

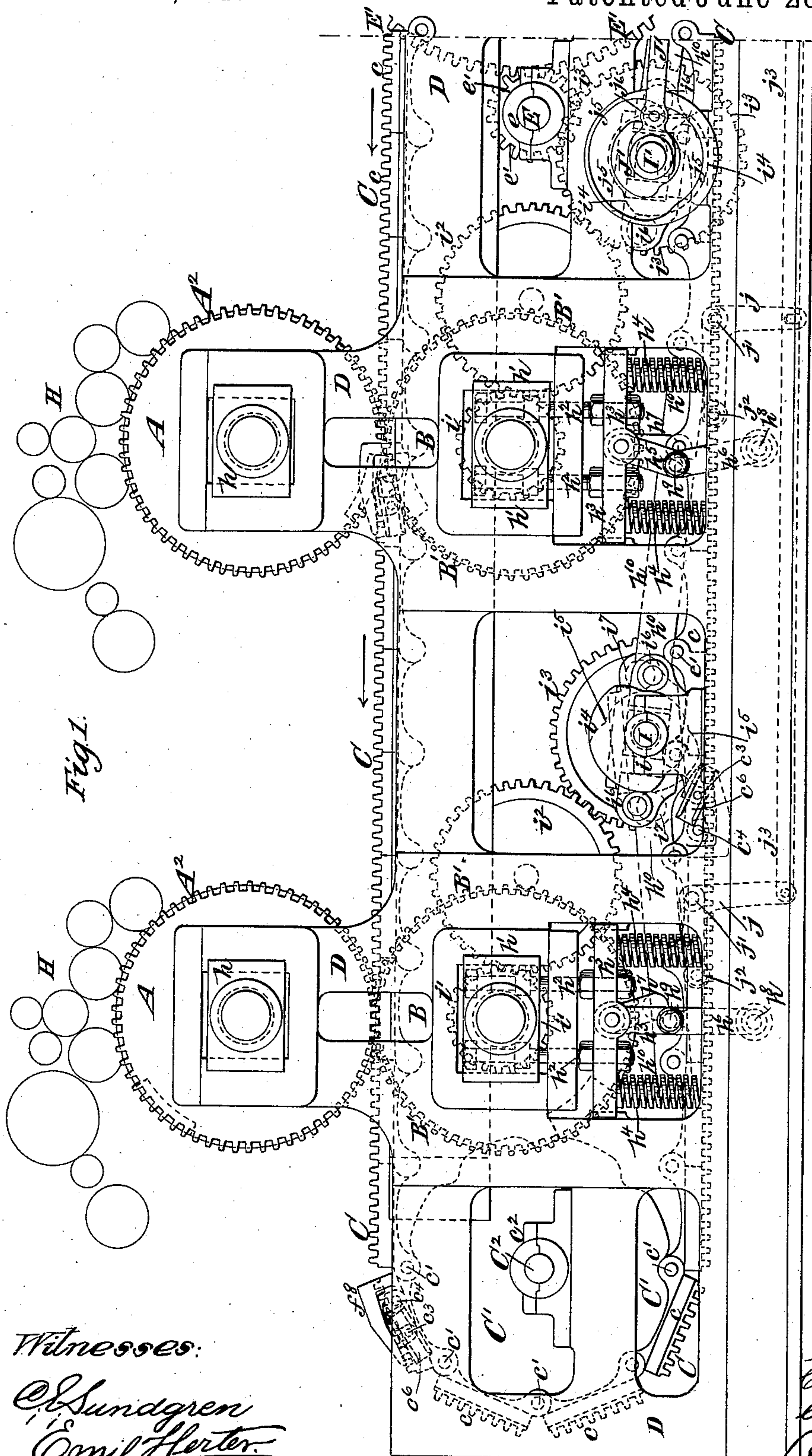
(No Model.)

5 Sheets—Sheet 1.

C. B. COTTRELL.  
CHROMATIC PRINTING MACHINE.

No. 365,581.

Patented June 28, 1887.



Witnesses:

*E. Sundgren*  
*Emil Hexter*

*Inventor:*  
*Calvert B. Cottrell*  
*by his attys*  
*Brown & Hall*

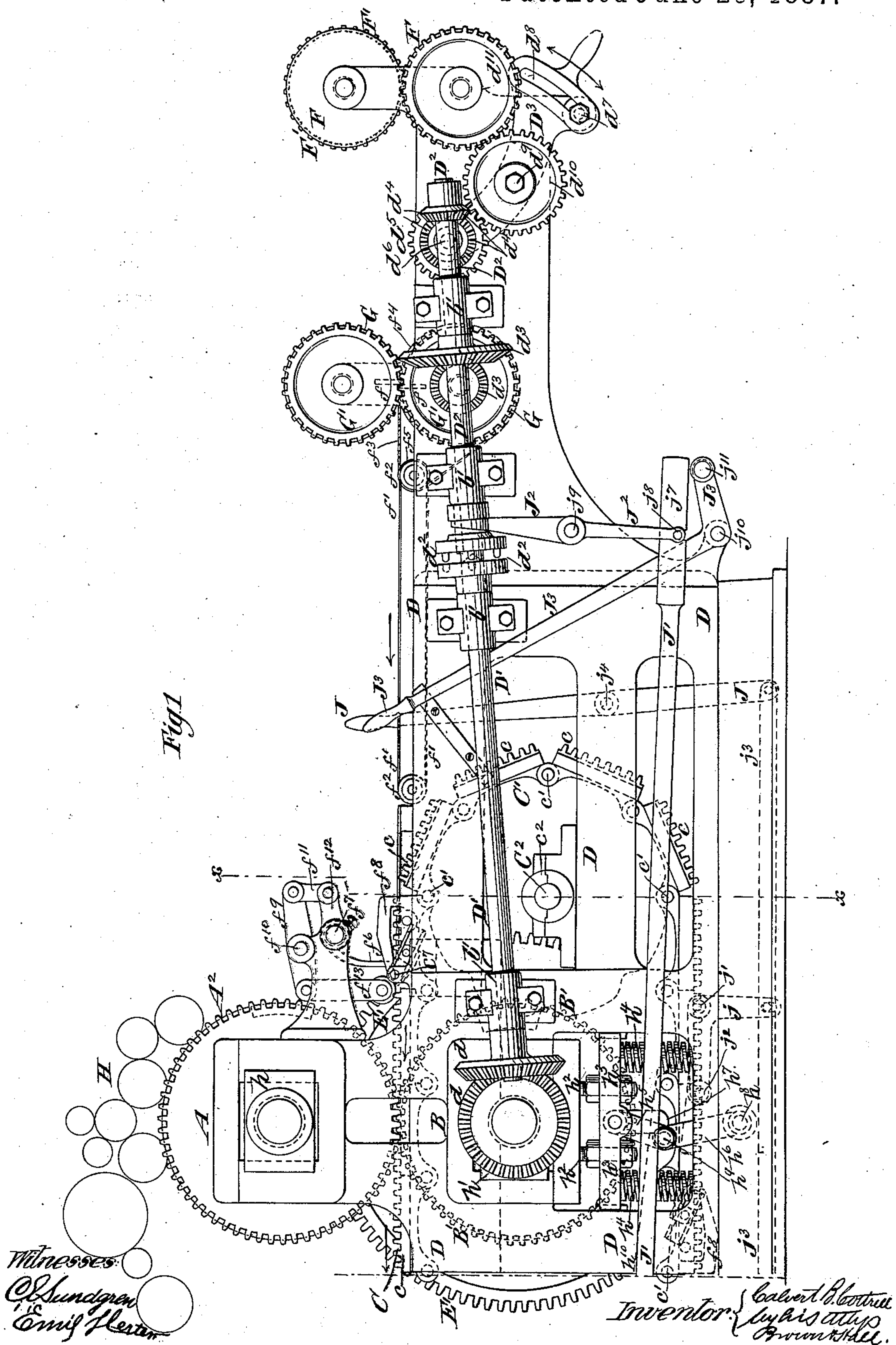
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5 Sheets—Sheet 2.

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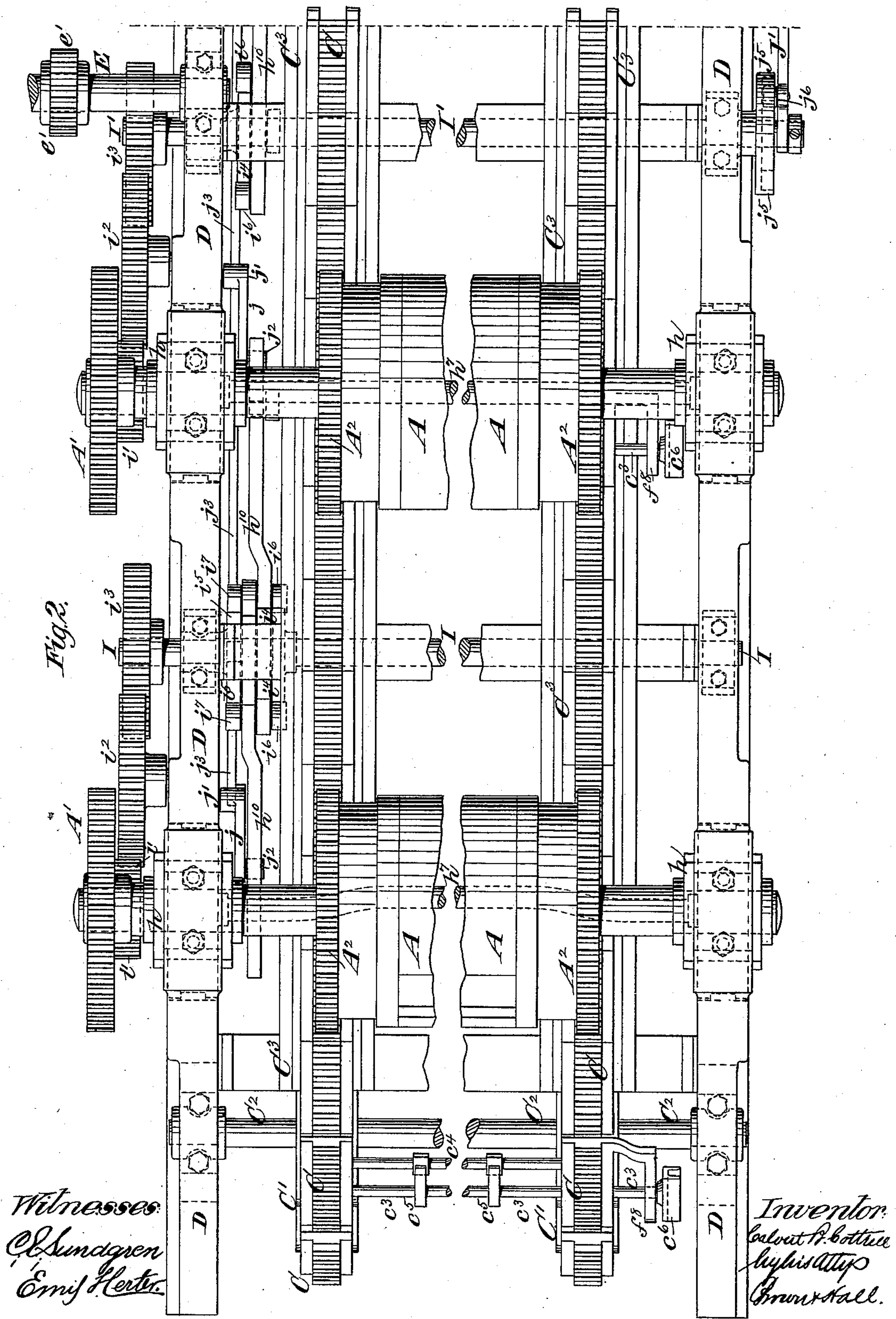
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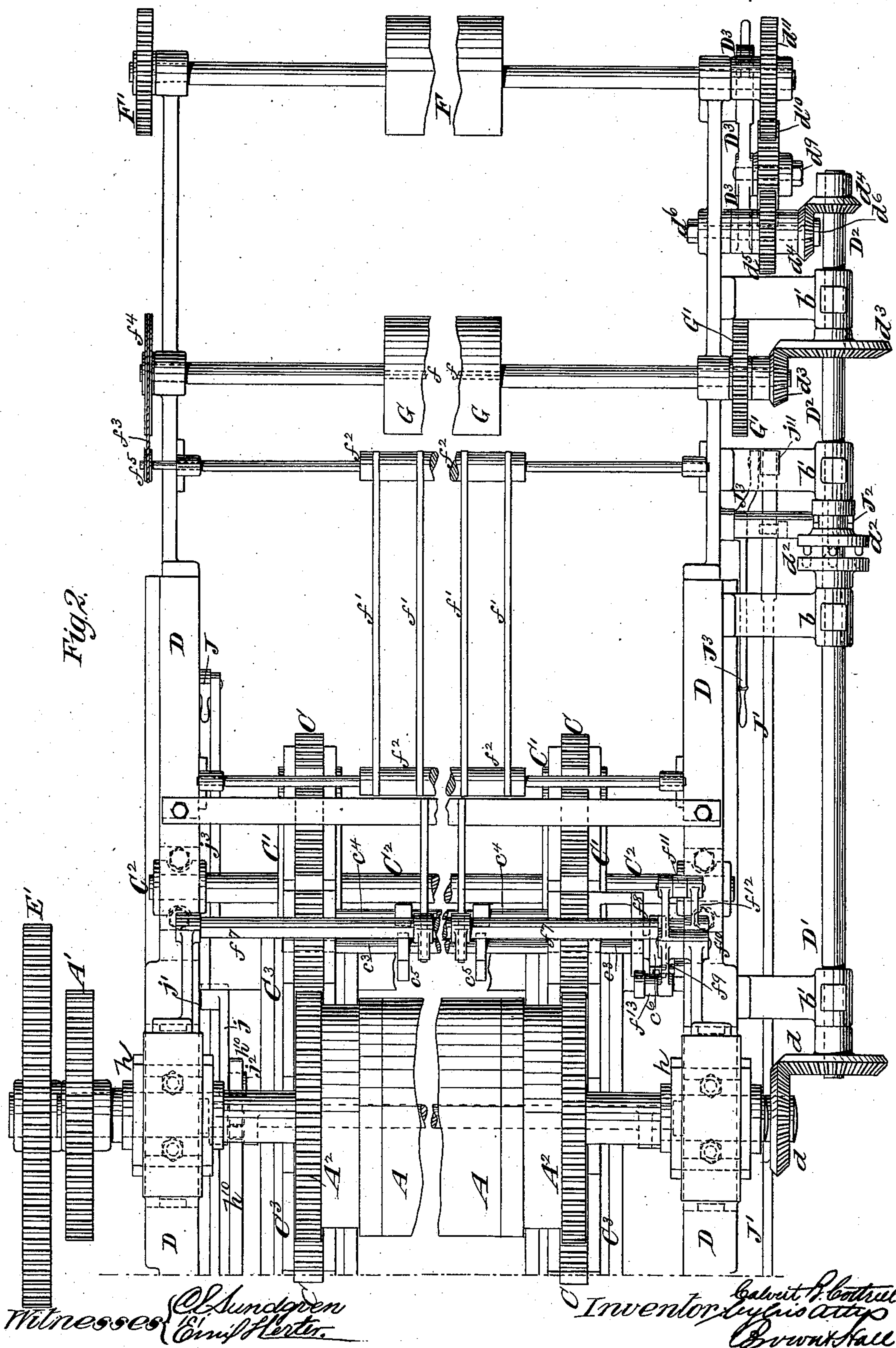
(No Model.)

5 Sheets—Sheet 4.

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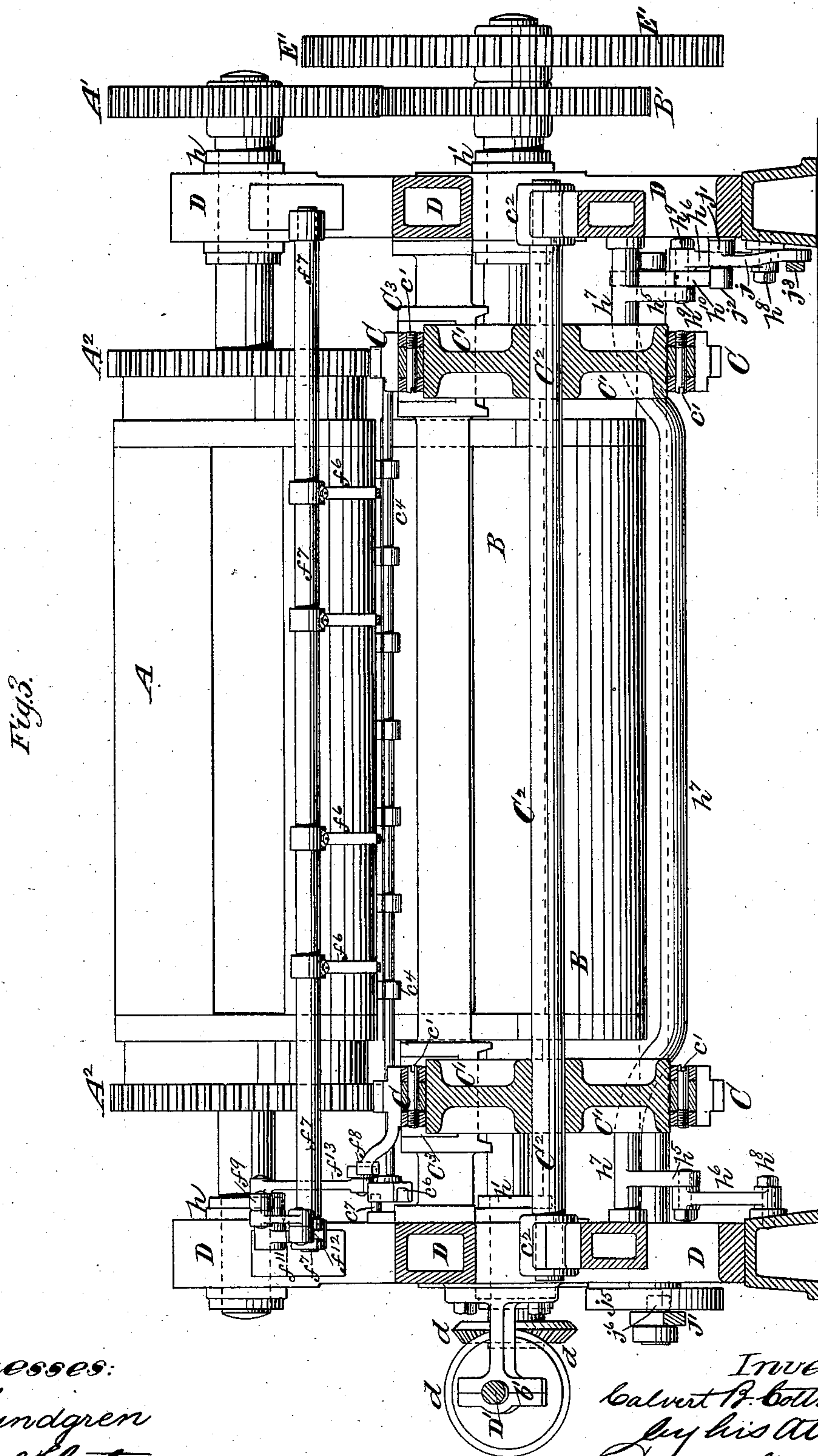
(No Model.)

5 Sheets—Sheet 5.

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# UNITED STATES PATENT OFFICE.

CALVERT B. COTTRELL, OF STONINGTON, CONNECTICUT.

## CHROMATIC-PRINTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 365,581, dated June 28, 1887.

Application filed February 11, 1887. Serial No. 227,271. (No model.)

*To all whom it may concern:*

Be it known that I, CALVERT B. COTTRELL, of Stonington, in the county of New London and State of Connecticut, have invented a new and useful Improvement in Chromatic-Printing Machines, of which the following is a specification.

My invention is applicable more particularly to color presses or machines used in printing two or more colors, and in which it is of the utmost importance to obtain the exact register of the type-forms; and the invention relates to machines in which the two or more pairs of type and impression cylinders are geared with and caused to rotate in exact synchronism by an endless spur-toothed rack, which is composed of rigid sections pivoted together and gears with a wheel upon one cylinder of each pair. Examples of this class of machines are shown in my United States Letters Patent Nos. 290,747 and 290,748, dated December 25, 1883. Usually two similar endless toothed racks are arranged at opposite sides of the machine, and between them extend a series of grippers for taking the sheets and drawing or carrying them through between the cylinders of the several pairs. Any wear upon the pins which connect the rack-sections will of course tend to lengthen the rack and to impair the register of the several type-forms upon the sheet, and also the smooth and accurate gearing of the rack with the several cylinders.

One feature of the invention consists in the combination, with pairs of type and impression cylinders and an endless spur-toothed rack geared with the cylinders and provided with grippers, of a driving gear-wheel, which may be a wheel upon one of the type-cylinders engaging the rack and arranged near the receiving end of the machine, whereby the rack in its upper travel will be moved with a pushing motion, and whereby any wear upon the pins connecting the rack-sections is prevented from affecting the length of the portion of the rack which is at any time operative, and the tooth-spaces at the junction of the rack-sections are maintained of uniform width.

The invention also consists in the combination, with pairs of type and impression cylinders and an endless spur-toothed rack geared with the cylinders and insuring their synchronous rotation and provided with grippers, of double-

rolling mechanism, whereby the cylinders of each pair may be periodically separated or moved one away from the other. In combination with the above I also employ an automatic feeding mechanism and cutting-cylinders, whereby the sheets may be cut from an endless web before they are taken by the grippers, which are moved by the rack or racks, and I provide in the shaft which transmits motion to the cutting-cylinders and the feed rolls or mechanism a clutch and connections from the double-rolling mechanism, whereby the clutch will be thrown off periodically when operating with double rolling.

The several features of my invention will be hereinafter more fully described, and pointed out in the claims.

In the accompanying drawings I have had to show each of the main figures upon two sheets, each showing about one-half the length of the machine, in order to illustrate my invention on as large a scale and as clearly as possible.

Figure 1, which is upon two sheets, is a side elevation of a machine embodying my invention. Fig. 2, also upon two sheets, is a plan of the machine; and Fig. 3 is a transverse section of the machine upon about the plane indicated by the dotted line *xx*, Fig. 1.

Similar letters of reference designate corresponding parts in the several figures.

A B designate type and impression cylinders, of which two or more pairs are employed, three pairs being here represented. The cylinders A B of each pair are connected by gear-wheels A' B', (best shown in Fig. 3,) so as to rotate synchronously; and one cylinder of each pair (in this example of my invention the type-cylinder A) has upon it at one or each end a wheel, A<sup>2</sup>, which gears with an endless toothed rack, C. I have here represented two similar racks arranged at opposite sides of the machine and gearing with wheels A<sup>2</sup> upon opposite ends of the type-cylinder. These racks C may be similar in construction to those shown and described in my aforesaid Letters Patent—that is to say, they may each be composed of rigid sections *c*, connected by pins or pivots *c'*, and abutting together at their ends when traveling in a straight line. At opposite ends of the machine are wheels C', which carry the racks, and which are mounted upon shafts C<sup>2</sup>, sup-



ported in suitable bearings,  $c^2$ , upon the main side frames, D, of the machine. The racks C, being in engagement with the wheels  $A^2$  upon the type-cylinder A, insure the synchronous rotation of such cylinders. In this example of my invention power is transmitted from an outside source to a driving-shaft, E, which is arranged in suitable bearings,  $e$ , upon the side frames, D, and which has upon it a pinion,  $e'$ , as shown in Figs. 1 and 3. This pinion engages a wheel,  $E'$ , upon the impression-cylinder B below, and thus drives said cylinder, and, through the wheels  $B' A'$ , transmits motion to the corresponding type-cylinder. These two cylinders just referred to are at the receiving end of the machine, and are the cylinders shown in the right-hand portion of Fig. 1, which is upon Sheet 2. The rack or racks C are operated by the type-cylinder A, in this example of my invention, which is at the receiving end of the machine, and the motion transmitted by the wheels  $A^2$  of this cylinder to the racks is by them transmitted in exactly equal degree to the other pairs of cylinders. An important advantage exists in driving the rack by a wheel engaging therewith at the receiving end of the machine, because the rack, in its operative or upper travel, is moved with a pushing force and in the direction of the arrows shown adjacent thereto in Fig. 1, and hence the effect of any wear upon the hinge-pins  $c'$  is neutralized, inasmuch as the sections are pushed one against another in their operation. The racks C in their upper travel are supported by bearers or channeled guides  $C^3$ , which project inward from the side frames, D, as is shown best in Fig. 3, and are thus held in proper gear with the wheels  $A^2$  upon the type-cylinders A.

The machine here represented is more particularly intended for taking paper from an endless web, feeding it forward at proper speed by a pair of feed-rolls, then severing the web transversely to form these separate sheets, which in this example of my invention are moved forward upon a series of tapes or an apron, as I shall describe, and are taken by grippers carried by the rack or racks. No particular description of these grippers is necessary, as they may be very similar to those which are shown and described in my aforesaid patent, No. 290,748. The racks C at opposite sides of the machine have extending between them a gripper-shaft,  $c^3$ , and a parallel rest-bar,  $c^4$ , and on the shaft  $c^3$  are grippers  $c^5$ . Upon the end of the gripper-shaft  $c^3$  is a tripping-cam,  $c^6$ , of ordinary construction, and upon the side frame of the press is a pin or roller,  $c^7$ , with which the cam engages, in order to trip the grippers and close them upon the sheet presented to them, as hereinafter described. The racks C are provided with several pairs of grippers, and the sheets after being cut off follow each other as closely as possible between the type and impression cylinders.

F designates a pair of feed-rolls, which are arranged at the receiving end of the machine, (shown in the right-hand portion of Fig. 1,) and

which are connected by gears  $F'$ , so as to rotate synchronously; and G designates a pair of cutting-cylinders or cutter-cylinders, carrying blades or cutters  $f$ , which operate in connection with each other to cut the web of paper fed forward by the rollers F. The cutting-cylinders G are geared together by wheels  $G'$ , and although these cylinders are here shown as substantially complete cylindric bodies, I desire to include by the term "cutter-cylinders" any rotary knife-carriers which comprise shafts and which operate to cut the sheet. Between the cutting-cylinders G and the point where the grippers  $c^5$  take the sheet I have represented a series of endless tapes,  $f'$ , which are mounted upon suitable rollers,  $f^2$ , and which may be operated by a belt,  $f^3$ , leading from a pulley,  $f^1$ , on one of the cutter-cylinder shafts G to a pulley,  $f^5$ , on the shaft of one of the rollers  $f^2$ . The motion thus given the tapes  $f'$  in the direction of the arrows shown thereon in Fig. 1 serves to carry the cut sheet forward to the receiving-point and against the feed-gages  $f^6$ , which are secured upon the shaft  $f^7$ . The feed-gages  $f^6$  may be lifted by the cam  $f^8$  upon one of the racks C, and which is shown in Fig. 1. The connections through which this cam operates are here represented as consisting of a beam or lever,  $f^9$ , fulcrumed at  $f^{10}$ , and connected at one end by a link,  $f^{11}$ , with an arm,  $f^{12}$ , on the rock-shaft  $f^7$ , and having at the other end a rod,  $f^{13}$ , which carries a roller within the path of the cam  $f^8$ . As the grippers come to the receiving-point, the cam  $f^8$  acts to lift the feed-gages  $f^6$ , and the sheet is taken by the grippers and carried forward between the cylinders of the several pairs by the movement of the racks.

In this example of my invention motion is transmitted to the feeding and cutting mechanism from the shaft of the lower impression-cylinder through bevel-wheels  $d$  and a diagonal shaft,  $D' D^2$ , which is mounted in suitable bearings,  $b'$ , and comprises a clutch,  $d^2$ , whereby the two sections of the shaft may be connected, so as to rotate in unison, or disconnected, so as to cause the stoppage of the feeding and cutting mechanism. The cutter-cylinders G may be operated by the section  $D^2$  of the shaft, which is beyond the clutch  $d^2$ , and through bevel-wheels  $d^3$  and through other bevel-wheels,  $d^4$ , the shaft transmits motion to a spur-pinion,  $d^5$ , which is mounted upon a fixed stud,  $d^6$ . Upon this stud  $d^6$  is also hung or fulcrumed a lever,  $D^3$ , which may be swung in the directions indicated by the double-headed arrow thereon in Fig. 1; but it may be clamped in any desired position after adjustment by a bolt,  $d^7$ , received in a slot,  $d^8$ . The lever  $D^3$  carries upon a stud,  $d^9$ , a wheel,  $d^{10}$ , which is in engagement with the pinion  $d^5$ , and which also gears with a wheel,  $d^{11}$ , on the lower feed-roll, F. The wheel  $d^{10}$  always being in engagement with the pinion  $d^5$ , it is obvious that the lever  $D^3$  may be swung upon its fulcrum, so as to engage with a larger or smaller wheel,  $d^{11}$ , upon the lower roll-shaft, F, and by changing



the wheel  $d^{11}$  for one larger or smaller I provide for varying the speed of the feed-rolls F.

I have shown in Fig. 1, in simple outline, a system of inking-rollers, H, for each type-cylinder; but I have not thought it necessary to show these rollers and the mechanism for operating them in detail, as my invention in no way relates to them, and they may be of any well-known or suitable character.

I provide means in my machine whereby it may be operated when double-rolling the cylinders. I have here shown the shafts of the type-cylinder A as supported in stationary boxes  $h$  in the side frames, D, while the shafts of the impression-cylinders B are journaled in boxes  $h'$ , which permit of a slight rising and falling movement. The boxes  $h'$  are connected by rods  $h^2$  with a cross-head,  $h^3$ , and upon this cross-head springs  $h^4$  act to raise the impression-cylinder into working contact with the type-cylinder. I have here shown toggle-arms  $h^5 h^6$ , for connecting the cross-head  $h^3$  with a fixed point on the press-frame, in order to raise and lower the boxes of the impression-cylinder. The toggles or levers  $h^5$  are upon the rock-shaft  $h^7$ , which is bent, as shown in Fig. 3, to pass under the cylinder B, and is at opposite ends journaled in the cross-heads  $h^3$ . The arms  $h^6$  are pivoted at  $h^8$  to the side frames, D, and, with the center joint or pin,  $h^9$ , of the toggles, engages a cam-actuated rod or bar,  $h^{10}$ , formed with a gab-hook to engage said pin, and which may be lifted off the pin when desired to operate with single rolling.

I have here represented double-rolling shafts I I', mounted in suitable bearings,  $i$ , upon the frames, and the shaft I serves to operate two cam-actuated bars,  $h^{10}$ , extending in opposite directions, for raising and lowering the impression-cylinders on opposite sides of it, while the shaft I' simply operates the double-rolling attachment of the first impression-cylinder. Motion is transmitted to each of the shafts I I' by a pinion,  $i'$ , upon the shaft of the impression-cylinder B, engaging a wheel,  $i^2$ , and the wheel  $i^2$  engages a wheel,  $i^3$ , upon the double-rolling shaft I or I'. Upon the shaft I are two cams,  $i^4 i^5$ , which are of proper shape, and which engage rollers  $i^6 i^7$  upon the bars  $h^{10}$ , and by these cams the proper motion is transmitted to the boxes of the impression-cylinders for double rolling. Upon the shaft I' is a single cam,  $i^4$ , which operates upon rollers  $i^6$  on the bar  $h^{10}$ , which operates the double-rolling attachment for the first impression-cylinder at the receiving end of the machine. For the purpose of raising the cam-actuated bars  $h^{10}$  when double rolling is not desired, and in order to lift their gab-hooks off the center joint-pins,  $h^9$ , of the toggles  $h^5 h^6$ , I have represented bell-crank levers  $j$ , which are fulcrumed at  $j'$ , and one arm of each of which carries a roller,  $j^2$ , underlying the bar  $h^{10}$ , while the other arms of said levers are connected by a rod,  $j^3$ , with the hand-lever J, which is fulcrumed at  $j^4$ . When the hand-lever J is operated to lift the several gab-hooks of the bars  $h^{10}$ , the cross-

heads  $h^3$  and the boxes  $h'$  of the impression-cylinders B will be at once raised by the springs  $h^4$  and maintained in raised position for single rolling. When desired to operate the machine with double rolling, the lever J is operated to permit the gab-hooks of all the bars  $h^{10}$  to drop onto the joint-pins  $h^9$  of the toggles  $h^5 h^6$ , and the wheels  $i^2$  being double the size of the pinions  $i'$ , the machines will be operated with double rolling; or, in other words, the impression-cylinder will be permitted to come into operative position only during alternate revolutions. When operating with double rolling, it is of course necessary to stop the feed-rolls during each alternate revolution, and it is also preferable to stop the cutter-cylinders G. Upon the shaft I' is a cam,  $j^5$ , here represented as having a groove in its face, which receives a truck-roll,  $j^6$ , upon the bar J', and this bar has at its rear end a gab-hook,  $j^7$ , which engages a pin,  $j^8$ , upon the lever J', which is fulcrumed at  $j^9$ , and engages by its upper end the clutch  $d^2$ . By this mechanism the section D' of the shaft from which the feed-rolls and the cutter-cylinders F G derive motion will be stopped during alternate revolutions of the cylinder. When operating with single rolling, however, the clutch  $d^2$  should not be thrown off, but should constantly connect the shaft-sections D' D', and I have shown a hand-lever, J', fulcrumed at  $j^{10}$ , and having an arm provided with a truck-roll,  $j^{11}$ , which underlies the gab-hook  $j^7$ , and provides for lifting it when desired.

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

1. The combination, with pairs of type and impression cylinders and an endless spur-toothed rack geared with said cylinders and provided with grippers, of a driving gear-wheel engaging the rack and arranged near the receiving end of the machine, whereby the rack in its upper travel will be moved with a pushing motion, substantially as and for the purpose herein described.

2. The combination, with pairs of type and impression cylinders and a spur-toothed endless rack, with which the cylinders are geared, and whereby their synchronous rotation is insured, and which is provided with grippers, of gearing whereby rotary motion from an outside source may be transmitted to the type-cylinder at the receiving end of the machine, whereby the rack in its upper travel will be operated with a pushing motion, substantially as and for the purpose herein described.

3. The combination, with pairs of type and impression cylinders and an endless spur-toothed rack geared with the cylinders and insuring their synchronous rotation and provided with grippers, of double-rolling mechanism, substantially as described, whereby the cylinders of each pair may be periodically separated or moved one away from the other, substantially as herein described.

4. The combination, with pairs of type and impression cylinders and an endless spur-toothed rack geared with the cylinders and in-



surings their synchronous rotation and provided with grippers, of double-rolling mechanism, both substantially as described, and an automatic feeding mechanism connected and  
5 combined to effect the stopping of the feed periodically when operating with double rolling, substantially as herein described.

5. The combination, with pairs of type and impression cylinders and an endless spur-  
10 toothed rack geared with the cylinders to insure their synchronous rotation and provided with grippers, of a pair of rotary cutting-cylinders and a pair of feed-rolls, double-rolling mechanism, substantially as described, for  
15 separating the cylinders of each pair, a shaft geared with the type and impression cylinders and with the cutting-cylinders and feed-rolls, and comprising a clutch and connections from the double-rolling mechanism, whereby the  
20 clutch will be thrown off periodically when operating with double rolling, substantially as herein described.

6. The combination, with pairs of type and impression cylinders and an endless toothed

rack geared with the cylinders to insure their 25 synchronous motion and provided with grippers, of double-rolling mechanism, cutting-cylinders, and feed-rolls, the shaft  $D'$   $D^2$ , comprising a clutch,  $d^2$ , and gearing for operating the cutting-cylinders and feed-rolls, the clutch- 30 lever  $J^2$ , and the cam-actuated rod for transmitting from a double-rolling shaft motion for operating the clutch, substantially as herein described.

7. The combination, with pairs of type and 35 impression cylinders and an endless toothed rack geared with the cylinders and provided with grippers, of double-rolling shafts and cam-actuated rods for operating the machine with double rolling, and a lever and connec- 40 tions whereby the several rods may be raised and lowered simultaneously, substantially as herein described.

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