(No Model.) 5 Sheets—Sheet 1.

C. B. COTTRELL.

DELIVERY APPARATUS FOR PRINTING MACHINES.

No. 442,862. Patented Dec. 16, 1890.

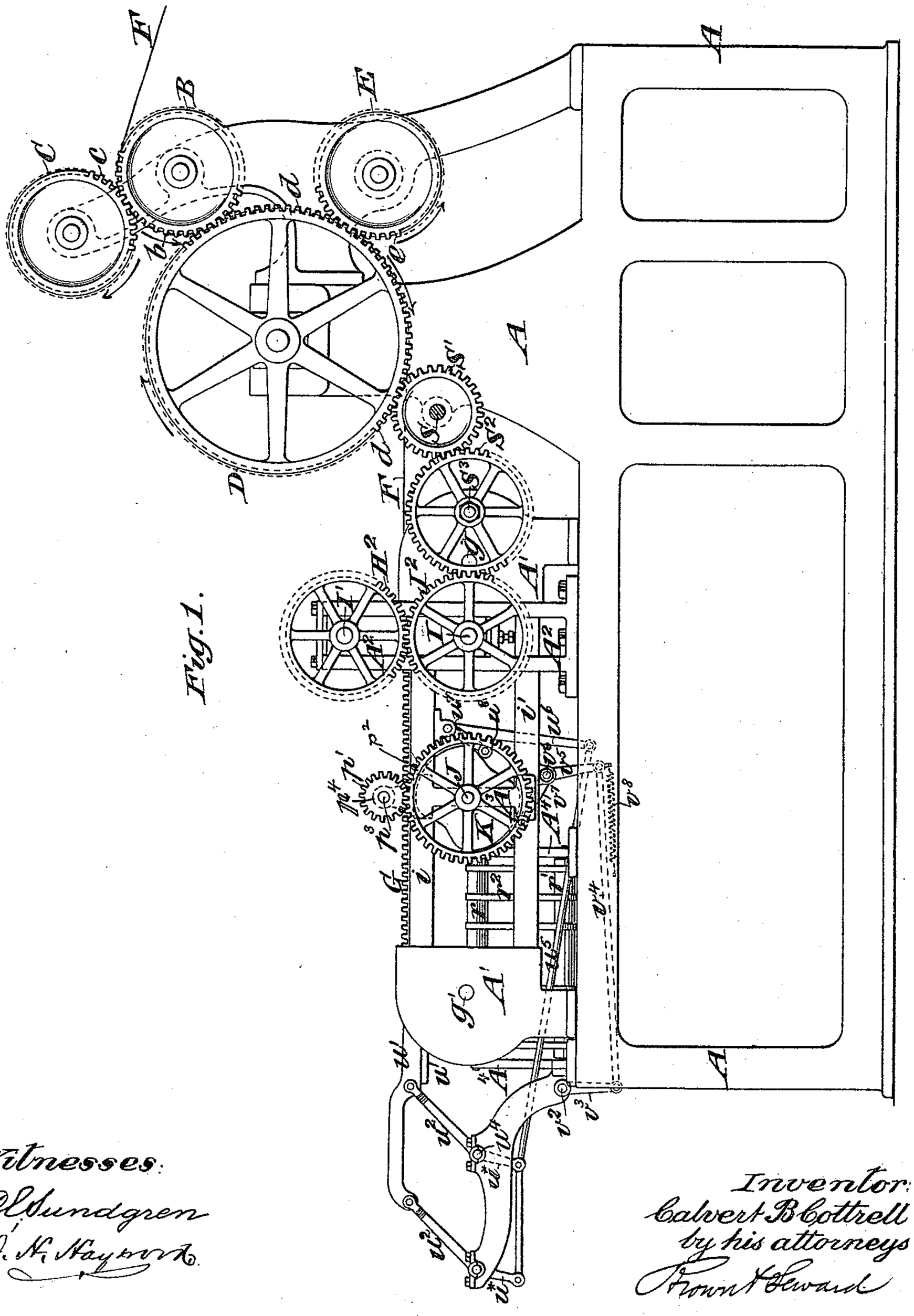

Fig. 1.

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(No Model.) 5 Sheets—Sheet 2.

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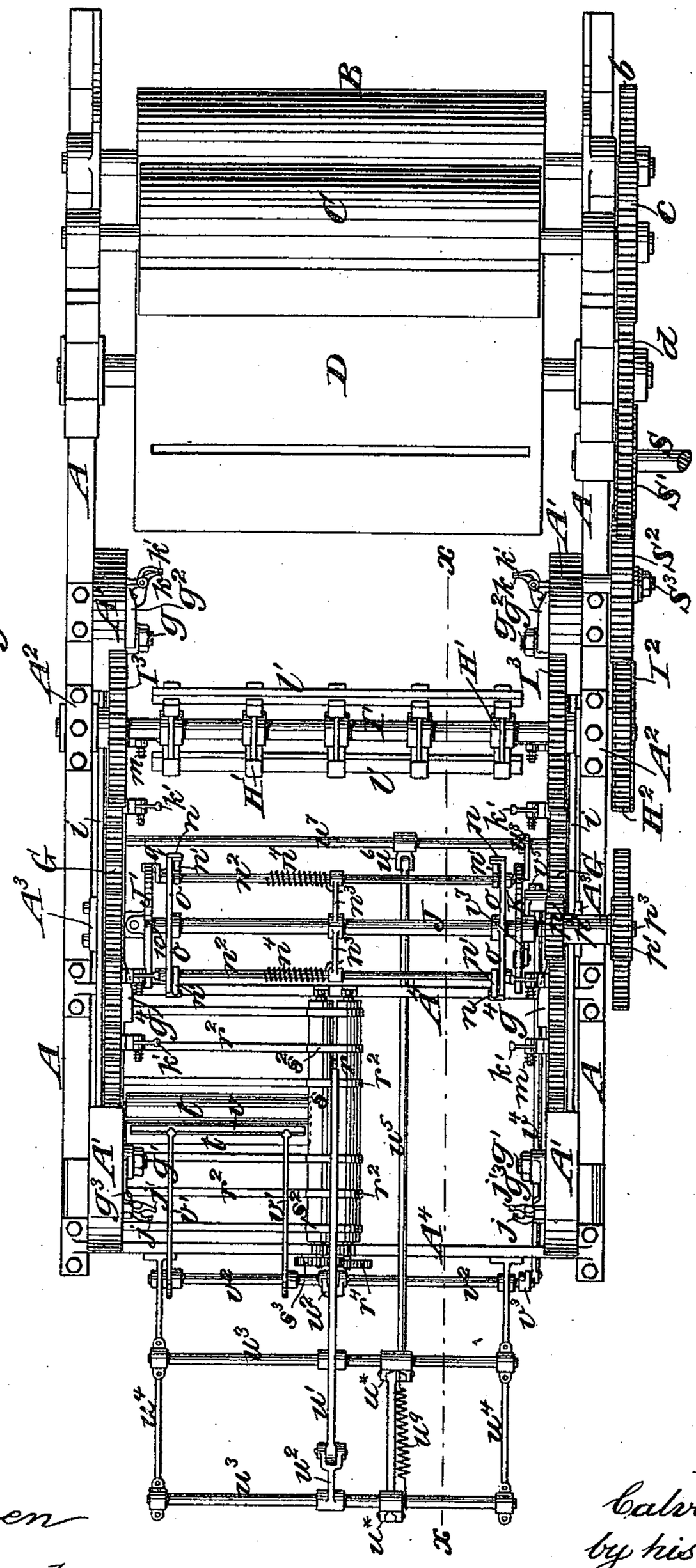
No. 442,862. Patented Dec. 16, 1890.

Fig. 2.



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(No Model.) 5 Sheets—Sheet 3.

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DELIVERY APPARATUS FOR PRINTING MACHINES.

No. 442,862. Patented Dec. 16, 1890.

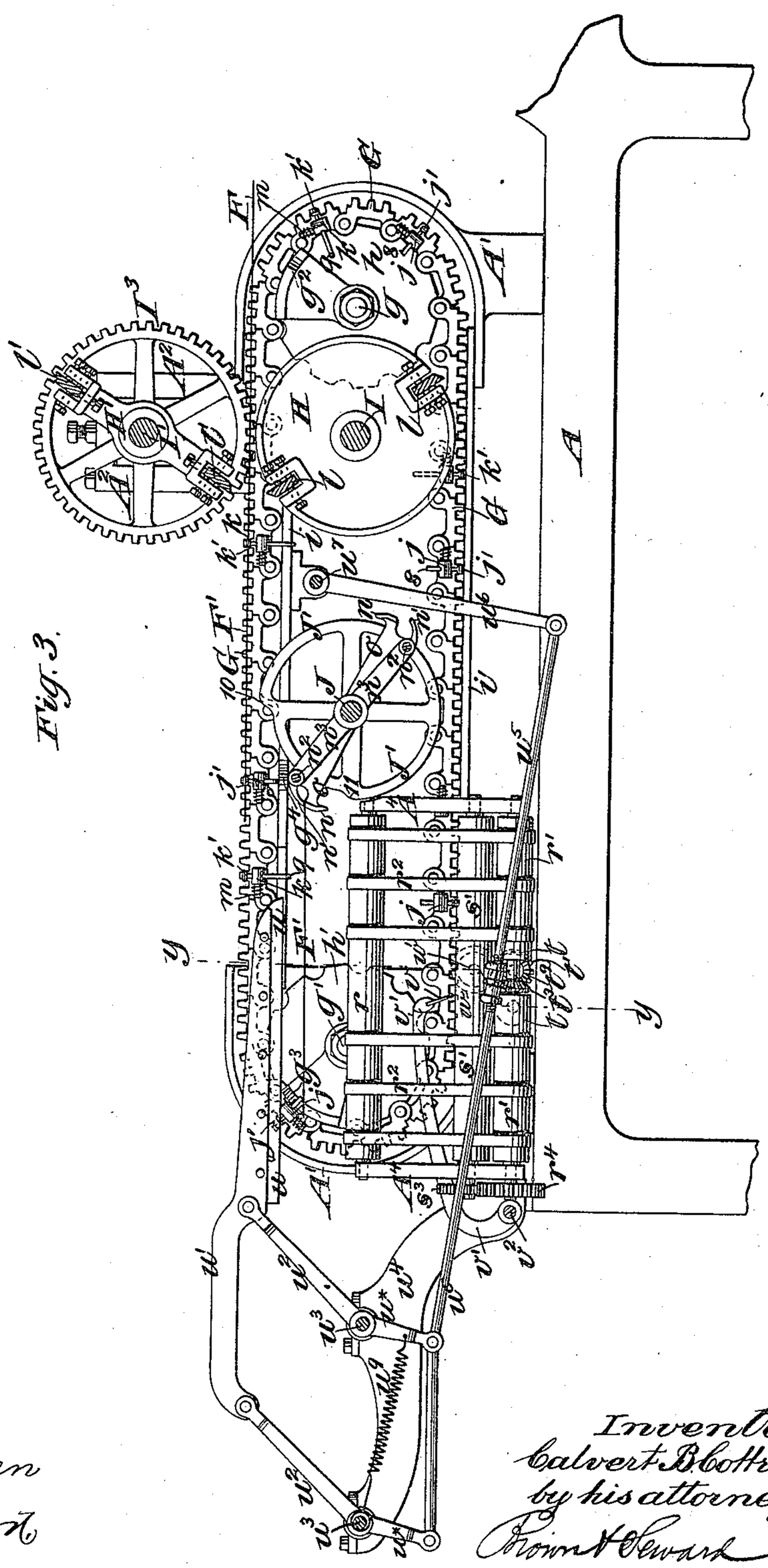

Fig. 3.

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(No Model.) 5 Sheets—Sheet 4.

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Fig. 5.

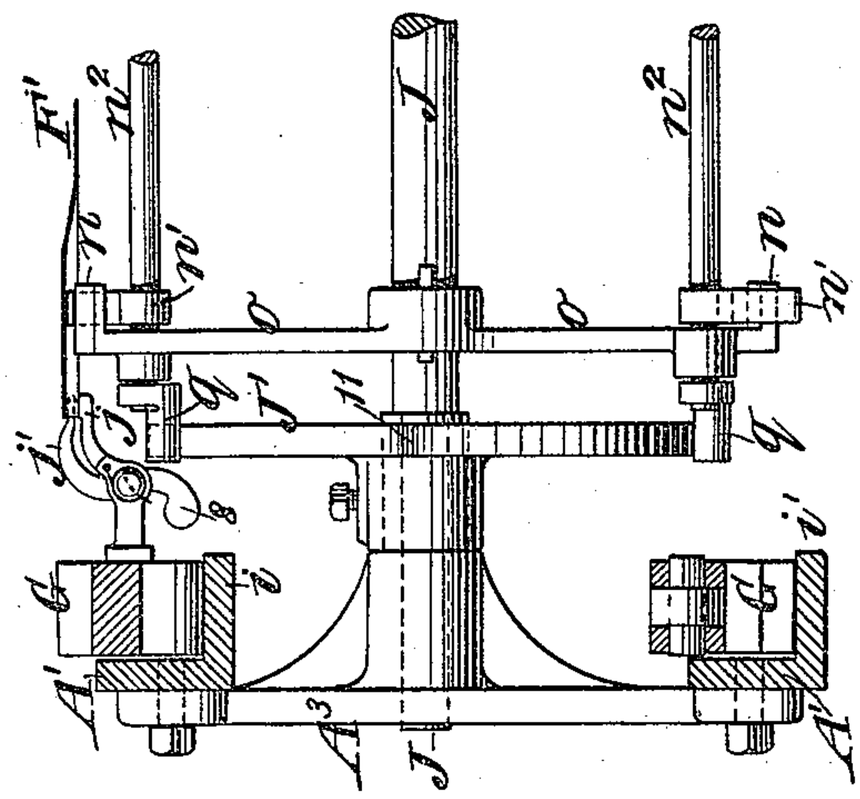

Fig. 7.

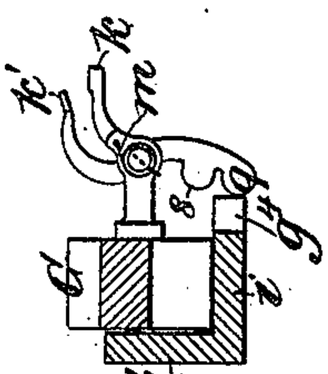

Fig. 4.

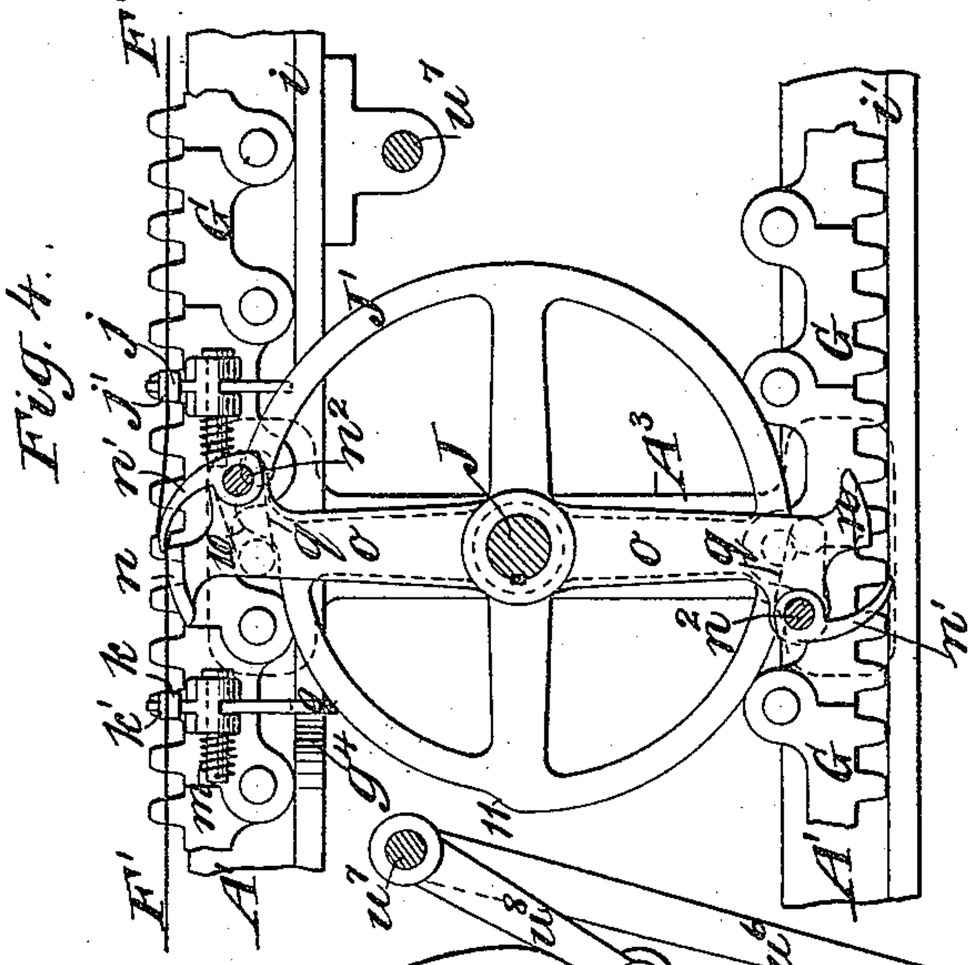

Fig. 8.

Fig. 6.

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DELIVERY APPARATUS FOR PRINTING MACHINES.

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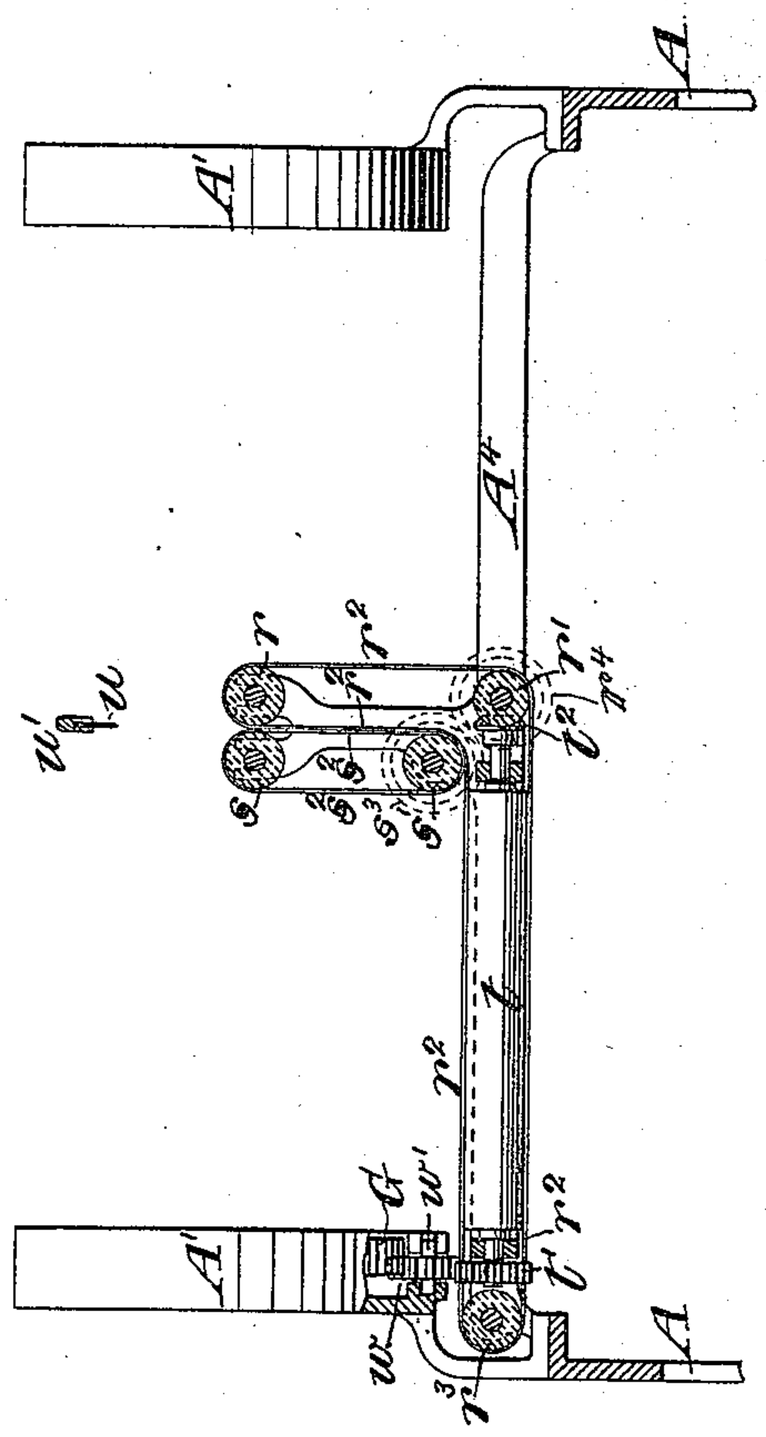
Fig. 9.



Witnesses:
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UNITED STATES PATENT OFFICE.

CALVERT B. COTTRELL, OF WESTERLY, RHODE ISLAND.

DELIVERY APPARATUS FOR PRINTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 442,862, dated December 16, 1890.

Application filed April 19, 1890. Serial No. 348,721. (No model.)

To all whom it may concern:

Be it known that I, CALVERT B. COTTRELL, of Westerly, in the county of Washington and State of Rhode Island, have invented a new and useful Improvement in Delivery Apparatus for Printing-Machines, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to rotary printing-machines in which the paper to be printed is supplied to the cylinders from a roll or continuous web and after having been printed is cut into sheets, which are delivered to a folding apparatus or to a receiving-table.

I will first describe my invention with reference to the accompanying drawings, and afterward point out its novelty in claims.

Figure 1 represents a side elevation of a perfecting-machine embodying my invention. Fig. 2 is a plan view of the same. Fig. 3 is a longitudinal vertical sectional view in the line *x x* of Fig. 2, showing the cutting apparatus, the delivery apparatus, and a folding apparatus on a larger scale than Figs. 1 and 2. Fig. 4 is a side view, on a still larger scale than Fig. 3, of parts of the delivery apparatus, which will be hereinafter explained. Fig. 5 is a sectional view corresponding with Fig. 4, taken at right angles thereto. Fig. 6 is a side view of part of the folding apparatus. Fig. 7 is a transverse sectional view of one of the endless gripper-carrying racks, which constitute part of the delivery apparatus, and a pair of grippers attached thereto. Fig. 8 is a detail view, to be hereinafter explained. Fig. 9 is a transverse sectional view taken nearly in the line *y y* of Fig. 3 to show the folding apparatus.

Similar letters and numbers of reference designate corresponding parts in all the figures.

A designates the main framing of the machine, which contains the bearings for the cylinders B C D E, of which B is the first impression-cylinder, C the first form-cylinder, D the second impression-cylinder, and E the second form-cylinder, and all of which are geared together by gears *b c d e* to rotate in the direction of the arrows, which are shown near them in Fig. 1, the whole deriving motion from the main shaft S of the machine through a gear S′ on the said shaft gearing with the spur-gear *d*, as shown in Figs. 1 and 2.

F is the web of paper supplied from a suitably-placed roll (not shown) and passing between the cylinders B and C downward between the cylinders D E and under the cylinder D to the delivery apparatus, which I will now proceed to describe.

A′ A′ are frames, erected one upon each of the side frames A of the main framing forward of the impression-cylinder D, for the support of the endless carrier, which is represented as consisting of two endless toothed racks or chains with attached grippers *j j′* and *k k′*. The said frames have secured in them studs *g g′*—one near each end of each frame—for the support of the wheels *h h′*, which carry the said endless racks, and have also provided in them parallel horizontal ways *i i′* for the support of those portions of the endless racks between the said carrying-wheels. The said endless racks are driven from the spur-gear S′ of the main shaft S through gearing which will be presently described, so that their upper parts, which are nearly on a level with the bottom of the impression-cylinder D, run in a direction away from the said cylinder. The said racks are each furnished on their inner sides with two series of grippers *j j′* and *k k′*, which are presented transversely to the length of the racks for the purpose of taking hold of the side edges of the printed web after the latter has passed the cylinder D.

H H′ represent two rotary cutter-heads furnished with cutting-blades *l l′*. These heads are mounted on shafts I I′, supported in bearings in the frames A^2 A^2, erected upon the side frames A a little distance forward of the carrying-wheels *h*. The height at which these shafts are respectively supported in their bearings is such that the edges of the cutting-blades of the two cutter-heads will meet in their rotation about on a level with the web of paper which is being carried away from the cylinder D by the grippers *j j′* and *k k′* and will cut the web into sheets.

The lower cutter-shaft I is furnished with a spur-gear I^2, which is geared with and derives rotary motion from the spur-gear S′ on the driving-shaft through an intermediate gear S^2, which runs on a fixed stud S^3, se-

cured in one of the frames A′, and the said gear I^2 communicates motion to the upper cutter-shaft I′ through a spur-gear H^2 on the said shaft, so that both cutter-shafts and their heads rotate at the same velocity. The upper cutter-shaft I′ also carries two spur-gears I^3, which gear with and drive the the endless racks G at the same velocity as that of the surfaces of the several cylinders, the cutter-shafts at the same time having such velocity imparted to them that a pair of cutting-blades—one on each cutter-head—will come into operation upon the web carried by the grippers *j j′* and *k k′* of the endless carrier at intervals corresponding with the length of the sheets to be cut. The grippers of the series *j j′*, which I term the "front grippers," are set on their respective chains at a distance apart in a direction lengthwise of the racks equal to the length of the sheets to be cut, and those of the series *k k′*, which I term the "rear grippers," are similarly arranged with respect to each other. Two opposite front grippers *j j′* and two opposite rear grippers *k k′* constitute a set for taking a sheet, the rear grippers being set at a distance behind the front ones somewhat less than the length of the sheet to be cut, so that the four grippers of a set hold the cut sheets near their four corners. The opening of these grippers to take the web as it passes between the cylinder D and the cutters is effected by two stationary cams g^2, which are firmly secured one to each of the fixed studs *g* on which the carrying-wheels *h* turn. The opening of the front grippers *j j′* to let go the forward ends of the sheets is effected by means of two stationary cams g^3, secured to the fixed studs *g′*, on which the carrying-wheels *h′* work. The opening of the rear grippers *k k′* to let go the rear ends of the sheets is effected by means of stationary cams g^4, which consist of projections on the inner edges of the ways *i i*, the several opening operations being produced by the grippers passing in contact with the said stationary cams as they are carried along by the endless racks. Each pair of grippers is provided with a closing-spring *m*, by which its jaws are kept closed.

The grippers *j j′* and *k k′*, as shown in Figs. 4, 5, and 7, are substantially like those now employed on endless chains and endless racks in sheet-delivery apparatus, and therefore need no particular description here, further than to say that the heels 8 of the movable members of the front grippers *j j′*, as will be seen by comparison of Figs. 4, 5, and 7, are shorter than the heels 8 9 of the movable members *h′* of the rear grippers in order that the front grippers may be opened by the cams g^2 g^3, but will pass the cams g^4 without opening, and that the rear grippers *k k′* may be opened by all the cams as they pass by them. It will be seen on reference to Fig. 3 that the cams g^4 are so much farther from the line of travel of the grippers than the cams g^2 g^3 that their short heels 8, though within range of the cams g^2 g^3, will not reach the cams g^4; but the elongated portions 9 of the heels of the rear grippers will reach the said cams g^4 while the portions 8 of the said heels are in range with the cams g^2 g^3.

At a distance not less than the intended length of the sheets to be cut forward of the cutter-shafts or farther from the cylinder D there is arranged within the endless carrier a horizontal rotary shaft J, which is supported in bearings in uprights A^3, secured to the side frames A′. This shaft has rigidly secured to it near each one of the endless racks G two arms *o* projecting in opposite directions and carrying grippers *n n′* for taking hold of the rear edges of the cut sheets F′ in the endless carrier between the rear grippers *k k′* of one set and the front grippers *j j′* of the next set, as shown in Fig. 4. One member *n* of the said grippers is formed directly upon the end of one one of said arms *o*, and the other member *n′* is secured to one of two horizontal rods n^2, which are free to rock in bearings in the said arms *o*. The said grippers *n n′* are arranged to pass just within the points of the grippers of the endless carrier. Additional bearings, one for each of the gripper-rods n^2, are provided in arms n^3, rigidly secured to the rotary shaft J. Springs n^4, coiled round said gripper-rods n^2 and secured to said rods and to said arms, are provided for the purpose of turning said rods in a direction to close members *n′* of the grippers upon the members *n*, as shown in Fig. 2. The rotary motion of the gripper-shaft is derived from the endless racks G through three gears *p p′* p^2, the gears *p p′*, which are represented as of equal size, being both fast upon a short shaft p^3, which turns in a box p^4, (see Figs. 1 and 2,) provided on the top of one of the uprights A^3, carried by the side frames A′, the said gear *p* gearing directly with the teeth of the endless racks and the gear *p′* gearing with the gear p^2, which is fast on the shaft J. The velocity of the rotary motion of the gripper-shaft is such that the velocity of the members *n* of its grippers, and also the velocity of the member *n′*, so far as the latter derives motion through the shaft, is the same as the velocity of the endless carrier.

For opening the grippers *n n′* at the proper time to take the rear edges of the cut sheets F′, a stationary cam J′ is secured to one of the uprights A^3, and arms *q* (represented in Fig. 8 and also dotted in Fig. 4) are provided on the said rods n^2 to run upon the periphery of this cam.

The operation of delivering the printed web, cutting it into sheets, and afterward delivering the cut sheets is as follows: The web coming from the impression-cylinder D is taken by the several grippers *j j′* and *k k′* on the endless chains as they successively rise with the endless carrier over the carrying-wheels *h*, and are first opened by the cams g^2 to receive its edges, and are afterward closed thereon by their springs *m*. As the web

passes between the cutters it is cut into lengths to form the sheets, and the cut sheets are still retained by the grippers $j\ j'$ and $k\ k'$ until the rotary grippers come into operation, as shown in Fig. 4, to take the rear edges of the sheets. These grippers $n\ n'$ arrive at the cuts of the web in an open condition by reason of the arms q of their movable members being on the higher part of the periphery of the cam J, and the members n of the said grippers pass under the rear edge of the advanced sheet without lifting it, while the open members n' pass under the front end of the next sheet and lift the said end. Just as the points of the members n' arrive at or very near the edges the arms q of the gripper-rods pass the upper step 10 of the cam J′ and the springs n^4 close the said members, and in so doing produce an accelerated forward movement of the points thereof, by which they are caused to pass far enough over the rear edge of the advanced sheet to take a good hold thereof. As the sheets are thus taken by the rotary grippers, the rear grippers $k\ k'$ of the endless carrier are opened to release them by passing the stationary cams g^4, while the front grippers, still remaining closed, retain their hold until they begin to descend with the endless carrier over the wheels h', and are opened by passing the stationary cams g^3. As this opening takes place the rotary grippers also open by their arms q passing the lower step 11 of the cam J. The sheet when thus released is in a nearly-horizontal position, as shown at F^2 in Fig. 3, and subject to a positive downward motion at both ends, whereby it may be deposited in a positive manner on any suitable receptacle—as, for instance, a receiving table, or, as in the example represented, in a folding apparatus.

The folding apparatus employed may be of any suitable kind; but it should be located so that its upper parts, which first receive the sheets, are situated between the chains or racks of the endless carrier and below the upper course of the said chains or racks. These upper parts, in the example represented, consist of tape-carrying rollers $r\ s$ and endless tapes $r^2\ s^2$ running thereon, which are shown in Figs. 2 and 9. These rollers and tapes, as well as other rollers t, to be presently described, constitute parts of the folding apparatus and are all supported in a frame A^4, which is arranged between the main side frames A of the machine. The said rollers $r\ s$ are parallel with the carrier. The tapes s^2, which run on the roller s, run also round a second roller s' directly below said roller s. The tapes r^2, which run over the roller r, run thence downward to and under the roller s', and thence horizontally to and round a roller r^3, which is arranged parallel with the before-mentioned rollers $r\ r'\ s\ s'$, and thence return horizontally to and under the roller r', arranged under the roller r and lower than the roller s'. Between the rollers r^3 and r' there are arranged two transverse rollers t.

The first folding of the paper is effected between the rollers r and s by means of a folding-blade u, attached to an arm u', which is carried by two arms u^2, fastened to two rock-shafts u^3, which are supported in brackets u^4, bolted to the frame A^4. This folding-blade u is brought down upon the sheet just as the latter is delivered from the grippers $j\ j'$ and $n\ n'$, and thereby caused to drive it between the rollers $r\ s$ and their tapes $r^2\ s^2$, and thus produce the first fold. Passing down between the tapes $r^2\ s^2$, the sheet is turned aside under the roller s' and carried horizontally by the tapes r^2 over the rollers t, between which it is driven by a folding-blade v, carried by the arms v' of a rock-shaft v^2, supported in bearings in brackets u^4. This blade v produces the second fold at right angles to the first, and the said rollers t, by their rotary motion, carry the twice-folded sheet downward, to be deposited on the floor of any suitable receptacle. The several rollers of the folding apparatus are represented as deriving motion from one of the endless racks G through a spur-gear w, (see Fig. 9,) which turns freely on a stud w' in the framing, and which gears with the lower part of the said endless rack and with a spur-gear t' on one of the rollers t, thereby driving the said roller. The rollers t may be geared together to rotate in opposite directions, or one may be driven by friction from the other. For driving the rollers $r\ s$ a bevel-gear t^2 is provided on the shaft of one of the rollers t to gear with a bevel-gear t^3 on the roller r'. The rollers $r'\ s'$ are geared together by spur-gears $r^4\ s^3$, so that the latter is driven by the former, and thus drive the tapes $r^2\ s^2$, and through these the rollers $r\ s$. The first folding-blade u, preparatory to the folding operation is raised by means of a connection of the downwardly-projecting arms u^* of its rock-shaft u^3 by a rod u^5 with the long arm u^6 of a rock-shaft u^7, on which is an arm u^8, which is operated upon by a cam K on the rotary shaft J′, hereinbefore described. The bringing down of the blade to produce the fold is effected very rapidly by a spring u^9, which connects the arm u^2 of one of the rock-shafts u^3 with the other of said rock-shafts. The second folding-blade v is raised by the connection of an arm v^3 of a rock-shaft v^2 by a rod v^4 with one arm v^5 of a bell-crank lever, which works upon a fixed stud v^6, and the other arm v^7 of which is operated upon by the before-mentioned cam K. The bringing down of this blade v to produce the fold is effected by a spring v^8, which connects the arm v^5 with the framing of the machine. It will thus be understood that the cam K controls the operation of both the folding-blades.

The folding apparatus herein described is not of itself claimed as any part of the present invention, but it serves as well as any other to illustrate my invention. As I do not claim it, it has only been described with sufficient fullness to enable its operation in con-

nection with the delivery apparatus of the printing-machine to be understood.

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

1. The combination, with the impression-cylinder of a printing-machine, of an endless carrier furnished with grippers for receiving a continuous web from said cylinder, a cutter for cutting sheets from said web in said endless carrier, cams for operating said grippers to take the web into said carrier, and cams for opening said grippers to release the cut sheets from said carrier, substantially as herein set forth.

2. The combination, in a printing-machine, with an endless delivery-carrier having grippers thereon, of rotary grippers separate from the said carrier for taking hold of the rear edges of sheets therein, and cams for opening the said grippers on said carrier and said rotary grippers, all substantially as herein set forth.

3. The combination, with the impression-cylinder of a printing-machine, of an endless delivery-carrier, a cutter for cutting said web into sheets on said carrier, grippers on said carrier for receiving the web and for holding the cut sheets, and rotary grippers for taking the rear edges of the cut sheets, substantially as herein set forth.

4. The combination, in a printing-machine, of an endless delivery-carrier consisting of endless racks or chains and attached grippers, a folding apparatus situated under the upper course of said carrier, and rotary grippers separate from said carrier arranged behind said folding apparatus, substantially as herein set forth.

5. The combination, with the impression-cylinder of a printing-machine, of an endless delivery-carrier, a cutter for cutting into sheets a web in said carrier, rotary grippers for taking the edges of the sheets cut from the web in said carrier, and a folding apparatus for receiving the cut sheets from said carrier and rotary grippers and folding the same, all substantially as herein described, whereby a printed web passing from the impression-cylinder of the machine is first cut into sheets and afterward folded, as herein set forth.

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