(No Model.) 3 Sheets—Sheet 1.

C. B. COTTRELL.

FEEDING APPARATUS FOR PRINTING MACHINES.

No. 487,914. Patented Dec. 13, 1892.

Fig. 1.

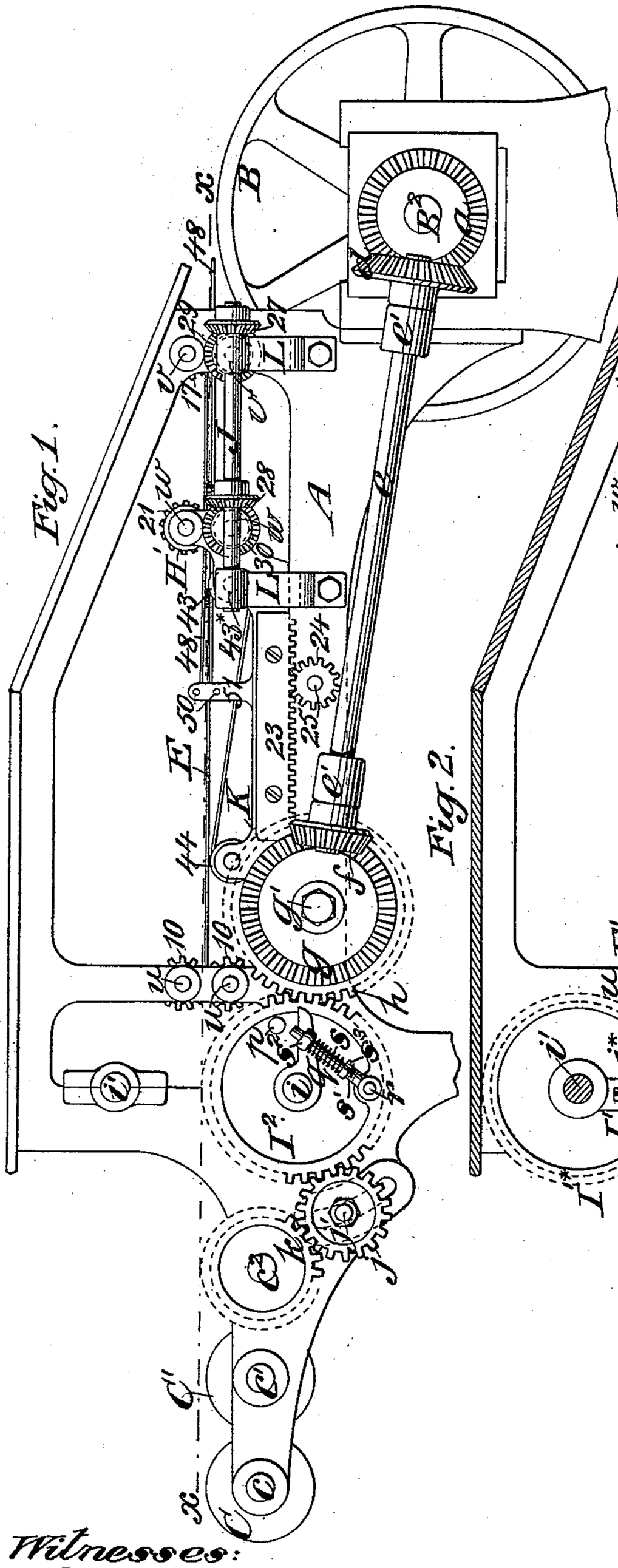

Fig. 2.

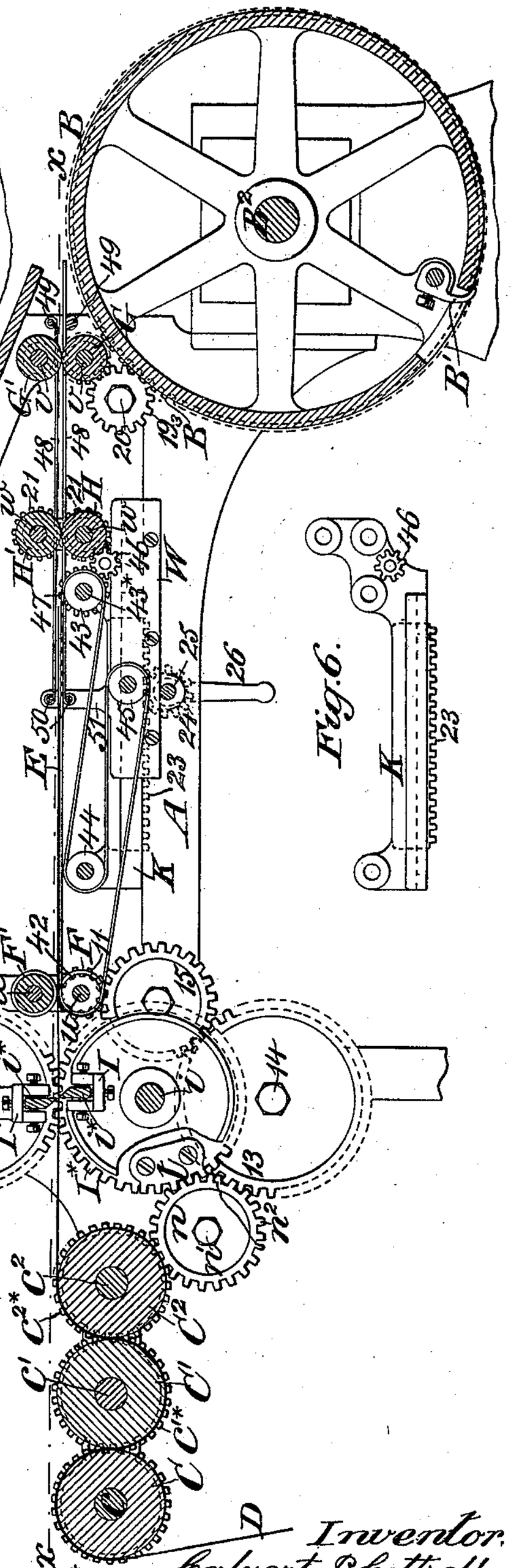

Fig. 6.

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(No Model.) 3 Sheets—Sheet 2.

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FEEDING APPARATUS FOR PRINTING MACHINES.

No. 487,914. Patented Dec. 13, 1892.

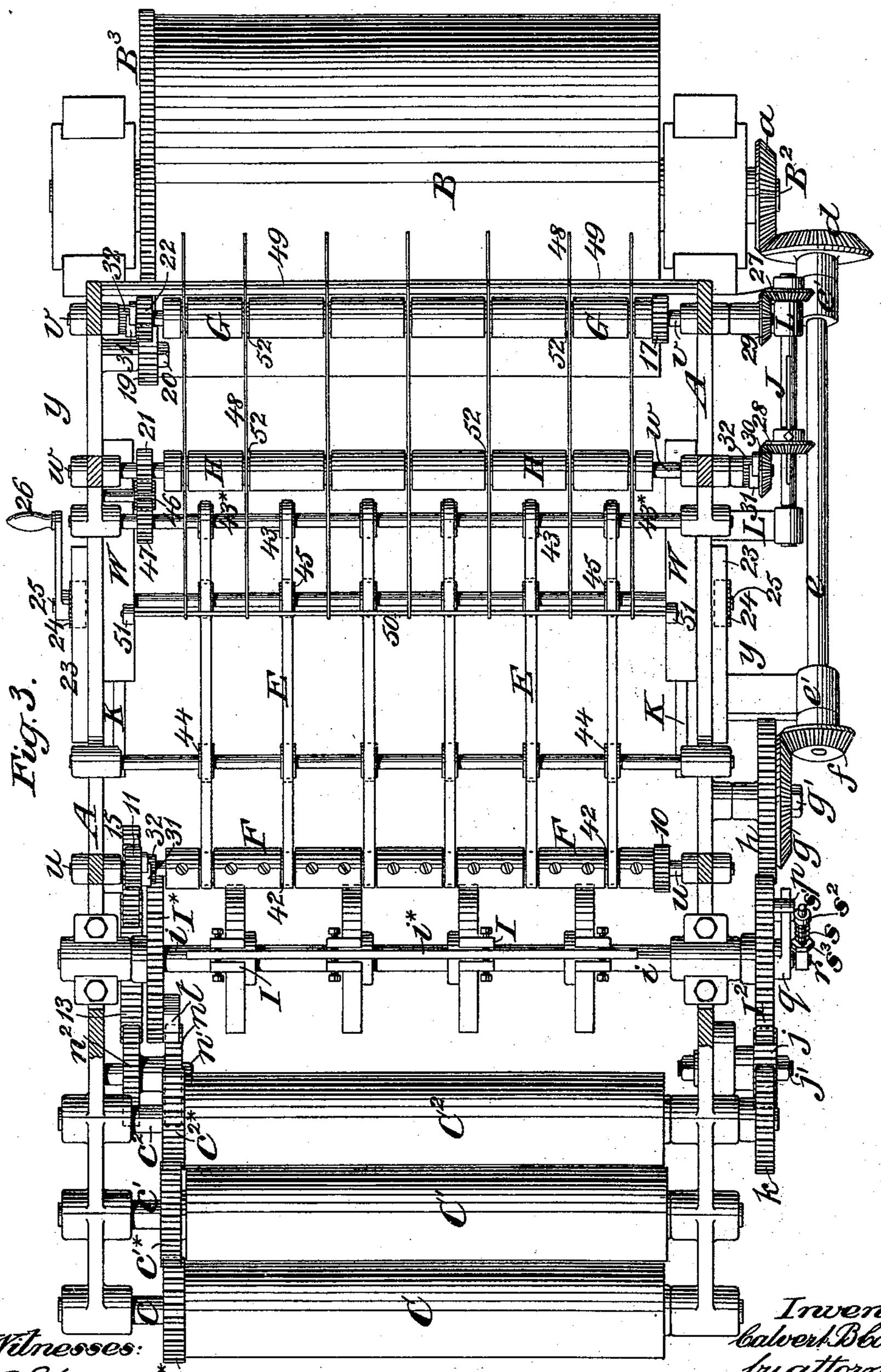

Fig. 3.

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FEEDING APPARATUS FOR PRINTING MACHINES.

No. 487,914. Patented Dec. 13, 1892.

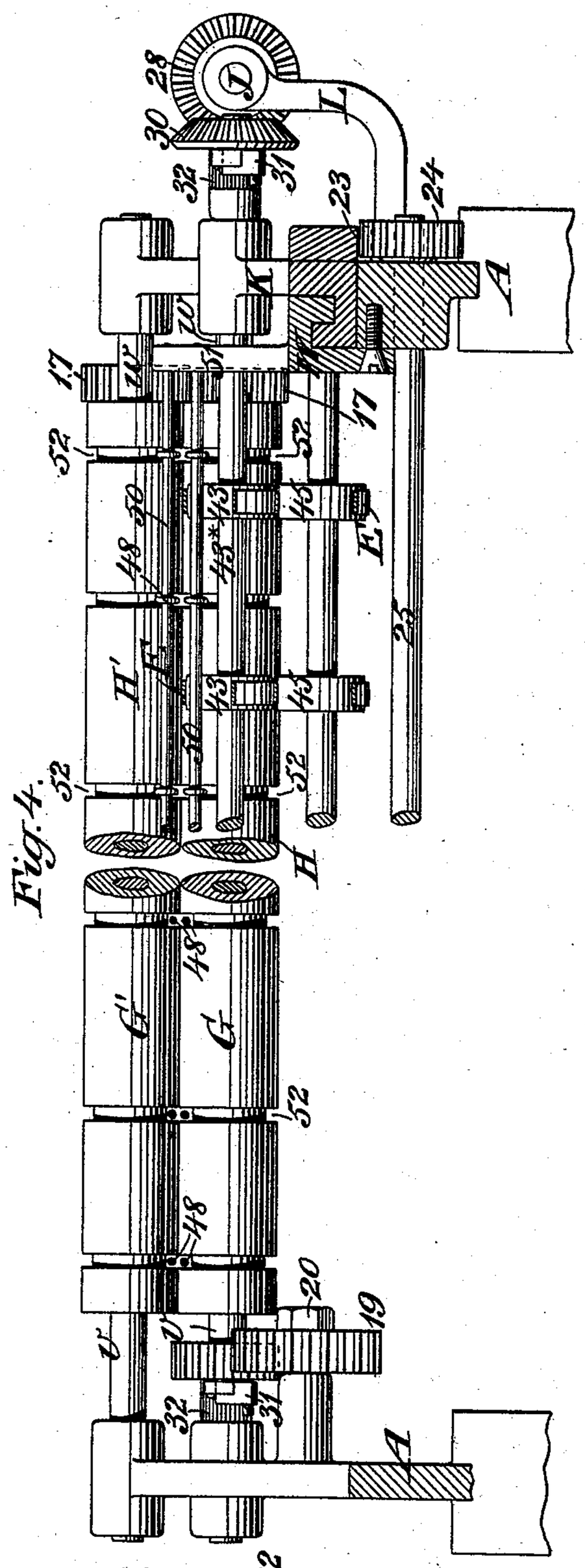

Fig. 4.

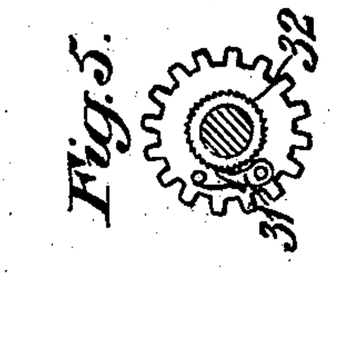

Fig. 5.

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CALVERT B. COTTRELL, OF WESTERLY, RHODE ISLAND.

FEEDING APPARATUS FOR PRINTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 487,914, dated December 13, 1892.

Application filed July 13, 1892. Serial No. 439,860. (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 Feeding Apparatus for Printing-Machines, of which the following is a specification.

This invention relates to feeding apparatus for feeding to the impression-cylinder of a printing-machine sheets of different lengths; and it is intended more particularly to be used in connection with a cutting apparatus for cutting sheets of different lengths from a roll or continuous web of paper.

The improvement consists in certain means, hereinafter described and claimed, whereby sheets of different lengths are so carried forward toward the impression-cylinder that their heads or forward ends are always brought into proper relation to the grippers of the said cylinder when the latter arrive in proper position to take them.

I will proceed to describe the construction and operation of my invention with reference to the accompanying drawings, in which—

Figure 1 is a side elevation of those parts of a two-revolution printing-machine which are necessary to illustrate my invention, including the impression-cylinder and the feeding apparatus. Fig. 2 represents a longitudinal section corresponding with Fig. 1. Fig. 3 represents a horizontal section in the line $x\,x$ of Figs. 1 and 2. Fig. 4 is a transverse vertical sectional view, on a larger scale than Figs. 1 and 2, in the line $y\,y$ of Fig. 3, taken looking to the right, but omitting the cylinder. Figs. 5 and 6 are detail views which will be hereinafter explained.

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

A is the side framing of the machine, B the impression-cylinder furnished with the usual grippers B, and C C′ C² are the feed-rollers for feeding a web from a roll. (Not shown.) The shafts $c\,c'\,c^2$ of the said feed-rollers C C′ C² are arranged in suitable bearings in the side framing A, and the said rollers are intended to be geared together by spur-gears $c^*\,c'^*\,c^{2*}$ on their respective shafts.

A short distance in front of the feed-rollers C C′ C² there is arranged a cutting apparatus, which is represented as of a well-known kind, consisting of two rotating shafts $i\,i'$, running in fixed bearings in the side framing and carrying cutter-stocks I I′, in which are secured the cutter-blades $i^*\,i^*$. In front of the cutting apparatus there is arranged a pair of feed-rollers F F′, which always run at the same surface velocity as the feed-rollers C C′ C² and the shafts $u\,u$ of which work in bearings in or on the side framing A. These rollers F F′ serve the purpose of feeding that part of the web which has passed beyond the cutters, but which has not yet been cut off, and also serve the purpose of feeding the sheets forward some distance after they have been cut off. As close as practicable behind the cylinder is arranged another pair of feed-rollers G G′, which always rotate at the same surface speed as the cylinder and the shafts $v\,v$ of which run in fixed bearings in the side framing. The distance between these two pairs of feed-rollers should be sufficiently greater than that of the longest sheets that will ever be required to be fed to the cylinder to provide room behind said rollers G G′ for an intermediate pair of feed-rollers H H′, (see Figs. 1, 2, and 3) which always rotate at the same surface velocity as the cylinder and the feed-rollers G G′ and the duty of which is to receive the cut sheets from the feed-rollers F F′ and give them to the feed-rollers G G′ next the cylinder, accelerating the velocity of the said sheets when necessary, according as the speed of the web is less than that of the cylinder. This pair of feed-rollers H H′ must be adjustable farther from or nearer to the rollers F F′ and correspondingly nearer to or farther from the rollers G G′, according to the different lengths of sheet to be cut and fed, so that the said rollers H H′ may receive the front end of a sheet just as the rear end is about to leave the rollers F F′, and for this purpose the shafts $w\,w$ of the said rollers H H′ have their bearings in a carriage K, a side view of which is given separately in Fig. 6, and which is movable lengthwise of the machine in guides W W on the side framing A, the said adjustment, as herein represented, being provided for by racks 23 on the sides of said carriage and pinions 24 on a shaft 25, which works in fixed bearings provided in or on the side framing A, the said shaft being

provided with a hand-crank 26 for the purpose of turning it. The pair of rollers F F′ are geared together by gears 10, the pair G G′ by gears 17, and the pair H H′ by gears 21, and the several pairs are furnished with such pressure-springs as are common to feed-rollers, and therefore do not require to be represented.

The feed-rollers G G′ next the cylinder B are driven from the cylinder itself through a gear 19, which turns on a fixed stud 20, the said gear 19 gearing with and deriving motion from the gear B^3 on the cylinder and gearing with a gear 22 on the shaft *v* of the lower roller G. The rollers H H′ are driven from the shaft of the lower feed-roller G through a shaft J, (see Figs. 1, 3, and 4,) which is arranged parallel with the length of the machine in brackets L, secured to one side of the machine, the said shaft being furnished with bevel-gears 27 28, which gear, respectively, with bevel-gears 29 30 on the shafts *v* and *w* of the lower feed-rollers G and H, the said gear 28 being movable with the carriage K lengthwise of the shaft J that it may be always in gear with the gear 30, notwithstanding the changes of distance of the rollers H H′ from the rollers G G′. The feed-rollers F F′ are driven, as shown in Figs. 2 and 3, from the shaft c^2 of the feed-rollers C^2 through the spur-gear C^{2*} on the said shaft in the following manner: The said gear C^{2*} gears with and drives a spur-gear n^2, which turns on a fixed stud n', secured in the side framing. The said gear n^2 gears with and drives a spur-gear 13, which turns on a fixed stud 14, secured in the framing. This gear 13 gears with and drives a gear 15, which gears with and drives a gear 11 on the shaft *u* of the lower feed-roller F. The said feed-rollers C C′ C^2 are driven by a train of gearing like that described in my United States Letters Patent, No. 466,030, dated December 29, 1891, and the cutters are driven as described in that patent; but a brief description of the said train and the means of driving the cutters will facilitate the explanation of the present invention. On the shaft B^2 of the cylinder B there is a bevel-gear *a*, gearing with and driving a bevel-gear *d* on the end of a shaft *e*, (see Figs. 1 and 3,) which works in bearings in brackets *e′* outside of the framing A and on the other end of which is a bevel-gear *f*, gearing with and driving a bevel-gear *g*, running freely on a stud *g′*, secured in the framing. To this bevel-gear *g* is affixed a spur-gear *h*, which gears with and drives a spur-gear I^2, which is loose on the lower cutter-shaft *i*. The said feed-rollers C C′ C^2 derive their motion from the aforesaid gear I^2, which gears with and drives a spur-gear *j*, turning freely on a stud *j′*, secured in the framing, the said gear *j* gearing with and driving a spur-gear *k* on the shaft c^2 of the feed-roller C^2, which in turn drives C′ and C through the gears c^{2*} c'^* c^*. The gear *k* of this train, which is changeable for one of a larger or smaller size, is the same as the changeable gear described in my United States Letters Patent, No. 431,201, dated July 1, 1890, for varying the speed of the said feed-rollers C C′ C^2 and the feed-rollers F F′ relatively to the speed of the cylinders to supply the paper in quantities sufficient for sheets of different lengths.

The cutter-shafts *i i′* are geared together by gears I^* I'^*, and, except at the time of cutting, they derive motion from the loose gear I^2 at a speed corresponding with the speed which the web requires to have for the shortest sheets through a stud *p*, which is secured to the said gear I^2 and which acts against an arm *q*, which is fast on the lower cutter-shaft *i;* but at the time of cutting, when the speed of the cutters may require to be accelerated to correspond with the speed of the feed which the web is required to have for longer sheets, the said shaft derives motion temporarily from a spur-gear *n*, which is fast to the spur-gear n^2, above mentioned as driven by the feed-rollers C C′ C^2 for driving the feed-rollers F F′, a toothed sector *t*, fast on one of the gears I^*, by which the cutter-shafts are geared together, then coming into gear with the said spur-gear *n*. While the cutters are thus driven by the spur-gear *n* the arm *q* on the cutter-shaft *i* may run forward away from the stud *p;* but in such cases after the cutting has been effected and the sector *t* has passed out of gear with the gear *n* the arm *q* on the shaft *i* is returned to contact with the stud *p* by means of a spiral spring *s*, applied on a rod *s′*, which is connected with a pin *r* in the gear I^2 and which passes through a swiveling guide s^2 on the arm *q*, said spring being confined between a shoulder s^3 on the said rod and the said swiveling guide s^2.

For the support of the paper between the feed-rollers F F′ and those H H′, I provide an endless carrier consisting of a series of tapes or bands E E and pulleys 42 43 44 45, and for the support of the cut sheets entering between the rollers H H′ and passing between the said rollers H H′ and those G G′, I provide an independent series of supports 48, which may be of light wire. The tape or band pulleys 42 are idlers, being loose on the shaft *u* of the lower feed-roller F, the said roller being made, as shown in Fig. 3, of a number of short sections fastened to the said shaft *u* and the said pulleys 42 being arranged between the said sections and of so much smaller diameter that the tapes may run free of the top roller F′. The pulleys 44 and 45 are also idlers. The pulleys 43, which are the drivers, drive the said bands or tapes at the same surface speed as the cylinder. The said shaft 43* of the latter pulleys has its bearings in the carriage K of the feed-rollers H H′ and is so arranged that the said pulleys are near and on a level with the lower feed-roller H, and the said shaft 43* derives its necessary rotary motion from the gear 21 on the lower feed-roller H through a pinion 46, turning on a stud on one side of the carriage, the

said pinion gearing with a toothed gear 47 on the said shaft 43*. The shaft of the pulleys 44 has its bearings so arranged in the back part of the carriage K that it is on a level with the shafts of the pulleys 42 and 43 and the roller H, and the shaft of the pulleys 45 has its bearings lower down in the fixed guides W, provided for the said carriage K, the position of the latter bearings being such that during the whole range of adjustment of the said carriage and feed-rollers H H′ to and fro the pulleys 44 will always be behind and the pulleys 43 will always be in front of the said pulleys 45. The bands or tapes run forward from the pulleys 42 to those 43, thence back to the pulleys 44, thence forward to the pulleys 45, and thence back to 42. As the carriage K, with the feed-rollers H H′, is adjusted forward or backward the carrier is lengthened or shortened to correspond with the position of the said rollers, so that its forward part will always occupy the same position relatively to the said rollers—that is to say, will be close behind the said rollers. As this lengthening and shortening of the carrier takes place the tapes or bands are kept tight, because so much as they are let out or taken up between 42 and 43 they are taken up or let out between 44 and 45.

The independent wire supports 48 for supporting the sheets between the tapes E and feed-rollers H H′ and between the said rollers H H′ and G G′ are arranged lengthwise of the machine at intervals between the pulleys and tapes, as shown in Figs. 3 and 4. They are represented as each consisting of two light wires stationary one above the other, with a space between them just sufficient for the sheets of paper to pass freely between them, the lower wires having their upper surfaces on a level with the tapes. The said wires extend backward beyond the extreme backward position to which the pulleys 43 may be brought by the backward adjustment of the carriage K and rollers H H′, and the said wires extend forward beyond the feed-rollers G G′, the lower ones extending nearly to the cylinder. Their front ends are supported on cross-bars 49, secured in the side framing A, and their rear ends are supported in cross-bars 50, which are carried by standards 51 on the fixed guides W. The upper and lower feed-rollers G G′ and H H′ are grooved, as shown at 52 in Figs. 3 and 4, where the wires 48 cross them, in order that the said rollers and the said wires may not interfere with each other.

In order that the rollers H H′ may accelerate the movement of the sheets to the speed of the cylinder without any hinderance from the rollers F F′, moving at the same velocity as the web from which the sheets are cut, I provide the latter rollers with a liberating device. The liberating device is here represented as a slip connection between the shaft *u* of the lower roller F and its driving-gear 11, the said slip connection consisting, as shown in Fig. 5, of a ratchet-wheel 32, fast on the said shaft *u*, and a pawl 31 on the said driving-gear 11, which is fitted to run freely on the shaft. I prefer to make the same slip connections between the shafts *v* and *w* of the lower feed-rollers G and H and their driving-gears 22 and 30, so that after the sheets have been taken by the cylinder-grippers they may not be held back by any slight inaccuracy of the gearing between the said shafts *v* and *w* and the cylinder.

The operation of cutting the sheets is as follows: The paper supplied by the feed-rollers C C′ C² passing the cutting apparatus during the intervals between the operations of the cutters is taken between the rollers F F′, moving at the same surface speed as the feed-rollers C C′ C² and the cutters, and is presented by the said rollers F F′ upon the carrier-tapes E E. These latter, moving faster than the said rollers F F′, drag along under the paper and keep its front pulled straight. After a sheet has been cut from the web the rollers F F′ continue to carry it forward with the assistance of the carrier-tapes E E until its front edge arrives between the rollers H H′, which, seizing it, carry it forward at an accelerated speed corresponding with that of the cylinder, such acceleration being permitted freely by the slip connection between the rollers F F′ and their driving-gear, the said rollers F F′ being turned by the sheet until its rear end has passed through the said rollers, which then assume their normal speed corresponding with that of the web. The rollers H H′, moving at the same surface speed as the rollers G G′ on the cylinder, then carry the sheet through the stationary supports 48 and give it to the latter rollers, which present its front edge to the cylinder-grippers, which arrive opposite the said edge in time to receive it.

It will be understood that if the rollers H H′ should be set at a distance from the rollers G G′ to take the longest sheet and give it at the proper time the accelerated velocity at which it is transferred to the rollers G G′ and at which it is given to the cylinder it is only necessary in order to give the shortest sheet to the said rollers G G′ in proper time that the said rollers H H′ should be set sufficiently farther back from the said rollers G G′ and nearer to the rollers F F′ for the said rollers H H′ to take the front end of the said sheet and produce its acceleration sufficiently earlier for the said end to reach and be taken by the said rollers G G′ at the same time relatively to the movement of the cylinder and the cylinder-grippers that the corresponding end of the longer sheet would have been taken by the said rollers G G′. Therefore by the proper adjustment of the rollers H H′ sheets having any differences of length within the limit of said adjustment may be timely fed to the cylinder. The tapes E E, being adjustable with the rollers H H′ to vary the length of their operative upper portions, though otherwise

independent of said rollers, always keep the sheets properly supported and straightened until taken by the said rollers H H′, and the stationary guides 48, reaching all the way between and in both directions beyond the rollers G G′ and H H′, respectively, and extending back beyond the forward part of the tapes E E, keep the sheets properly supported after they leave the said tapes and all the way to the cylinder.

It is obvious that the cutters *i** need not be of such character as to entirely sever the web, but may be such as are commonly employed to merely perforate the web, so that the portion in front of the perforations intended to form a sheet may be easily parted by a draft upon it and that in such case the rollers H H′ may so bite upon the sheet as to be capable of accelerating the draft necessary to detach it from the portion of the web behind the perforations.

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

1. The combination, substantially as herein described, with the impression-cylinder of a printing-machine, a pair of feed-rollers for carrying a sheet toward the said cylinder, and mechanism for supplying said feed-rollers with sheets of different lengths, of a second pair of feed-rollers arranged between the first-mentioned rollers and the said cylinder and driven with a surface speed equal to that of the said cylinder and higher than that of the first-mentioned rollers and a liberating device, substantially as herein described, applied to the first-mentioned rollers to permit the acceleration of the speed of the sheet by the second set of rollers, as herein set forth.

2. The combination, with the impression-cylinder of a printing-machine, of a web-feeding apparatus, a cutting apparatus arranged in front of said web-feeding apparatus, a pair of feed-rollers arranged between the said cutting apparatus and the cylinder, means for driving the said web-feeding apparatus, feed-rollers, and cutting apparatus at variable surface velocities relatively to that of the cylinder, a second pair of feed-rollers adjustable to and fro between the first-mentioned feed-rollers and the cylinder and having a surface speed equal to that of the cylinder for taking a sheet from the first-mentioned feed-rollers, and a liberating device applied to the first-mentioned feed-rollers to permit the free movement of the sheet by the second feed-rollers at an accelerated velocity toward the cylinder, all substantially as herein set forth.

3. The combination, with the impression-cylinder of a printing-machine, of a web-feeding apparatus, a cutting apparatus for cutting said web into sheets, a train of gearing for driving the said web-feeding apparatus and cutting apparatus, including a changeable gear for varying the speed of said web feeding and cutting apparatus relatively to the cylinder, a pair of feed-rollers geared with the said train of gearing to have the same surface speed as said feeding and cutting apparatus, a pair of adjustable feed-rollers arranged between the first-mentioned feed-rollers and the impression-cylinder and having a surface speed equal to that of the cylinder, and a liberating device applied to the first-mentioned feed-rollers, substantially as herein set forth.

4. The combination, with the impression-cylinder of a printing-machine, of a web-feeding apparatus for supplying a web of paper, a cutting apparatus for cutting said web into sheets, a train of gearing for driving the said feeding apparatus and cutting apparatus, including a changeable gear for varying the speed of the said feeding and cutting apparatus relatively to the cylinder, a pair of feed-rollers geared with the said train of gearing to have the same surface speed as the said feeding and cutting apparatus, a second pair of feed-rollers arranged in a fixed position near the cylinder and having the same surface velocity therewith, a third pair of feed-rollers geared with the said second pair of feed-rollers to have the same surface speed therewith and adjustable to and fro between the said first and second pairs of feed-rollers, and a liberating device between said first-mentioned feed-rollers and said train of gearing, substantially as herein set forth.

5. The combination, with the impression-cylinder and web feeding and cutting apparatus adapted to feed and cut a web to produce sheets of different lengths, of feed-rollers having the same surface speed as said cylinder, a carriage for said rollers adjustable toward and from said cylinder, and an endless carrier of variable length between the web feeding and cutting apparatus and said feed-rollers, substantially as herein set forth.

6. The combination, with the impression-cylinder and web feeding and cutting apparatus adapted to feed and cut a web to produce sheets of different lengths, of a pair of feed-rollers arranged in a fixed position relatively to the cylinder and having the same surface velocity therewith, a second pair of feed-rollers behind said first-mentioned pair, having the same velocity as said first-mentioned pair and adjustable back and forth toward said first-mentioned pair, an endless carrier of variable length arranged between said web feeding and cutting apparatus and said second pair of feed-rollers, and independent sheet-supports between the said first and second pairs of feed-rollers, substantially as herein set forth.

7. The combination, with the impression-cylinder and web feeding and cutting apparatus adapted to feed and cut a web to produce sheets of different lengths, of a pair of feed-rollers having the same surface speed as the said cylinder, a carriage movable toward and from the said cylinder and in which the said rollers are supported, and an endless carrier consisting of four sets of pulleys and shafts therefor, and a set of tapes or bands running

on said sets of pulleys, two of said shafts having fixed bearings and two having bearings on the said carriage, and one of the latter being geared with said feed-rollers to drive the said tapes or bands, substantially as herein set forth.

8. The combination, with the impression-cylinder and web feeding and cutting apparatus adapted to feed and cut a web to produce sheets of different lengths, of a pair of feed-rollers arranged in a fixed position relatively to the cylinder and geared with the cylinder to run at the same surface velocity therewith, a second pair of feed-rollers and a carriage therefor with which they are adjustable toward and from the first pair, a shaft carrying bevel-gears, fixed bearings for said shaft, and bevel-gears, one on one of the rollers of each pair, gearing with the bevel-gears on the said shaft, one of the latter gears being movable lengthwise on said shaft by the said carriage for driving the second pair of feed-rollers at various distances from the first set, all substantially as herein set forth.

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