(No Model.) 7 Sheets—Sheet 1.

E. H. & C. P. COTTRELL.

MACHINE FOR CUTTING AND FOLDING PAPER.

No. 604,004. Patented May 10, 1898.

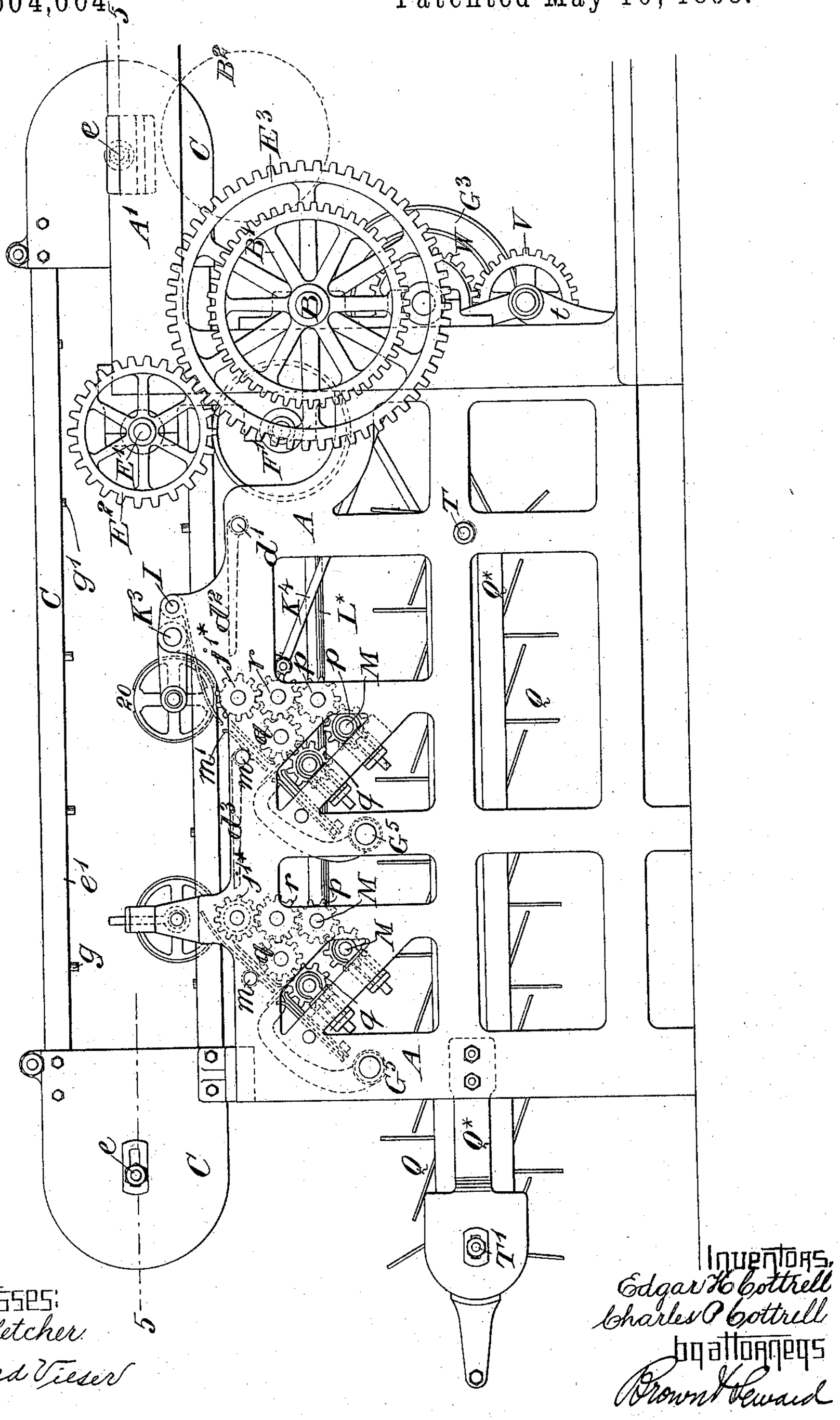

Fig. 1.

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Edward Tieser

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Charles P. Cottrell
by attorneys
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(No Model.) 7 Sheets—Sheet 2.

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Fig. 2.

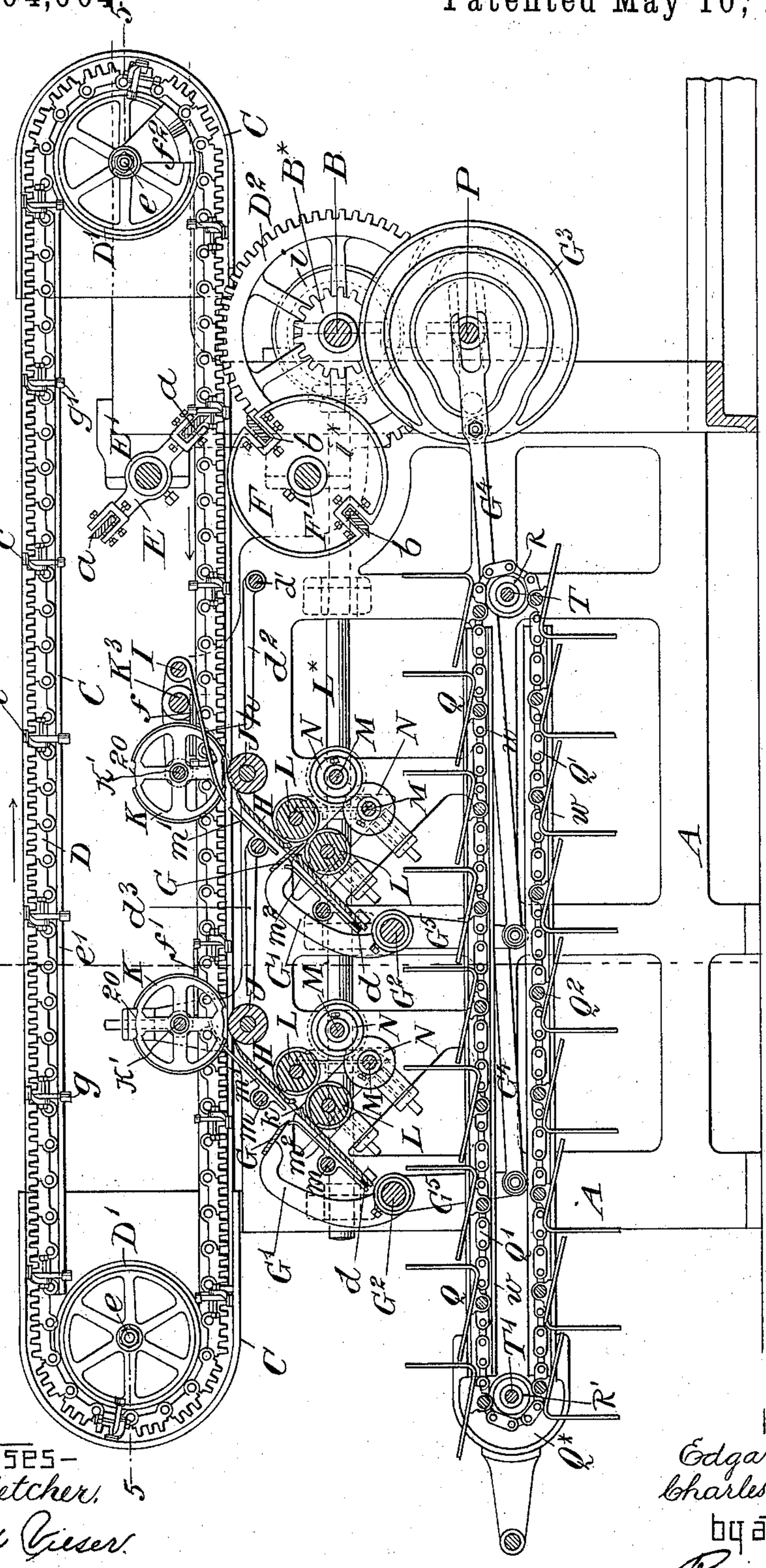

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Fig. 3.

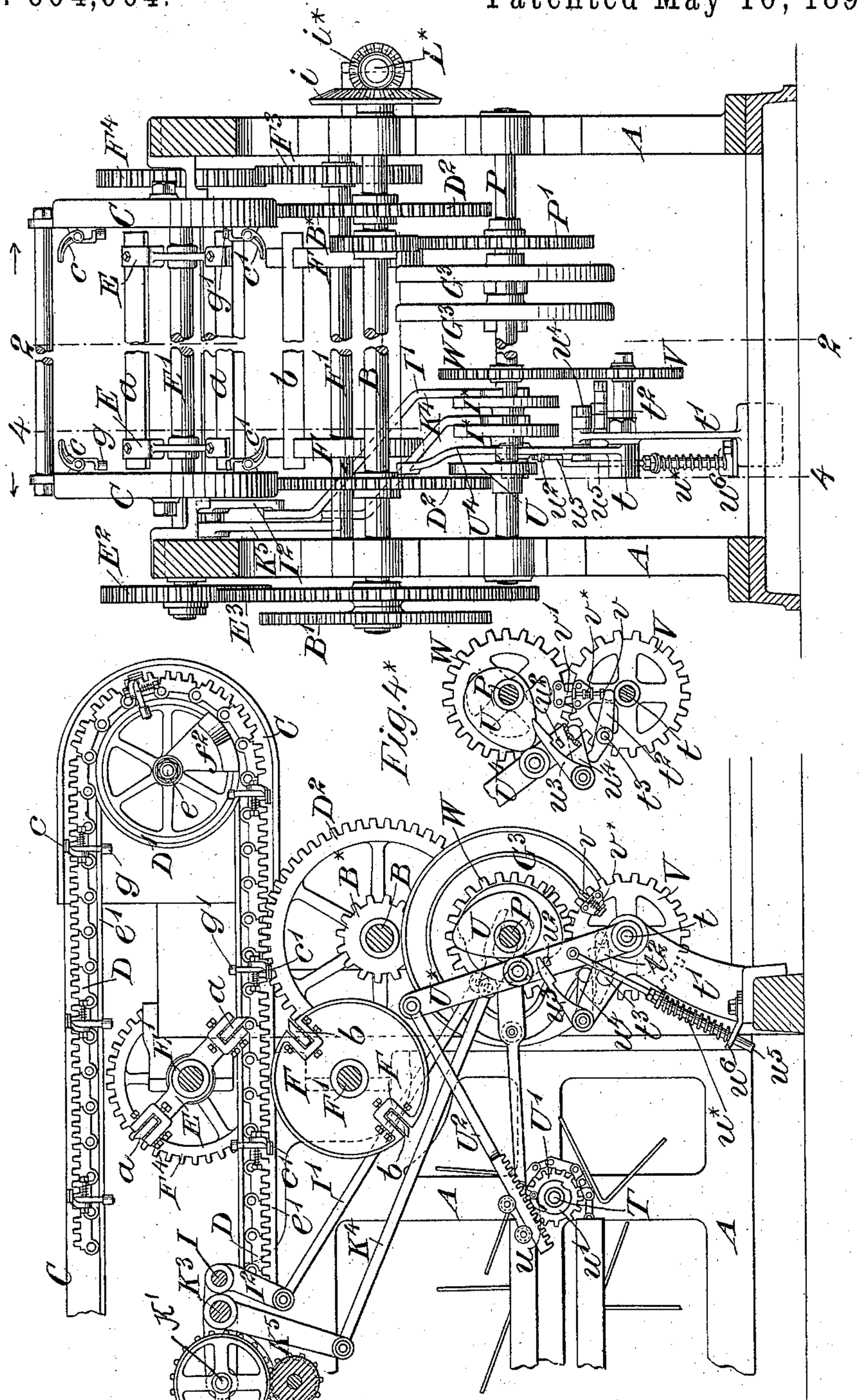

Fig. 4.

Fig. 4*.

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(No Model.) 7 Sheets—Sheet 4.

E. H. & C. P. COTTRELL.

MACHINE FOR CUTTING AND FOLDING PAPER.

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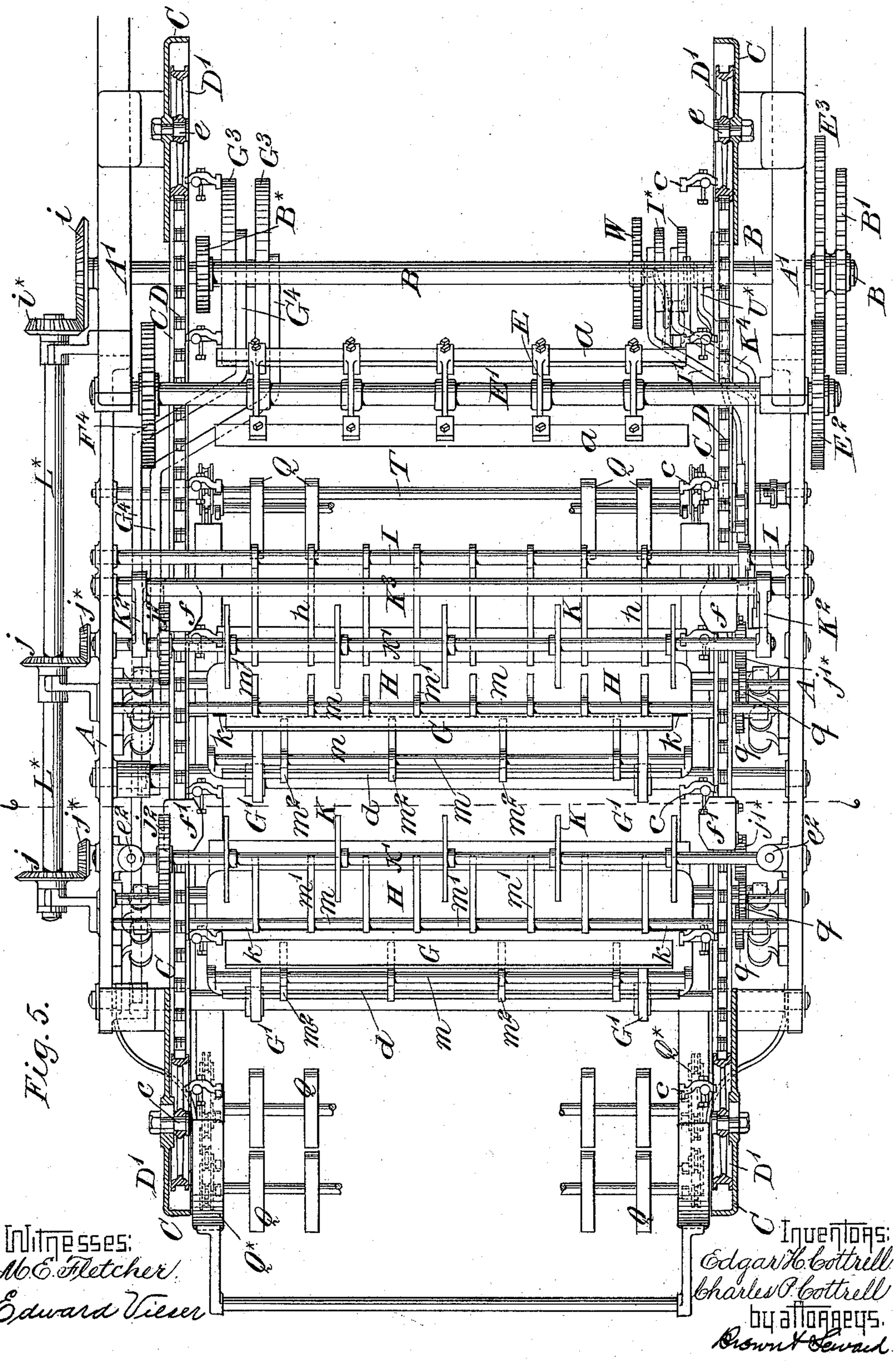

Fig. 5.

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(No Model.)

7 Sheets—Sheet 5.

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MACHINE FOR CUTTING AND FOLDING PAPER.

No. 604,004. Patented May 10, 1898.

Fig. 7.

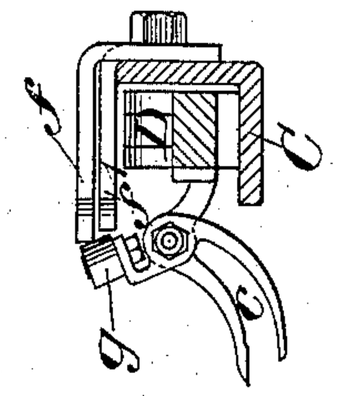


Fig. 8.

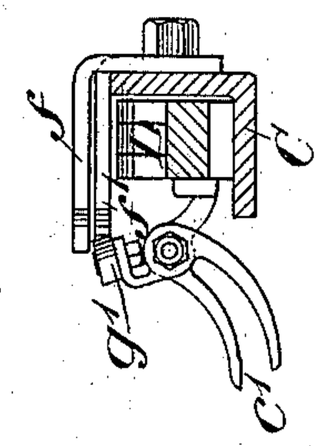
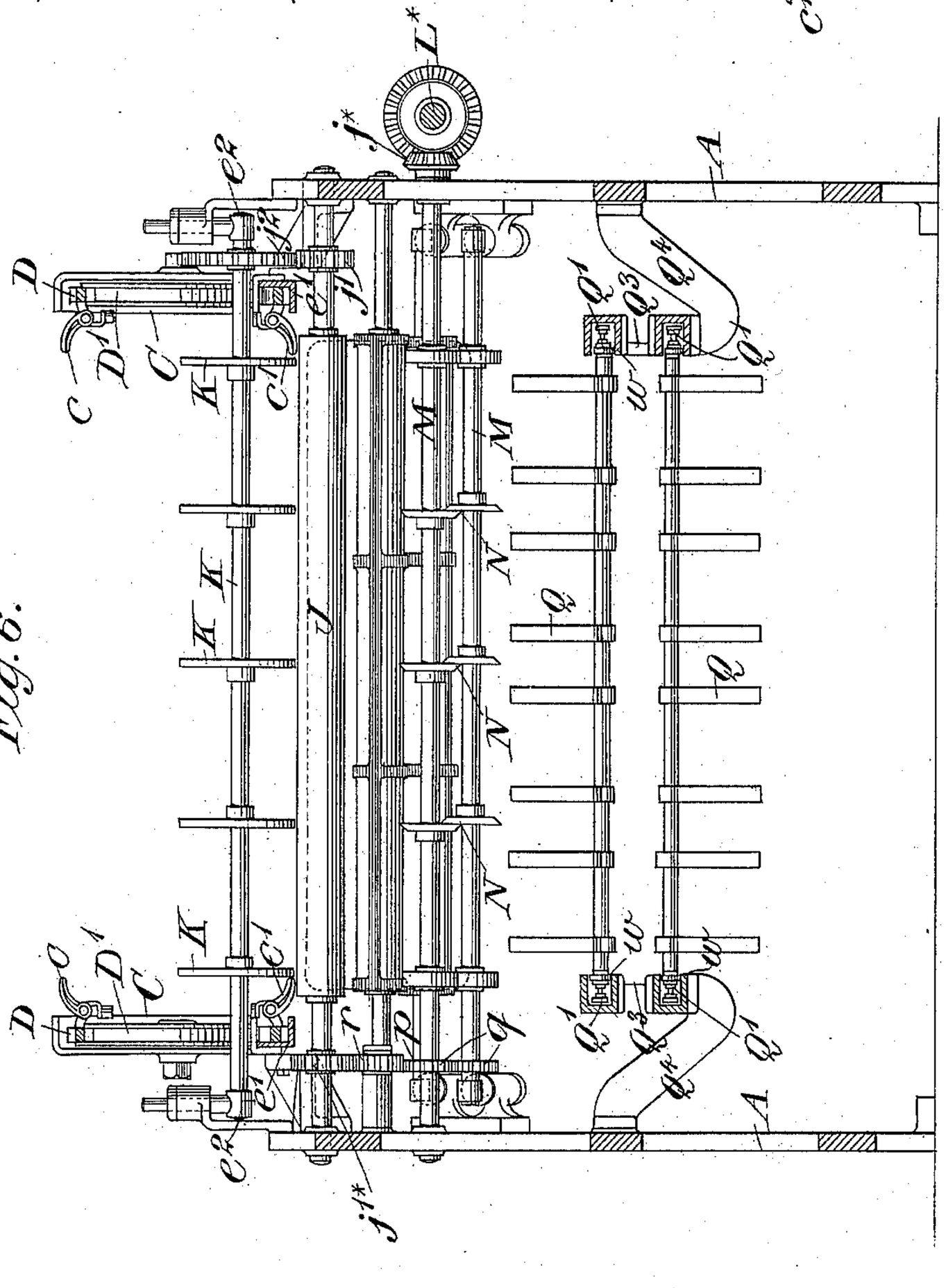


Fig. 6.



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MACHINE FOR CUTTING AND FOLDING PAPER.

No. 604,004. Patented May 10, 1898.

Fig. 10.

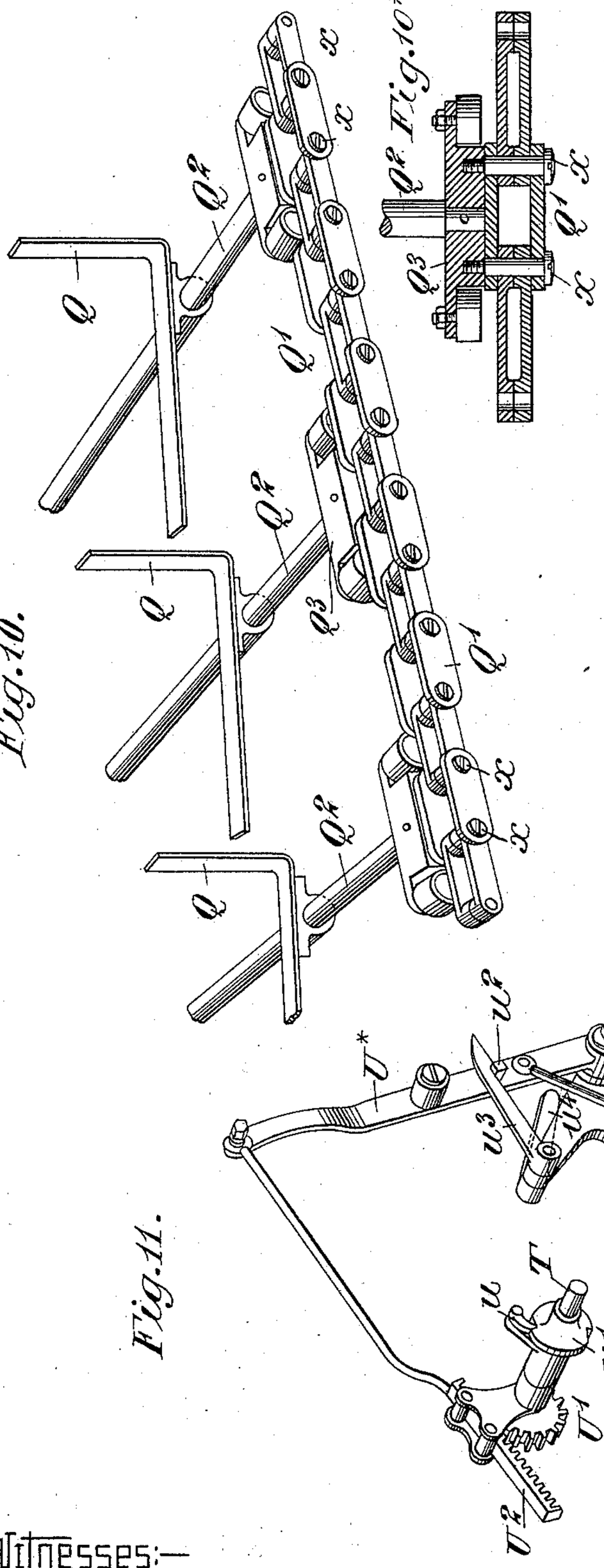

Fig. 9.

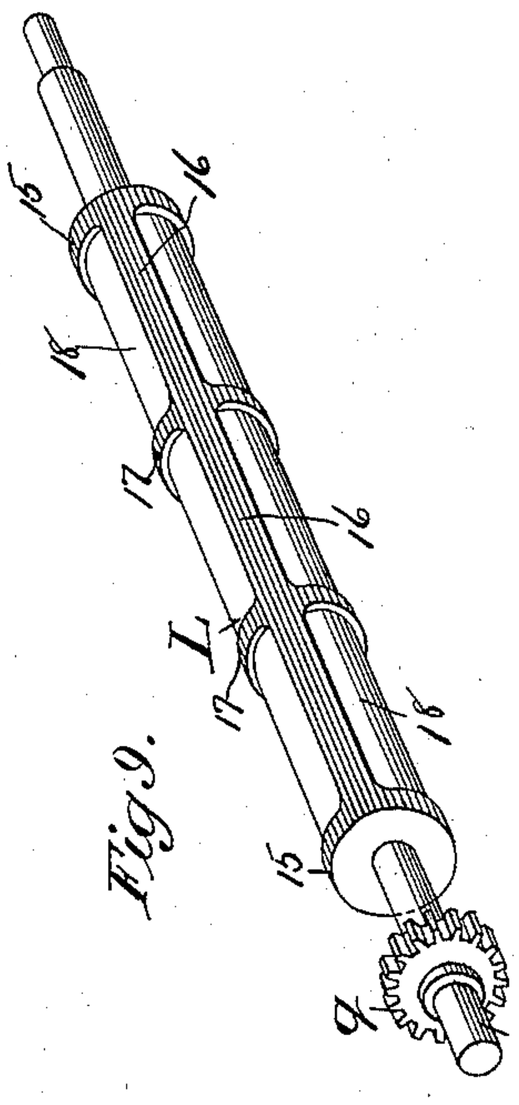

Fig. 11.

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MACHINE FOR CUTTING AND FOLDING PAPER.

No. 604,004. Patented May 10, 1898.

Fig. 12.

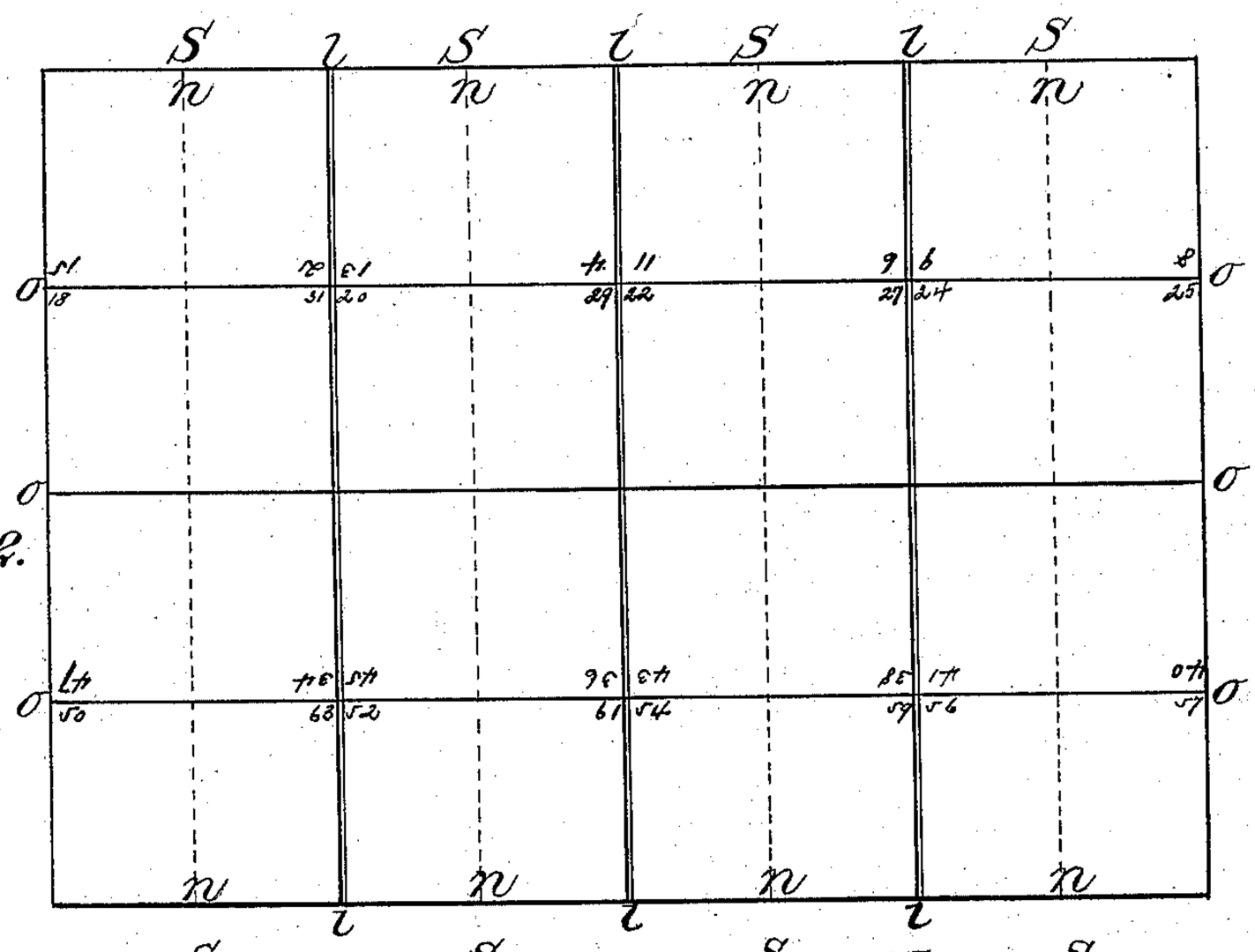
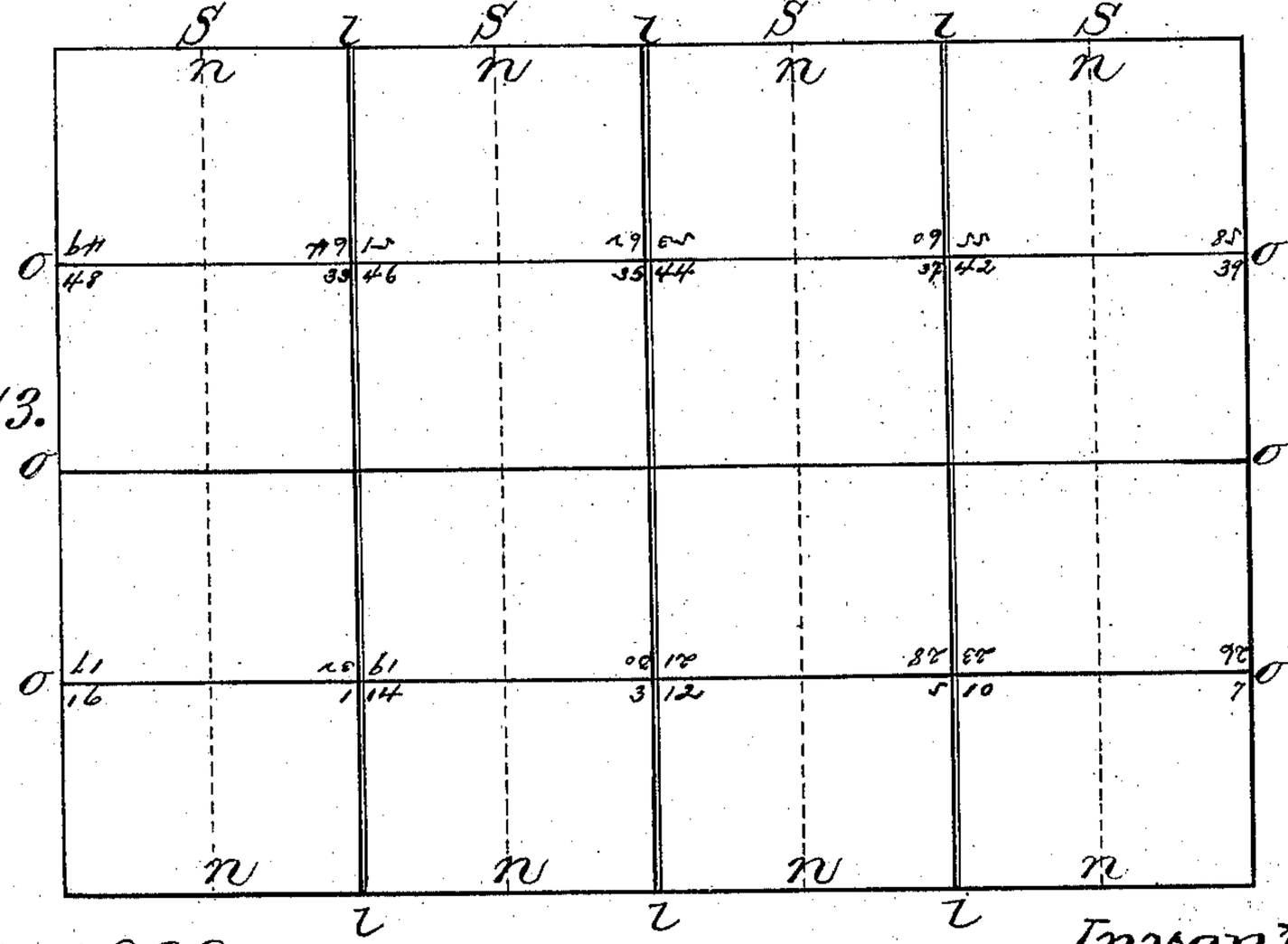


Fig. 13.



Witnesses:
Edward Uxer.
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UNITED STATES PATENT OFFICE.

EDGAR H. COTTRELL AND CHARLES P. COTTRELL, OF STONINGTON, CONNECTICUT, ASSIGNORS TO THE C. B. COTTRELL & SONS COMPANY, OF SAME PLACE AND NEW YORK, N. Y.

MACHINE FOR CUTTING AND FOLDING PAPER.

SPECIFICATION forming part of Letters Patent No. 604,004, dated May 10, 1898.

Application filed February 11, 1897. Serial No. 622,947. (No model.)

To all whom it may concern:

Be it known that we, EDGAR H. COTTRELL and CHARLES P. COTTRELL, of Stonington, in the county of New London and State of Connecticut, have invented a new and useful Improvement in Machinery for Cutting and Folding Paper, of which the following is a specification.

This invention is more especially intended to be used as an adjunct to a perfecting printing-machine for printing books, magazines, or pamphlets, the matter for numerous pages of which is printed by one impression on each side of the paper. The improvement is, however, wholly, and some of its parts are separately, capable of being used unconnected with printing machinery.

To enable others skilled in the art to make and use the invention, we have illustrated it by drawings, and will proceed to describe it in the complete form in which it is to be applied to a perfecting printing-machine for, first, cutting into a number of sheets each of the successive portions of a continuous web upon which a number of pages have been printed on both sides by one impression on each side; second, assembling the said sheets; third, folding at one operation all the so-assembled sheets; fourth, slitting at one operation all the so-folded sheets into signatures, and, fifth, finally delivering the said signatures in condition ready to be stitched or prepared for binding.

Figure 1 of the drawings represents a side elevation of a cutting and folding apparatus embodying our invention; Fig. 2, a longitudinal vertical section of the same, taken in the line 2 2 of Fig. 3; Fig. 3, an elevation of that end of the apparatus which is presented to the right in Figs. 1 and 2; Fig. 4, a longitudinal vertical section of part of the apparatus, taken approximately in the line 4 4 of Fig. 2; Fig. 4*, a side view of some of the details shown in Figs. 3 and 4; Fig. 5, a horizontal section in the line 5 5 of Figs. 1 and 2; Fig. 6, a transverse vertical section in the line 6 6 of Figs. 2 and 5, taken looking toward the left of that line; Figs. 7 and 8, transverse sectional views illustrating the operation of grippers which carry the web and sheets to the cutting and folding devices; Fig. 9, a perspective view of one of the folding-rollers; Fig. 10, a perspective view of parts of a delivery-carrier by which the signatures are received and delivered from the cutting and folding devices; Fig. 10*, a horizontal sectional view of parts of said delivery-carrier; Fig. 11, a perspective view of mechanism for operating the carrier above mentioned. Figs. 12 and 13 are diagrams of the two sides of a portion of a web printed on both sides to form sixty-four pages, illustrating how, by the example of our invention represented, the said portion is cut into four sheets, which are afterward assembled and folded together, then all cut together to form four signatures of sixteen pages each.

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

A designates framing which may be and is represented as a portion of the framing of a printing-machine prolonged for the purpose of supporting the principal working parts of the machinery which constitutes our invention.

B is a horizontal shaft mounted in suitable bearings on the framing and carrying gears from which the cutting and folding devices derive their movements, which are to be properly timed in relation to the revolutions of the form-cylinders of the printing-machine to which the invention is applied. The shaft B may be driven by any suitable means; but it is represented as furnished for the purpose with a spur-gear B′, which is to be geared through an intermediate gear B^2 (represented in Fig. 1 by a dotted circle) with a gear on one of the cylinders of the printing-machine.

On the top of the framing A are the two side frames C for the support of the carrier by which the printed web as it comes from the printing-machine is taken to the rotary cutters *a b*, (see Figs. 2 and 4,) and thence forward toward the folding devices. This carrier is represented as of a kind heretofore used in delivery and folding apparatus in connection with printing-machines, consisting of two parallel endless toothed racks or chains D, with attached grippers *c* and *c′*, the said

chains running on supporting-wheels D′, which turn freely on studs *e*, secured in the side frames C, and the straight portions or runs of the said chains between the said wheels running, in the direction of the arrows shown near them in Fig. 2, on guideways *e′* on the said frames C, the said carrier, except as to the spacing apart of the grippers lengthwise of the carrier, as will be hereinafter described, being substantially like the carrier described in the patent of Calvert B. Cottrell, No. 494,846, dated April 24, 1893. It is represented as driven continuously by two spur-gears D^2 (see Figs. 2 and 3) on the shaft B engaging with the teeth in the lower runs of the chains, the speed corresponding with that of the surfaces of the printing-machine cylinders.

The rotary cutters consist of pairs *a b* of shear-blades of a length equal to the width of the web of paper. Two pairs are represented, one, *a*, of each pair being carried by stocks E on a shaft E′ and the other, *b*, being carried by stocks F on a shaft F′, the said shafts running in bearings on the framing A, one of the said shafts being under and the other above the lower run, which is the operative run of the carrier. The upper one E′ of said shafts is furnished with a spur-gear E^2, (see Figs. 1 and 3,) through which it receives motion from a spur-gear E^3 on the shaft B, and the lower one F′ is furnished with a gear F^3, Fig. 3, through which it derives motion from a gear F^4, Figs. 3 and 4, on the upper one E′. The speed of the cutter-shafts is such that the edges of the cutters move at the same speed as the carrier and the surfaces of the printing-machine cylinders. The pairs *a b* of cutters must be spaced apart at a distance equal to the lengths of web to be cut for the sheets S, (see Figs. 12 and 13,) and, as in the example represented, the said sheets S are to have a length equal to one-quarter of the circumference of the cylinders of the printing-machine, and as there are two pairs *a b* of cutters the cutter-shafts must make two revolutions for every one of the said cylinders. The grippers *c c′* are spaced lengthwise of the carrier to correspond with the sheets S, so that there is one gripper for each side of every sheet S.

The folding devices represented for carrying out our invention comprise, as shown in Figs. 2 and 5, folding-blades G, arranged crosswise of the carrier to operate between the chains or racks thereof, and stationary beds consisting of plates H, arranged below the carrier with an inclination downward in the direction of the travel of the lower and operative run of the carrier. These plates have in them slots or narrow openings *k*, into which the said blades enter. There are two sets of said devices, arranged one in advance of the other in relation to the lower and operative run of the carrier, according to the patent of C. B. Cottrell hereinbefore mentioned, one set operating to fold every other series of four sheets S and the other set operating to fold the intervening alternate series of four sheets after the sheets forming the series have been assembled by the means hereinafter described. The said blades G are carried by the arms G′ of rock-shafts G^2, which are arranged in bearings on the framing. The said rock-shafts derive their necessary movements for operating the blades from two similar cams G^3 on a shaft P, which is arranged in fixed bearings on the framing A and which is driven from the shaft B at the rate of one revolution of P to two of B through gears B* and P′ on the respective shafts. The connections between the cams G^3 and the rock-shafts G^2 consist, as shown in Fig. 2, of yoke-rods G^4, engaging with the cams and connected with downwardly-projecting arms G^5 on the rock-shafts. The said two cams G^3 are set in opposite directions in order that the folding-blades may be operated alternately at regular intervals.

In order to provide for folding the successive series of four sheets by the first and second sets of folding devices alternately, the grippers *c c′* of the endless carrier have to be so organized in alternate series of consecutive fours on each side that every other series of fours will be opened to liberate their sheets as they arrive at the first set of folding devices and the intervening alternate series must pass the first set without opening and be opened as they arrive at the second set. This is accomplished in about the same manner as in the machine described in the patent of C. B. Cottrell hereinbefore referred to, but we will here briefly describe it. The grippers are made self-closing by means of springs, and they are opened by passing stationary cams *f f′* on the frame C. The cams *f*, one on each side, for opening the grippers *c* of the series which deliver to the first folding devices, are arranged, as shown in the transverse sectional views, Figs. 7 and 8, so much higher than the cams *f′* for opening the grippers *c′* of the intervening series that the short rollers *g′*, attached to the grippers *c′*, will pass under and clear of the said cams *f*, although they will pass in operative contact with those *f′*. The rollers *g* of the grippers *c* are long enough to reach the higher cams *f* to open those grippers at the proper place for the first folding devices.

For each folding apparatus or folding device there is a set of devices independent of the carrier for assembling the sheets in fours on the folding-plate H, a pair of folding-rollers L L for completing the folding commenced by the blade G, and a set of rotary cutters N N for slitting the folded sheets across their folds into signatures. As the two sets of these several devices are in most respects alike, it will be sufficient to describe fully and in detail the first set—viz., that which is nearest the cutters *a b*—and afterward briefly describe the second set. The assembling devices in the first set consist, as shown in Figs.

1, 2, and 4, of a set of downwardly-curved switch-fingers *h*, attached to a bar or rock-shaft I, which is arranged crosswise of the carrier and feed-rollers J K, (see Figs. 2 and 5,) the said fingers *h* serving to direct the forward edges of the sheets downward toward the slotted folding-plate H, which, as will be seen by reference to Figs. 1 and 2, has a forward and downward inclination, and the said rollers J K serving to carry the sheets which have been liberated by the carrier forward and downward onto the slotted table H. The roller J, which is under the carrier, works in fixed bearings on the side framing A and derives rotary motion from the shaft B, with a surface velocity considerably less than that of the carrier, through a horizontal shaft L*, arranged in bearings on the outside of the framing A and gearing, which will be hereinafter described, the said roller J making one revolution while the carrier travels the length of a sheet. The roller J may be and is represented as a full cylinder, but that K, which is merely a pressure-roller acting to confine the paper to the roller J, is made up of a series of narrow-edged disks, so arranged as to press upon the sheets between the unprinted portions and hold them to the roller J. The two outermost of said disks K are arranged to take the sheets close to their side edges. All of said disks are notched, as shown at 20, at opposite points in their circumference. One object of these notches 20 is to allow the front edges of the sheets to get directly between the centers of the rollers before the rollers begin to take their hold upon the sheets; but the notches in the two outermost disks allow the carrier-grippers to pass by those disks without interference, as the grippers will enter these notches. The said rollers K are geared with J to rotate at the same surface velocity by gears j' and j^2. (See Fig. 6.)

The folding-plate H has along its lower edge a stop-gage *d*, (see Figs. 2 and 5,) to which the sheets drop one at a time from the assembling-rollers J K, so that all those of a series of four are assembled evenly in a pile in proper position for folding them all together midway between the cut edges *l l*, as indicated by the dotted lines *n n* in Figs. 12 and 13. In front of and above the folding-plate H there are arranged across the said plate two stationary horizontal shafts or bars *m m*, to which are attached fingers m' m^2, which guide the sheets in their way over the said plate and confine them loosely thereto. Under and behind and parallel with the folding-plate H, opposite the slot *k* therein, are the pair of folding-rollers L L, which work in suitable bearings on the side framing and which receive the several sheets from the blade G and complete the folding commenced by the said blade in forcing them through the slot *k*. Behind and in rear of and parallel with the folding-rollers L L there are arranged the two parallel shafts M M, on which are the three pairs of rotary slitting-cutters N N, to which the folded sheets are carried by the rollers L L to be slit transversely to their folds, as indicated by the lines *o o* in Figs. 12 and 13, to produce from each folded sheet a signature of sixteen pages composed of four separate folded sheets of four pages each. The slitting-cutters N are simply disk shear-blades of well-known kind.

The horizontal shaft L*, hereinbefore mentioned, drives not only the feed-roller J, but the folding-rollers L L and the cutter-shafts M M. The said shaft L* derives motion from the shaft B through bevel-gears *i i**, (see Figs. 3 and 5,) and it carries another bevel-gear *j*, which gears with a bevel-gear j^* on one of the cutter-shafts M M. (See Figs. 5 and 6.) The latter shafts are geared together by spur-gears *p p*, and the folding-rollers are geared together by gears *q q*. (See Figs. 1 and 6.) One of the gears *p p* and one of the gears *q q* are geared through an idler-gear *r*, pivoted to the framing, with a gear j'^* on the feed-roller J, the said gearing j j^* j'^*, *p p*, *q q*, and *r* thus driving the feed-roller J, the folding-rollers L L, and the slitting-cutters N N.

It may be here mentioned that the folding-rollers L L have their surfaces knurled, as shown in the perspective view, Fig. 9, of one of said rollers at 15 and 16, where they come in contact with the margins of the sheets, and at 17, where they seize the folded edges thereof, and between the said knurled portions their surfaces are slightly depressed, as indicated at 18.

Except as to the guiding-fingers *h* m' m^2 and the pressure-roller K the second set of assembling, folding, and slitting devices—viz., the set farthest from the cutters *a b*—are similar in detail to the first set and they will be identified by the similar letters of reference applied to their corresponding parts. In the first set the fingers *h h* and the pressure-roller K have to be raised to allow the passage under them of the alternating series of four sheets, which are still held by the grippers c', to be carried to the second folding-plate H. The raising of the fingers *h* is effected by rocking the said bar or shaft I in its fixed bearings on the framing, and provision is made for raising the pressure-roller K by mounting its shaft K′ in bearings in the arms K^2 of a rock-shaft K^3, (see Figs. 2 and 4,) which is supported in fixed bearings in the framing, and by giving the said rock-shaft a suitable movement. In the second set the fingers *h* are dispensed with by giving an upward and backward curved prolongation to the guide-fingers m', as shown in Fig. 2, and the shaft K′ of the pressure-roller is simply mounted in journal-boxes e^2, to which springs are applied in the manner common to pressure-rollers.

The movement of the rock-shaft I for raising the fingers *h* and afterward bringing them down to the operative position and the movement of the rock-shaft K^3 for raising and lowering the pressure-roller K are both produced

by means of two similar cams I* on the shaft P, hereinbefore described, the said cams I* operating, respectively, as shown in Figs. 3, 4, and 5, through rods K^4 and I′, connected with arms K^5 and I^2 on the rock-shafts K^3 and I.

In the operation hereinbefore described of carrying the sheets by the grippers to the assembling and folding apparatus the sheets are always held near their front edges, leaving the rear edge of each sheet free to drop far enough for the front edge of the following sheets to pass over it; but to prevent the rear edges from thus dropping too low there is arranged between the cutter-heads E F and the first assembling-rollers J K a sheet-support, consisting of a stationary transverse bar d' and a series of attached horizontal fingers d^2, and there is also arranged between the first and second assembling-rollers J K a similar set of fingers d^3, attached to the cross-bar m, which carries the guides m' for guiding the sheets over the first folding-plate.

Under the folding, assembling, and slitting devices above described there is arranged an intermittently-traveling delivery-carrier consisting principally of two parallel endless chains Q′ and a series of pockets Q Q, attached thereto, for receiving the signatures from the slitting-cutters N and delivering them to a suitable receptacle; but before describing this receiving and delivering apparatus we will give a brief résumé of the successive operations of the previously-described parts from the reception of the web by the grippers c c' of the carrier to the slitting of the folded sheets by the cutters N, first mentioning that the opening of the grippers to receive the web is effected in a manner common to web and sheet carriers of this kind by passing a stationary cam f^2, (see Figs. 2 and 4,) fast upon the fixed studs e, on which rotate the carrier-wheels D′ at the receiving end of the carrier.

The printed web taken by the grippers c c' is first cut into the short sheets S, (see Figs. 12 and 13,) which continues to be held by the grippers near their front edges until the grippers successively arrive at and are opened by their respective cams f f'. Four consecutive sheets, held by the grippers c with the long rollers g and intended to be released by the cams f for the first set of assembling, folding, and slitting devices, are released one at a time as their front edges arrive at the first feeding-rollers J K. When the first of these sheets has reached the said rollers and has been released, it is fed by the said rollers onward down the folding-plate H, being conducted under the sheet-guides m' m^2 by the switch-fingers h. The feed-rollers feed the sheet at a slower speed than that at which the carrier travels, and the second sheet, still held by the grippers, is lapped over the first sheet a short distance, when it (the second sheet) is seized by the feeding-rollers, and for a short distance the two sheets are fed along together before the first runs out from the feeding-rollers and drops to the stop-gage d. The distance which the sheet drops is less than the lap of the two sheets, so that the holding edge of the second will not catch on the rear edge of the first sheet. In the same way the third sheet is lapped over the second and the fourth over the third. When the fourth sheet has been guided part of the way down the folding-plate H, the switch-fingers h and also the feeding-rollers K of the first set are lifted to allow the sheets intended for the second set of assembling, folding, and slitting devices to pass. When the four sheets on the first folding-plate H have all reached the gage d and have been assembled in a pile thereon, the folding-blade G pushes the middle of the pile of sheets through the slot in the folding-plate into the folding-rollers L, the knurled surfaces of which seize it, pinch the sheets together, and pass them on to the slitting-rollers, by which each is cut into four signatures, which are dropped into one of the delivery-pockets Q, which is for the time stationary underneath them. In the meantime the four sheets carried by the grippers c' with short rollers g' have been fed to the second set of assembling, folding, and slitting devices, wherein the same operation is repeated, the signatures being delivered into a delivery-pocket Q, which is at the time stationary underneath.

The delivery-pockets Q of the delivery-carrier are represented of skeleton form, each consisting of a row of angle-pieces carried by a bar Q^2, the ends of which have attached to them roller-carriages Q^3, (see Fig. 10,) which run on tracks w, (see Figs. 2 and 6,) formed on two stationary side plates Q*, which are supported by brackets Q^4 (see Fig. 6) on the main framing A. The said carriages are connected with the two parallel endless chains Q′, hereinbefore mentioned, which run on carrying-wheels R and R′ on two horizontal shafts T and T′, fitted to bearings on the side plates Q*. The carriages Q^3 may be attached to the chains Q′ in any suitable manner. They are represented in Fig. 10 as screwed thereto by the pins x x, which connect the links of the chains Q′ together.

The shaft T is the driving-shaft by which the delivery-carrier has imparted to it the necessary intermittent movement for presenting the pockets successively at the proper time under the slitting-cutters. This shaft T derives its movement from a cam U on the shaft P, the said cam acting on a lever U*, (see Figs. 4 and 11,) which works on a fulcrum-pin t in a fixed standard t', and which carries a rack-bar U^2, which gears with a spur-gear U′ on the chain-driving shaft T. This spur-gear is loose on the said shaft T, but it has attached to its hub a pawl u, engaging with a two-toothed ratchet-wheel u', which is fast on the said shaft, and hence when the lever moves away from the said shaft and toward the cam-shaft P the rack-bar turns the

gear U′ without turning the shaft; but when the lever and rack-bar are moved by the cam away from the cam-shaft the ratchet-wheel and the shaft T are turned to the extent of a half-revolution, which is sufficient to give the chains and pockets a movement equal to the distance between one pocket and the next. The lever U* is constantly pressed toward its cam by a spring u^*, which works upon a rod u^5, connected with the said lever, the said spring abutting between a shoulder on the said rod and a fixed bearing u^6; but until the proper time arrives for moving the pockets the lever is locked out of the operative range of the cam by a hooked catch u^3, which is pivoted to the standard t', and which engages, as shown in Fig. 11, with a catch-piece u^2 on one side of the lever. When the proper time arrives, the said catch u^3 is lifted from the catch-piece and the lever is left to the action of the spring, which causes it to follow the cam, so that it may be caused to move the chains and as the rising portion of the latter comes into action on it.

The lifting of the catch u^3 is effected, as shown in Fig. 4, by a movable tripping-tappet v on a spur-gear V, which turns on the pin t, the said tappet acting on a tripping-arm u^4, attached to the catch u^3, through a short trip-lever t^2, (see Figs. 3, 4, and 4*,) which works on a fulcrum-pin t^3 on the standand t'. The said gear V is driven by a gear W, having a smaller number of teeth on the cam-shaft. The said gear W has fixedly attached to it a tappet-lug v', which once during a certain number of revolutions of the cam-shaft comes into contact with the outer end of the movable tappet v and pushes the latter inward far enough for its inner end to act on the lever t^2 and produce the disengagement of the lever U, which is then pushed back by the spring u^*, as shown in Fig. 4, into operative contact with the lower portion of the cam. The tappet v has applied to it a spring v^*, which presses it outward to the position to be met by the tappet v', but which allows it to move inward to act on the lever t^2.

The number of teeth on the gears V and W and the number of tappets on the gear V will depend upon the number of signatures to be deposited in each pocket. Suppose, for example, that the gear W has thirty-five teeth and V thirty-six and that V is provided with two tappets v. The cam-shaft P making one revolution to two assemblages of four sheets S folded—that is to say, to one assemblage of sheets folded by each folder—the tappet-gear V will make eighteen ($36 \div 2 = 18$) revolutions between the times of moving the receiving-pockets, and as both folders deliver into the same pockets each will contain thirty-six folded and slit sheets, or one hundred and forty-four signatures, when it reaches the delivery-point at the outer end of the machine, eighteen sheets, or seventy-two signatures, having been delivered into it from the first folding-and-slitting apparatus and eighteen from the second. Suppose again that with the same number of teeth on the gears W V there should be three tappets on the gear V. Then the said gear will make twelve ($36 \div 3 = 12$) revolutions between the times of moving the receiving-pockets, and each pocket will contain twenty-four sheets or ninety-six signatures.

What we claim as our invention is—

1. The combination of a carrier for carrying sheets one before another, a folding apparatus, assembling-rollers located between the carrier and the folding apparatus and having a surface velocity less than that of the carrier for taking therefrom several sheets one after another and placing them in a pile on the folding apparatus, means for operating the folding apparatus to produce the folding at once of the several sheets of the pile and cutters for cutting at once the several sheets thus folded together, substantially as herein described.

2. The combination of a carrier for carrying sheets one before another, a reciprocating folding-blade under said carrier, a folding-bed having an opening for said blade, assembling-rollers located between said carrier and said bed and having a surface velocity less than that of said carrier for taking several sheets one after another from said carrier and placing them in a pile on said bed, and a stop-gage against which the sheets are successively received on said bed, substantially as herein described.

3. The combination of a carrier for carrying sheets one before another, a folding apparatus located under entirely below said carrier, sheet-assembling rollers independent of said carrier located between the carrier and the folding apparatus and having a surface velocity less than that of the carrier, a bar arranged crosswise of the carrier and having attached to it fingers which project downward to direct the sheets downward therefrom to the folding apparatus, substantially as herein described.

4. The combination of a carrier, cutters for cutting paper into sheets in said carrier, a folding apparatus, assembling-rollers independent of said carrier located between the said carrier and folding apparatus for taking from the said carrier one after another several sheets cut by said cutters and placing said sheets one at a time in a pile on the folding apparatus, and means for operating the folding apparatus to produce the folding at once of the several sheets of the pile, substantially as herein described.

5. The combination of a carrier, cutters for cutting a web into sheets in said carrier, a folding apparatus, assembling-rollers independent of said carrier located between the said carrier and the folding apparatus and having a surface velocity less than that of said carrier for taking therefrom one after another several sheets cut from the web therein by said cutters and placing said sheets in a

pile on the folding apparatus, and means for operating the folding apparatus to produce the folding at once of the several sheets of the pile, substantially as herein described.

6. The combination of a carrier for carrying sheets one before another, a reciprocating folding-blade under said carrier, a folding-bed consisting of a slotted plate stationary under said carrier with a downward inclination in the direction of the operating movement of the carrier, assembling-rollers for taking the sheets from said carrier to said plate, bars arranged across said plate above and below its folding-slot and carrying-fingers for guiding the sheets over the face of said plate and confining them thereto, substantially as herein described.

7. The combination of an endless carrier provided with sheet-holding grippers, and a pair of assembling-rollers having a surface velocity less than that of the carrier for taking sheets one after another from said carrier, one of said rollers having notches for the passage of the grippers between said rollers, substantially as herein described.

8. The combination of a carrier, rotary cutters for cutting a web transversely into sheets in said carrier, a folding apparatus arranged below said carrier for folding the cut sheets parallel with their cuts, assembling-rollers for taking the sheets one at a time from said carrier and presenting them in a pile to said folding apparatus, and cutters for slitting at once the several folded sheets of a pile transversely to their folds, substantially as herein described.

9. The combination of two folding apparatuses arranged one before the other, sheet-carrying devices running to both of said apparatuses, a pair of assembling-rollers for each folding apparatus and mechanism for separating the assembling-rollers of one pair to allow sheets to pass by that pair and its respective folding apparatus to be taken by the other pair to the other folding apparatus, substantially as herein described.

10. The combination of two folding apparatuses arranged one before the other, a sheet-carrier having grippers in alternate series running past both of said apparatuses, a pair of assembling-rollers for each folding apparatus, and mechanism for separating the assembling-rollers of one pair to allow sheets carried by the grippers of one series to pass by that pair and its respective folding apparatus to be taken by the other pair to the other folding apparatus, substantially as herein described.

11. The combination of two folding apparatuses arranged one before the other, a sheet-carrier having grippers in alternate series running past both of said apparatuses, a pair of assembling-rollers for each folding apparatus, a bar with attached fingers for directing the sheets from the grippers of one series from one pair of assembling-rollers to the folding apparatus for that pair and means for operating said bar and fingers to allow the sheets in the grippers of the other series to pass by said fingers to the other folding apparatus, substantially as herein described.

12. The combination of two folding apparatuses arranged one before the other, a sheet-carrier running past both of said apparatuses to present sheets to each of them, and an intermittently-traveling delivery-carrier common to both feeding apparatuses for receiving folded sheets first from one and afterward from the other of said folding apparatuses, substantially as herein described.

13. The combination of two folding apparatuses arranged one before the other, a sheet-carrier running past both of said apparatuses to present sheets to each of them, an intermittently-traveling delivery-carrier common to both feeding apparatuses for receiving folded sheets first from one and afterward from the other of said folding apparatuses, and cutters between each folding apparatus and the delivery-carrier, substantially as herein described.

14. The combination for locking and unlocking the cam-lever U* to control the operation of the delivery-carrier, of the geared tappet-wheels V W and their tappets v v', the catch-hook u^3 for engaging with a projection u^2 on said lever and the trip-lever t^2 through which the tappet v acts upon said catch-hook, substantially as herein described.

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Witnesses:
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