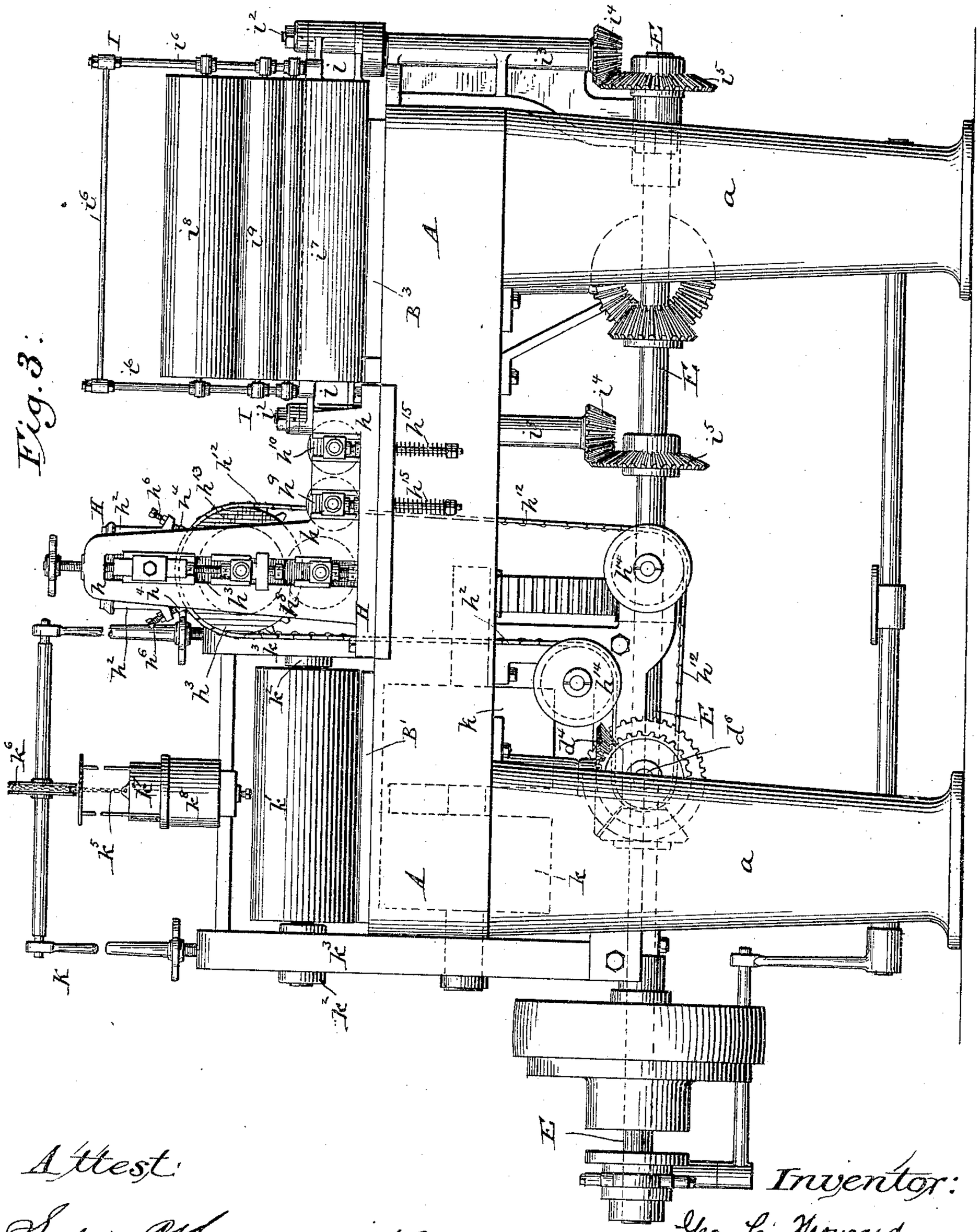

Fig. 3.

Attest:

Sydney B. Hollingsworth
M. R. Kennedy.

Inventor:

Geo. C. Howard
By his atty
Phie. T. Dodge

(No Model.) 6 Sheets—Sheet 4.

G. C. HOWARD.

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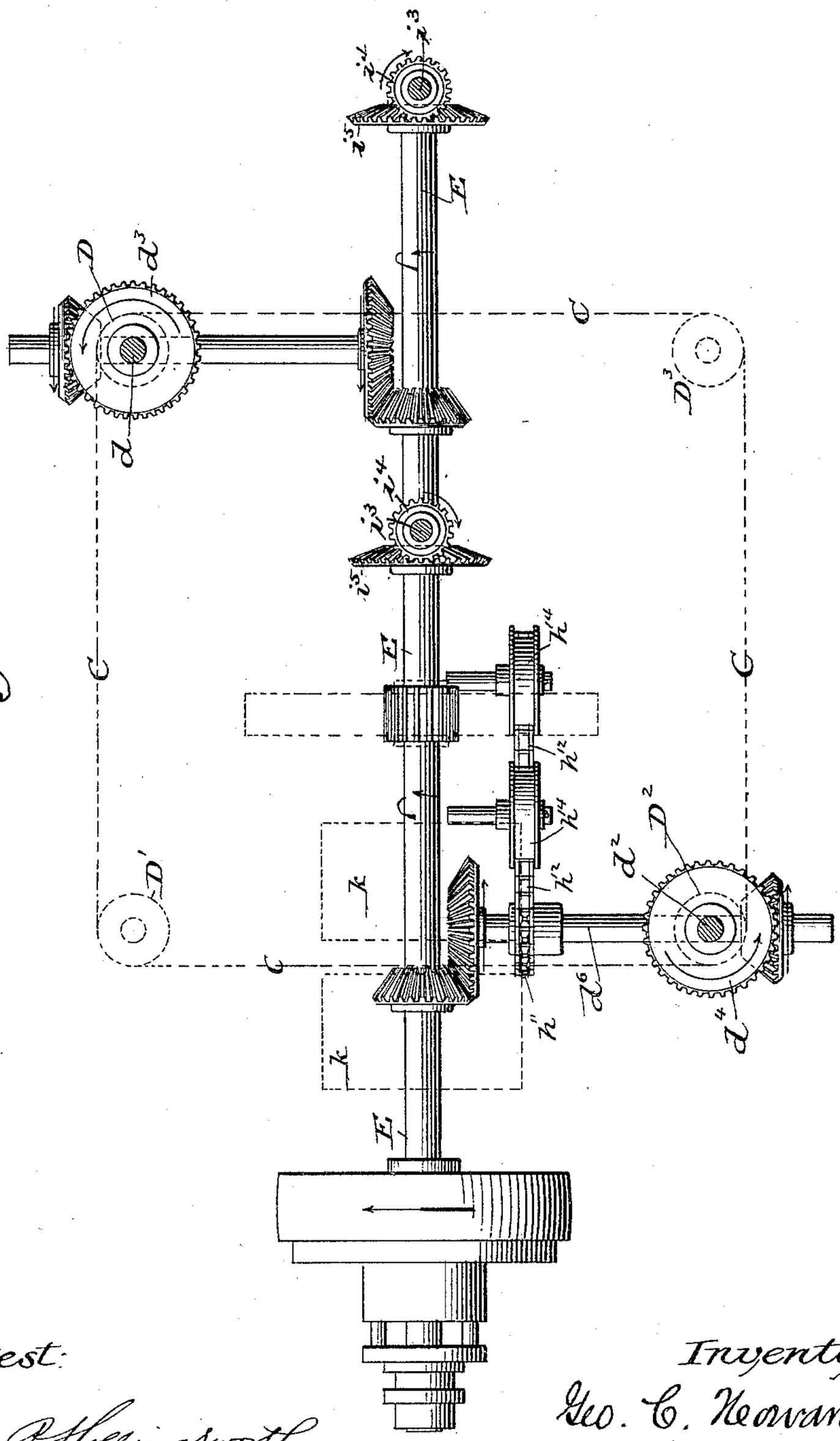
No. 446,635. Patented Feb. 17, 1891.

Fig. 4.



Attest:

Sidney P. Hollingsworth

H. A. Kennedy.

Inventor.

Geo. C. Howard

By his Atty.

Phil. T. Dodge

(No Model.) 6 Sheets—Sheet 5.

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Fig. 7

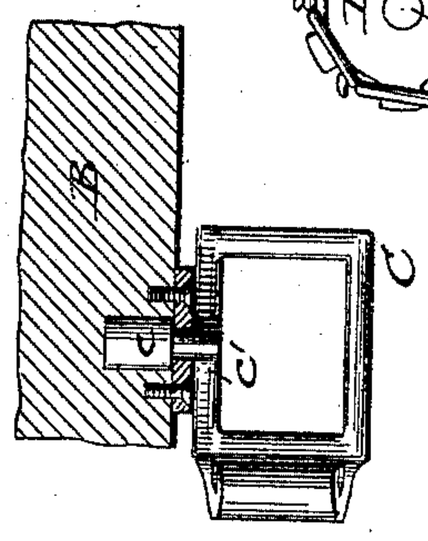


Fig. 8

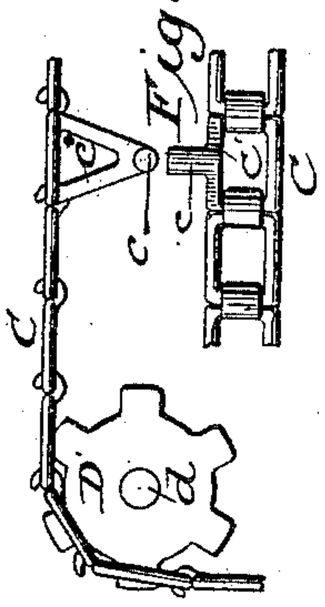


Fig. 12.

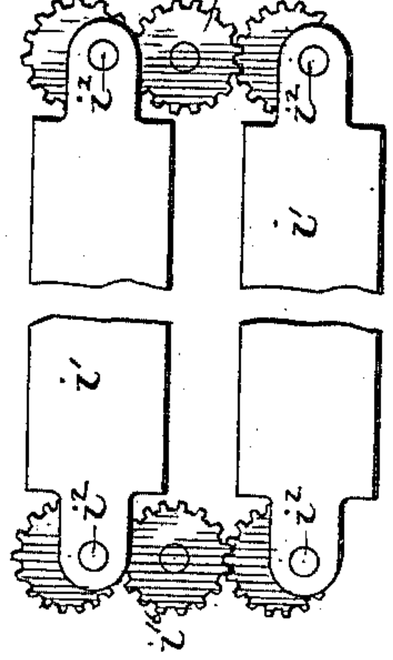


Fig. 13.

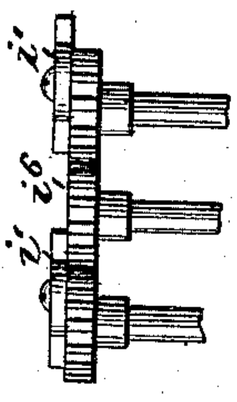


Fig. 11.

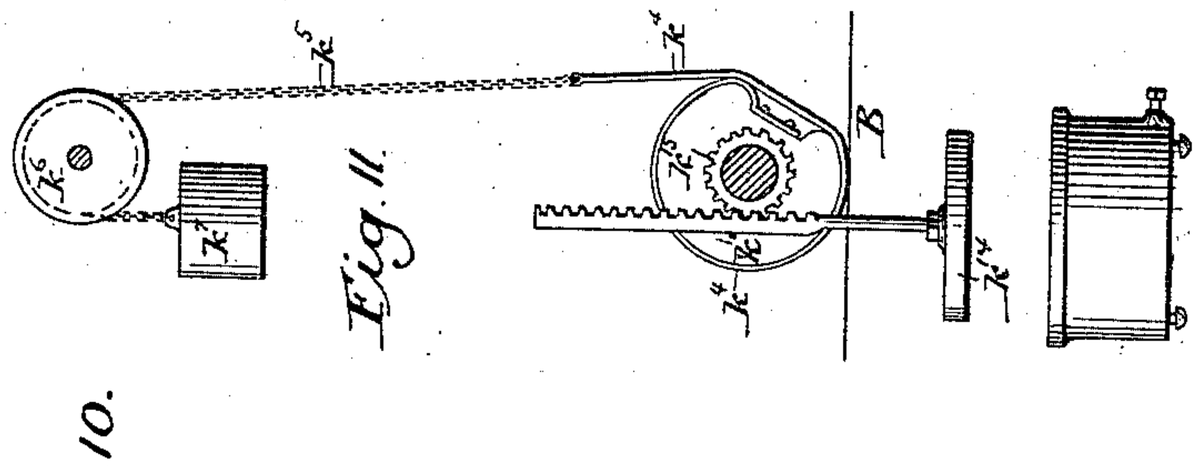


Fig. 10.

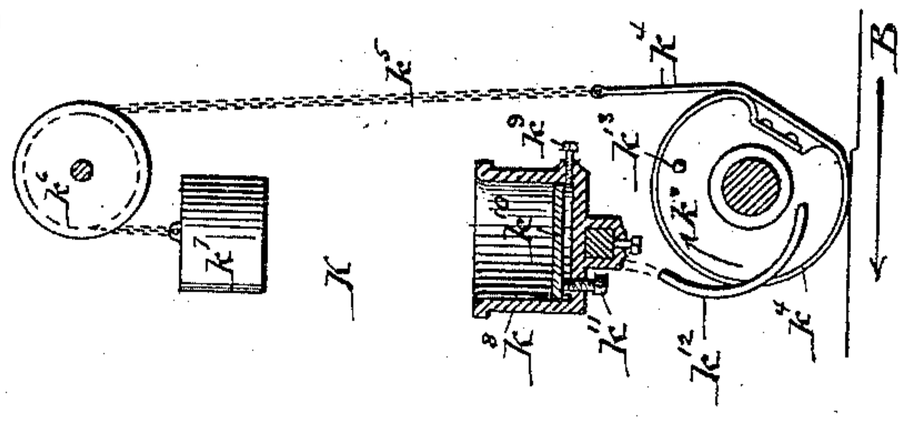


Fig. 6

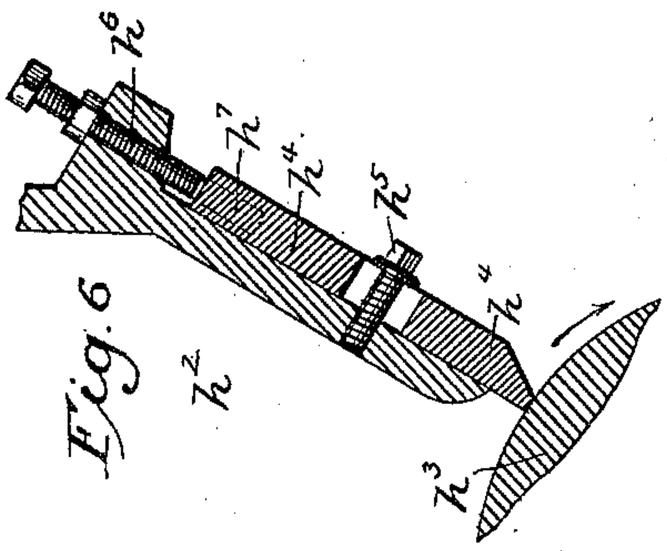
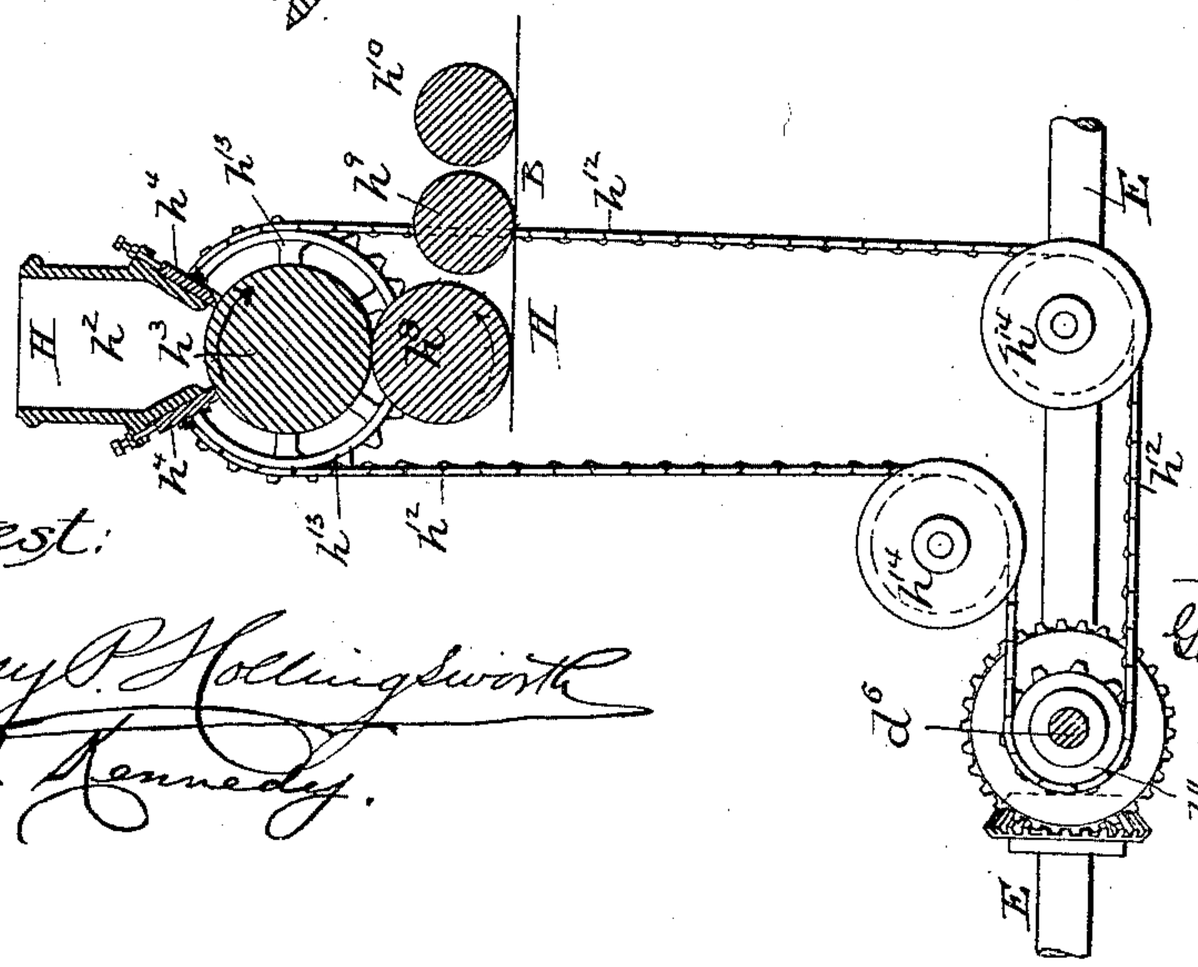


Fig 5.



Attest:

Sidney P. Hollingsworth

H. R. Kennedy.

Inventor:

Geo. C. Howard

By his atty

Chas. T. Dodge

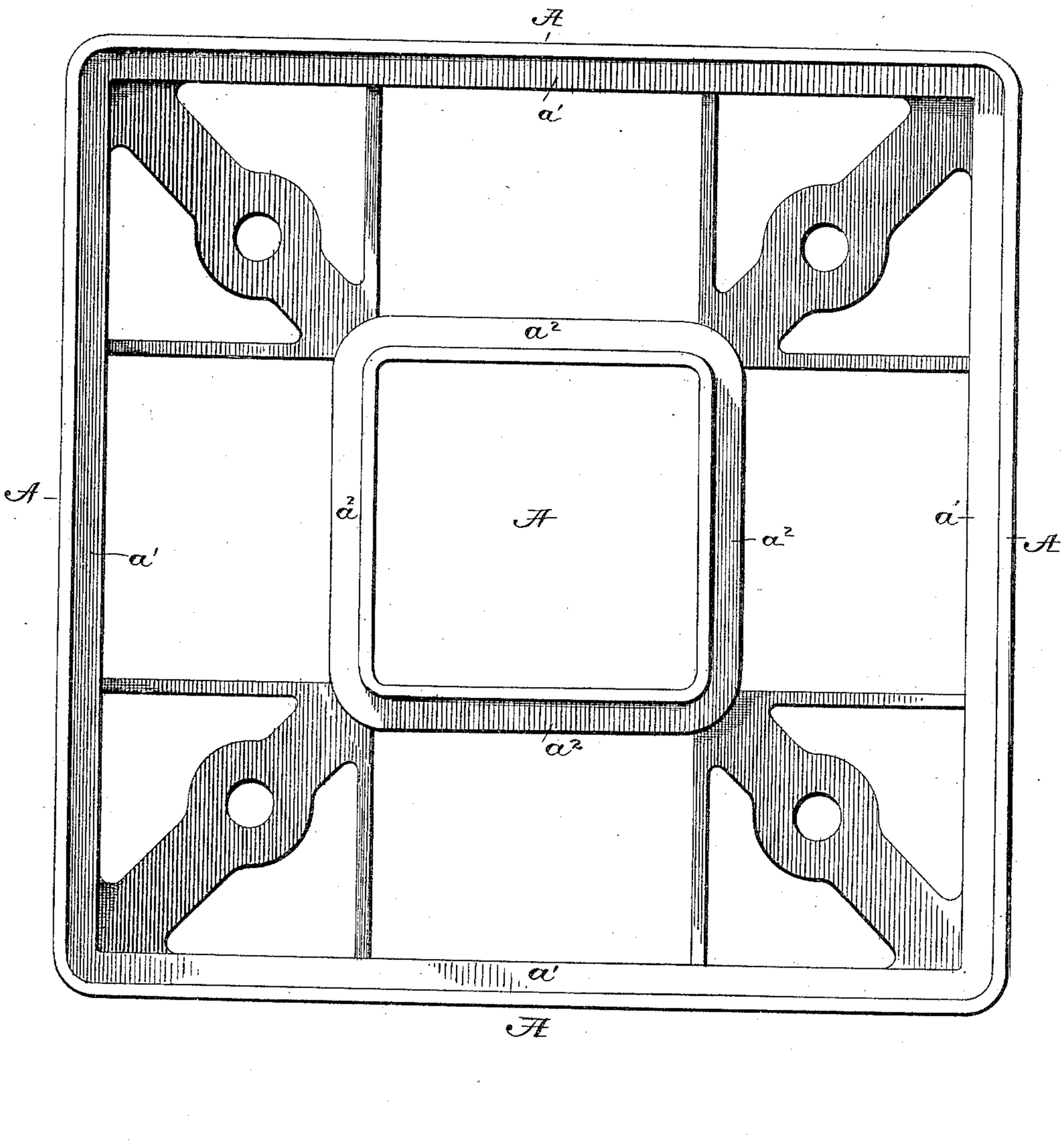
(No Model.) 6 Sheets—Sheet 6.

G. C. HOWARD.

PLATE PRINTING PRESS.

No. 446,635. Patented Feb. 17, 1891.

Fig. 14.



Witnesses

W. W. Mortimer

W. A. Kennedy

Inventor

Geo. C. Howard

By Rice T. Dodge

Attorneys

UNITED STATES PATENT OFFICE.

GEORGE C. HOWARD, OF WALLINGFORD, PENNSYLVANIA.

PLATE-PRINTING PRESS.

SPECIFICATION forming part of Letters Patent No. 446,635, dated February 17, 1891.

Application filed April 19, 1887. Serial No. 235,412. (No model.)

To all whom it may concern:

Be it known that I, GEORGE C. HOWARD, a citizen of the United States, residing at Wallingford, Delaware county, Pennsylvania, have invented Improvements in the Construction of Plate-Printing Presses, fully described and represented in the following specification and accompanying drawings, forming a part of the same.

My invention relates to that class of plate-printing presses in which a bed or series of beds connected with each other by a chain are arranged to travel horizontally around a supporting-frame, passing in their course beneath the inking, wiping, and impression mechanisms.

The aim of my invention is more particularly to strengthen and simplify the press, to afford convenient access to its operative parts, to permit the beds to change their direction of movement at the corners of the frame with a smooth and easy action, and to improve the action of the wiping devices.

To this end it consists more particularly in improvements in the construction of the frame, in the devices for imparting motion to the beds, in a buffer for arresting and directing the motion of the beds, and in a wiping mechanism of peculiar construction.

In the accompanying drawings, Figure 1 represents a top plan view of a press having my various improvements incorporated therein. Fig. 2 is a side elevation of the same, a portion being broken away and shown in vertical section. Fig. 3 is an elevation of the press looking endwise against the inking-roll. Fig. 4 is a plan view showing in outline the arrangement of the driving-gear, driving-chain, &c. Fig. 5 is a vertical section through the inking mechanism. Fig. 6 is a vertical cross-section, on an enlarged scale, through one of the gates for regulating the delivery of ink. Fig. 7 is a side elevation of the link by which one of the beds is carried, a portion of the bed being also shown. Fig. 8 is a top plan view of a portion of the chain and one of its supporting-pulleys. Fig. 9 is a side elevation of the same. Fig. 10 is a vertical sectional elevation showing the devices for arresting the rotation of the impression-roll. Fig. 11 is a similar view of the same in modified form. Fig. 12 is a plan view illustrating the eccentric-gears for imparting motion to the wiping mechanism. Fig. 13 is an end view of the same. Fig. 14 is a plan view in outline of the main frame, the parts above the tracks or guides for the beds being removed.

Referring to the drawings, A represents a horizontal square bed-frame, ordinarily cast complete in one piece and supported at its four corners by legs or posts *a*, which are bolted firmly thereto. This construction, while sustaining the bed rigidly in position, permits free access to the various operative parts therein and thereunder, and is in this regard superior to the frames heretofore in use, which were cast in box-like form with closed sides, so that access could be had to the internal parts through the top only.

In order to support and guide the horizontally-moving beds the frame is constructed, as shown in Fig. 1, with a horizontal track or way *a'* around the inside of its outer wall and with a central corresponding track a^2, having in plan view a square form with its several sides parallel with and equidistant from the outer rail *a'*. At the corners the inner and outer frames are slightly rounded, as shown, in order that the beds may pass smoothly around the same in changing their course.

B B' B^2, &c., represent the traveling or circulating beds, which are made of square form, mounted on the rails *a'* a^2, and arranged to travel horizontally around the frame, one after another. The beds are connected by means of a driving-chain C, which passes around horizontal sprocket-wheels D D', &c., located on journals or shafts fixed in the corners of the frame, as shown, the chain serving to maintain the proper distance between the beds, to impart motion thereto, and to carry each bed around the corners and along the four sides of the frame in succession. Owing to the weight of the beds and the power required to move them, it is found desirable to drive the chain at more than one point, and in practice I have found it highly advantageous to drive the same at diagonally-opposite corners of the frame. To this end I prefer to adopt the arrangement of gearing represented in Fig. 4. In this case the vertical shafts *d* and d^2,

which carry the sprocket-wheels D and D^2, are extended downward and provided on their lower ends with horizontal beveled gears d^3 and d^4, respectively. A main driving-shaft E, seated in suitable bearings in the frame, is extended transversely beneath the beds and connected by intermediate beveled gearing and shafts with the gears d^3 and d^4, as shown in Fig. 4. In this way motion is imparted positively from the driving-shaft to the sprocket-wheels and the chain at the diagonally-opposite corners.

When the press is driven at high speed it is necessary that the momentum of the bed shall be gradually arrested as it approaches a corner preparatory to changing the direction of its movement. To this end I provide the frame with a yielding buffer F, located at one corner directly in the path of the advancing bed. This buffer consists of a horizontal movable frame attached, as shown in Fig. 2, to a piston-rod f', passing through a stationary cylinder f^3 and provided with a piston f^4 therein. The outer end of the cylinder is closed, or practically so, and the inner end of the piston is connected by a chain f^5 to a crank-arm or rock-shaft f^6, which is in turn provided with a second crank-arm and a weight f^7. This weight acts through the intermediate parts to draw the piston and the buffer-frame f inward, so that the buffer projects normally over the track a' and into the path which must be traversed by the bed. When, therefore, the bed advances it encounters the buffer, the movement of which is arrested by the air confined within the cylinder outside the piston. This air, being compressed or confined against speedy escape, offers a yielding resistance and serves as a spring to retard the movement of the buffer F and the bed, the result being that the advance of the bed is arrested in a smooth and easy manner, so that when it has completed its forward motion it may change its course at a right angle without undue shock or strain. This action occurs with each bed at the corner of the frame. The essence of the invention in this regard lies in the provision of a buffer to arrest the advancing bed; and it will be manifest that the details may be variously modified without departing from the spirit of my invention.

In order that the chain may act smoothly in passing around the corners, I connect it to the beds in the manner shown in Figs. 8 and 9, each bed receiving in its under side a vertical pivot or journal c on the end of an arm c', extending horizontally from the inside of the chain. The length of this arm is the same as the radius of the sprocket-wheels D D', &c., so that during the instant that the bed is at the corner of the frame and before its course of movement is changed the pivot c coincides with the axis of the sprocket-wheel, the arm c', which connects it with the bed, turning around this axis as a center as it is carried with the chain.

For the purpose of automatically inking the plates which are fixed upon the beds, I adopt an inking mechanism such as shown at H, in Figs. 1, 2, 3, and 5. This consists, essentially, of two vertically-slotted standards h h', bolted to the bed-frame and supporting near their top a horizontal ink-trough h^2, the bottom of which is fixed by a horizontal roll h^3. The sides of the ink trough or well are inclined inward at the lower edge and are provided, respectively, with two gates h^4, the lower edges of which are adjusted upon or in close proximity to the upper surface of the roll. Each of these gates is slotted vertically and held in place against the outer surface of the well by the bolts h^5. It is forced downward by bolts h^6, tapped through flanges on the ink-wells and bearing on the upper edge of the gate. The downward movement of the gate is limited by bolts h^7, passed loosely through the flange on the ink-well and threaded into the gate, as shown in the several figures. By means of the three series of bolts I am enabled to hold the gates firmly in position and to adjust them with extreme accuracy. Below the roll h^3 is located a roll h^8 in suitable position to transfer the ink to the plate as the latter is carried thereunder by the bed. Supplemental rolls h^9 and h^{10} assist in properly distributing the ink upon the plate after it passes from under the roll h^8.

Motion is communicated to the ink-roll h^3 in the manner shown in Figs. 2 and 5. The horizontal shaft d^6, through which one of the bed-chain pulleys is driven, is provided with a sprocket-wheel h^{11}, connected by a sprocket-chain h^{12} to a corresponding pulley h^{13} on one end of the ink-roll. This chain is carried in an angular direction beneath two guide-pulleys h^{14} to bring it in proper position to pass upward through the central opening of the frame.

Each of the inking-rolls is mounted, as shown in Fig. 3, in vertically-sliding bearings adjustable by screws to regulate their descent. The bearings of the rolls h^9 and h^{10} have depending rods or spindles encircled by spiral springs h^{15}, which draw the rollers downward, as shown in Fig. 3.

After the plate has been inked it is subjected to an automatic wiping operation by a mechanism located at the adjacent side of the machine and shown in detail in Figs. 1, 2, and 3. A horizontal pad or wiper i is adjustably connected to a horizontal frame or cross-head i', the two ends of which are mounted on vertical crank-pins i^2 at the upper end of two vertical shafts i^3. These shafts are mounted in rigid bearings on the main frame and are driven in unison by means of beveled gears i^4, mounted on their lower ends and arranged to engage gears i^5 on the main driving-shaft, as shown in Figs. 3 and 4. The crank-arms serve to give the wiper a horizontal circulatory movement over the plates while the latter are being carried thereunder by the bed, the result being a wiping action

very similar to that commonly performed by hand.

In connection with the bed, and as the direct means of wiping the plate, I employ a cloth or felt, which is gradually carried beneath the pad, in order to present a new or changing surface to the plate. In order to support and feed this cloth, I erect on top of the wiper-frame i' a suitable frame-work of the particular form shown, or other equivalent skeleton frame i^6, provided with bearings for the journals of horizontal rolls. The cloth i^7, made of great length, is wound upon one of these rolls i^8, passed thence around a lower roll i^9, then beneath the wiper-pad over a lower roll i^{10} at the opposite side of the skeleton frame, and finally wound upon a roll i^{11}, resting loosely on top of the roll i^{10} and subject in its turn to the weight of an overlying roll i^{12}. The boxes of the rollers i^{11} and i^{12} are arranged to slide freely upward and downward on the frame, so that the entire weight of the roll i^{11} is received upon the lower and driving roll i^{10}, and so that the weight of the roll i^{12} is in turn received upon the cloth as the latter winds upon the intermediate roll. In practice it is found that under this arrangement the friction of the lower and positively-driven roll i^{10} is sufficient to turn the roll i^{11} and that the cloth is wound tightly upon the latter. A belt i^{13} may be and commonly is extended from a pulley on the end of the driving-roll i^{10} to a pulley on the end of the roll i^9 at the opposite side, whereby the last-named roll is positively turned and caused to assist in properly moving the cloth.

Motion may be imparted positively to the roll i^{10} by any suitable mechanism; but I commonly provide it, as shown in Fig 2, with a ratchet-wheel, and operate it by means of a lever i^{14}, mounted on its axis and provided with two dogs or pawls, this lever in its turn receiving motion through a rod i^{15} from a crank-arm i^{16}, mounted on one of the rock-shafts f^6, heretofore alluded to as being connected with one of the buffers. When the buffer is moved backward by the impact of the bed, it causes the ratchet-lever to turn the roll i^{10}, which in this manner receives an intermitting rotation. After leaving the wiping mechanism the beds pass in due course around the corner of the frame to the adjacent side of the machine, where they are freely exposed, in order that the plate may be finally wiped or polished by hand. As the bed turns the next corner—that is to say, the upper left-hand corner of Fig. 1—the paper is laid upon the plate, after which the bed passes beneath the impression devices K. (Shown in detail in Figs. 1, 3, and 10.)

Directly beneath the position occupied by the bed during the impression are mounted two supporting-rolls k, the journals of which are sustained by suitable bearings in the main frame. The bed rides closely upon and is to a considerable extent sustained by these rolls. The two rolls are employed side by side in order that space may be left between them for the passage of the driving-chain connected to the under side of the beds. The impression is effected by means of a horizontal impression-roll k' overlying the bed, this roll being made, as usual, of D form in cross-section and sustained by journals mounted in boxes k^2, which are in turn mounted in vertically-slotted standards k^3 on the main frame. Screws or equivalent devices will be provided for adjusting the boxes vertically and regulating the pressure of the roll; but as these devices form no part of my invention it is unnecessary to describe them herein.

The D-roll is provided, as usual, with a blanket k^4, secured at one edge thereto, wound around the same, and extended upward at the opposite edge, where it is attached, as shown in Fig. 10, to one end of a cord or chain k^5, which is passed upward around a fixed pulley k^6 and provided on its end with a cylindrical weight k^7. The roll is turned in a forward direction and the blanket wound thereon by the frictional effect of the traveling plate under and against the blanket. After the passage of the bed the weight acts to unwind the blanket and return the roll to its original position. In order to permit the roll to be turned quickly backward, as required, preparatory to the next impression, I find it necessary to provide means for arresting its momentum, and to this end I locate beneath and in the path of the weight k^7 a dash-pot or cylinder k^8, into which the weight enters as the backward motion of the roll is completed. This dash-pot is provided at the bottom with a vent to permit the gradual escape of the confined air, which serves as a cushion for the weight. This vent is regulated by a screw k^9 or equivalent device, so that the descent may be checked with greater or less rapidity, as required. In order to check the rotation of the roll at one point or another, according to the size of the plate from which the impression is being formed, and in order that the roll may stop in the exact position required, I provide the dash-pot with an adjustable bottom plate k^{10}, sustained by adjusting-screws k^{11}, through which it may be raised and lowered. As a further means for arresting the rotation of the roll, I propose to use, when required, a friction-brake which in the form shown consists of a spring-arm k^{12}, fixed adjacent to the roll in position to encounter a pin k^{13} on the roll.

While I prefer to arrange the weight and dash-pot in the manner above described, the details may be modified, provided there is no essential change in their mode of operation. Fig. 11 presents one of these modifications, in which I use a special piston or plunger to enter the dash-pot. This piston k^{14} is provided with a rack-bar which engages the pinion k^{15} on the end of the impression-roll. In other respects the arrangement is the same as that in Fig. 10.

Referring again to the automatic wiping

mechanism, I may employ instead of a single wiping-frame of large size two frames of smaller size, each mounted upon two vertical crank-pins, as represented in Figs. 12 and 13, in which i' represents the wiper-frames, and i^2 their operating-cranks. The cranks of the two frames may be provided, as shown, with pinions and connected by intermediate pinions i^{16}. This arrangement causes the two frames to move in different paths and in reverse directions with movements very similar to those of the printer's hands in the ordinary operation of hand-wiping.

Having thus described my invention, what I claim is—

1. In a plate-press, and in combination with a bed moving in a right-angular path, a sliding buffer mounted in the path of the bed to check its motion in one direction and aid in guiding it in another, and means, substantially as shown, giving a yielding support to the buffer, so that it may retreat bodily under the impact of the bed.

2. In combination with a main frame or guide and a bed moving in an angular path thereover, a buffer mounted in the path of the bed to arrest its motion preparatory to its change of direction, and a weight urging the buffer toward the advancing bed.

3. In combination with the traveling bed and the track adapted to guide the same in an angular course, the yielding buffer, the underlying cylinder, its piston, the piston-rod connected with the buffer, and the retracting weight.

4. In a plate-press, and in combination with a plate-supporting bed movable in a rectangular path, an endless driving-chain, pulleys around which the chain is carried, and an arm equal in length to the radius of the pulleys, extended from the chain and pivoted at its end to the bed, whereby the pivotal connection of the arm to the bed is caused to coincide with the axis of the pulley and to serve as a center of motion for the arm as the latter passes around the pulley preparatory to a change in the course of the bed.

5. In a plate-press, the traveling bed, the endless driving-chain connected thereto, the chain-sustaining pulleys located at the corners of a rectangle to carry the chain and bed in a rectangular path, a driving-shaft, and intermediate gear connecting said shaft with the two chain-pulleys at diagonally-opposite corners of the rectangle, as described and shown.

6. In a plate-printing press, a traveling plate-sustaining bed and a pad or pressure-frame located immediately over the path of the bed, in combination with a long cloth or blanket extending beneath the pad to wipe the plate, winding-rolls whereon the ends of the blanket are wound, and a driving-roll acting against the blanket wound upon one of the winding-rolls and acting to drive the same by its friction thereon.

7. In combination with the wiping-blanket, the winding-roll i^{11}, the driving-roll i^{10}, the lever-pawl and ratchet-wheel for turning the driving-roll, the movable buffer in the path of the bed, and connections, substantially as shown, for transmitting motion from the buffer to the ratchet-lever, whereby the advance of the blanket is effected by the action of the bed upon the buffer.

8. In combination with the wiping-blanket, the two rolls whereon its ends are wound, the two rolls underlying the winding-rolls and in frictional contact with the blanket wound thereon, and the belt and pulleys connecting said underlying rolls, as shown.

9. In a plate-press, and in combination with the D-roll and a bed traveling thereunder, the blanket attached to the roll, the weight to unwind the blanket, and the dash-pot k^8 to aid in checking the momentum of the weight.

10. In a plate-press, a traveling bed, a D-roll above the same, a blanket attached at one end to said roll, a weight connected to said blanket and tending to unwind the same, with a suitable projection, as k^{13}, and the spring-brake acting in connection therewith to check the roll in its backward rotation.

11. In a plate-press, and in combination with a traveling bed and an impression-roll thereover, the blanket secured at one end to said roll, the weighted cord attached to the free end of the blanket and carried over a sustaining-pulley, and a dash pot or cup located in the path of the descending weight and in position to receive the same.

12. In combination with the D-roll and the vertically-moving weight connected thereto to turn it backward, the dash-pot having a vertically-movable bottom to limit the descent of the weight and determine the stopping-point of the roll.

13. In a plate-printing press, the rectangular frame formed in one piece with the tracks a' a^2 therein, in combination with the flanged tubular shaft-bearings passed vertically through the frame and bolted thereto.

GEO. C. HOWARD.

Witnesses:
OLIVER F. BUTTS,
JOHN M. HOWARD.