

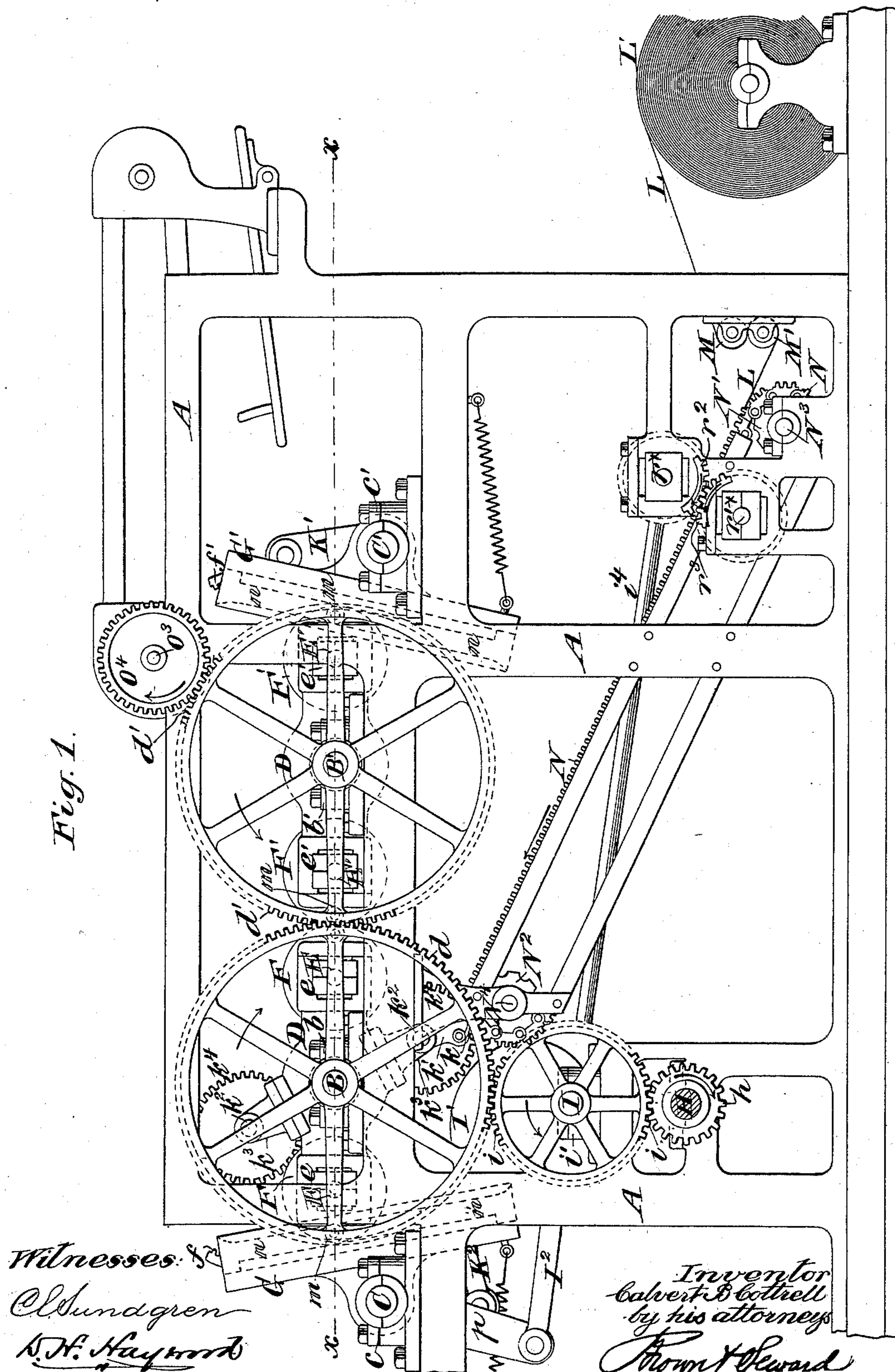
(No Model.)

5 Sheets—Sheet 1.

C. B. COTTRELL.
PRINTING MACHINE.

No. 448,775.

Patented Mar. 24, 1891.

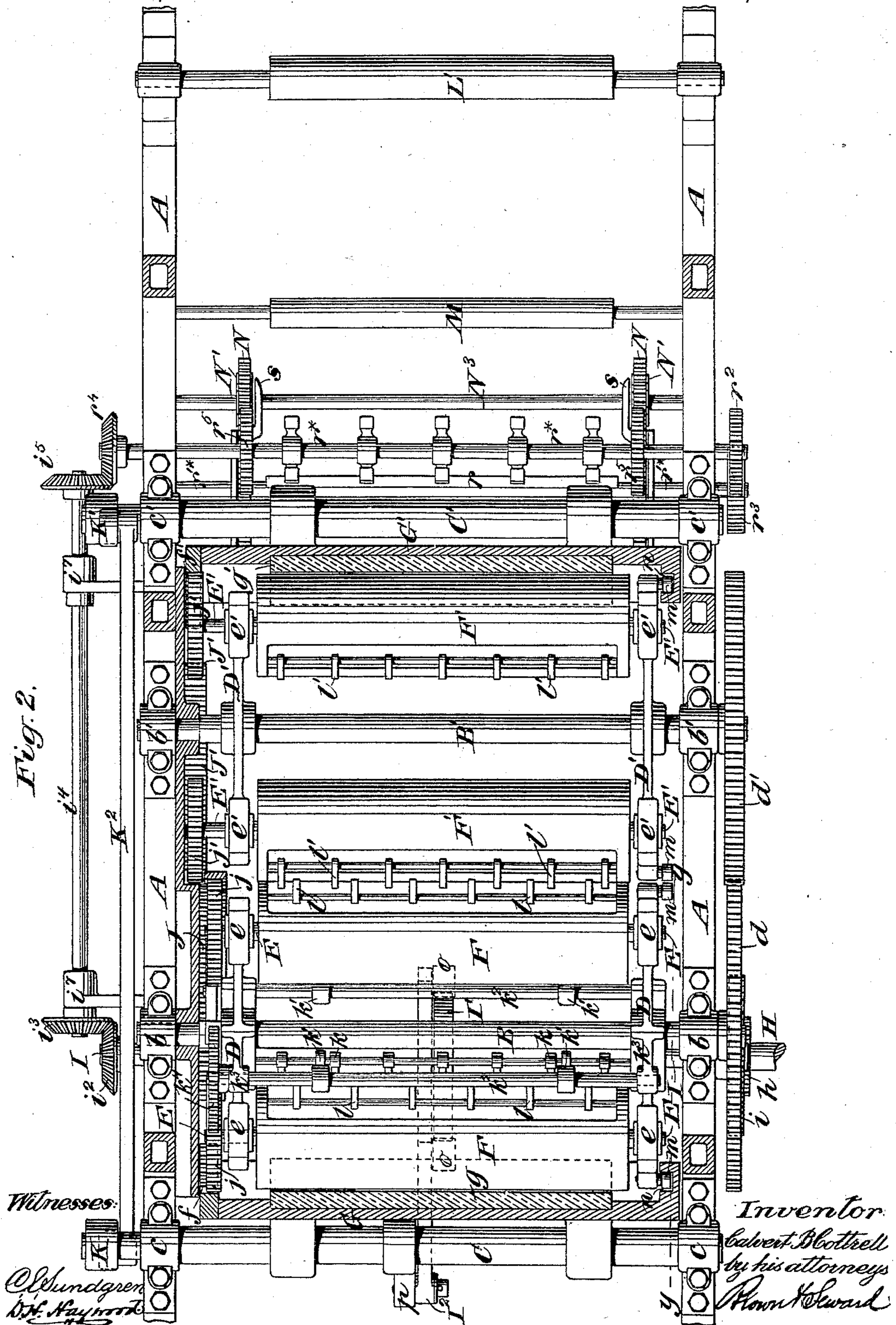


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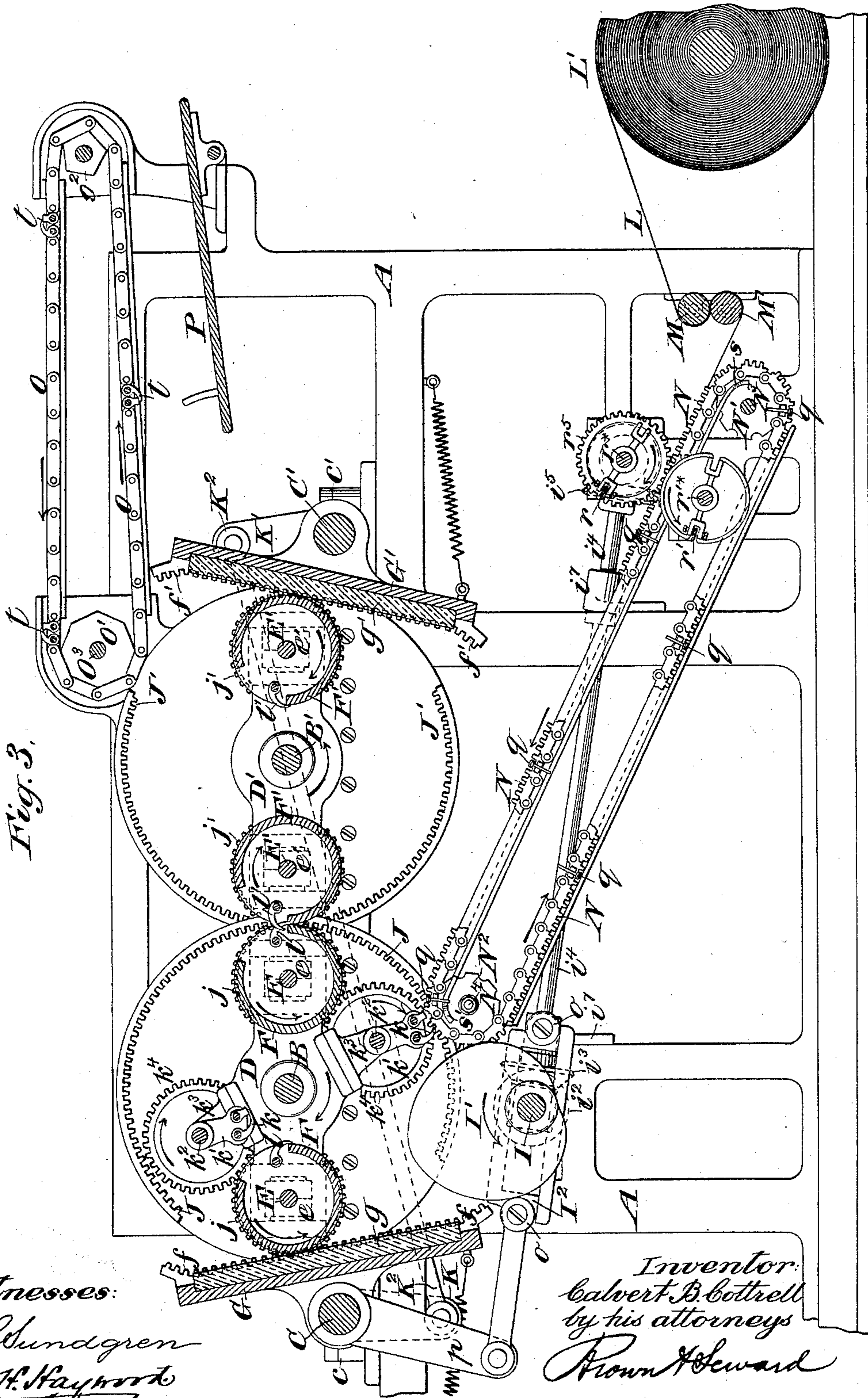
Fig. 2.



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Fig. 5.

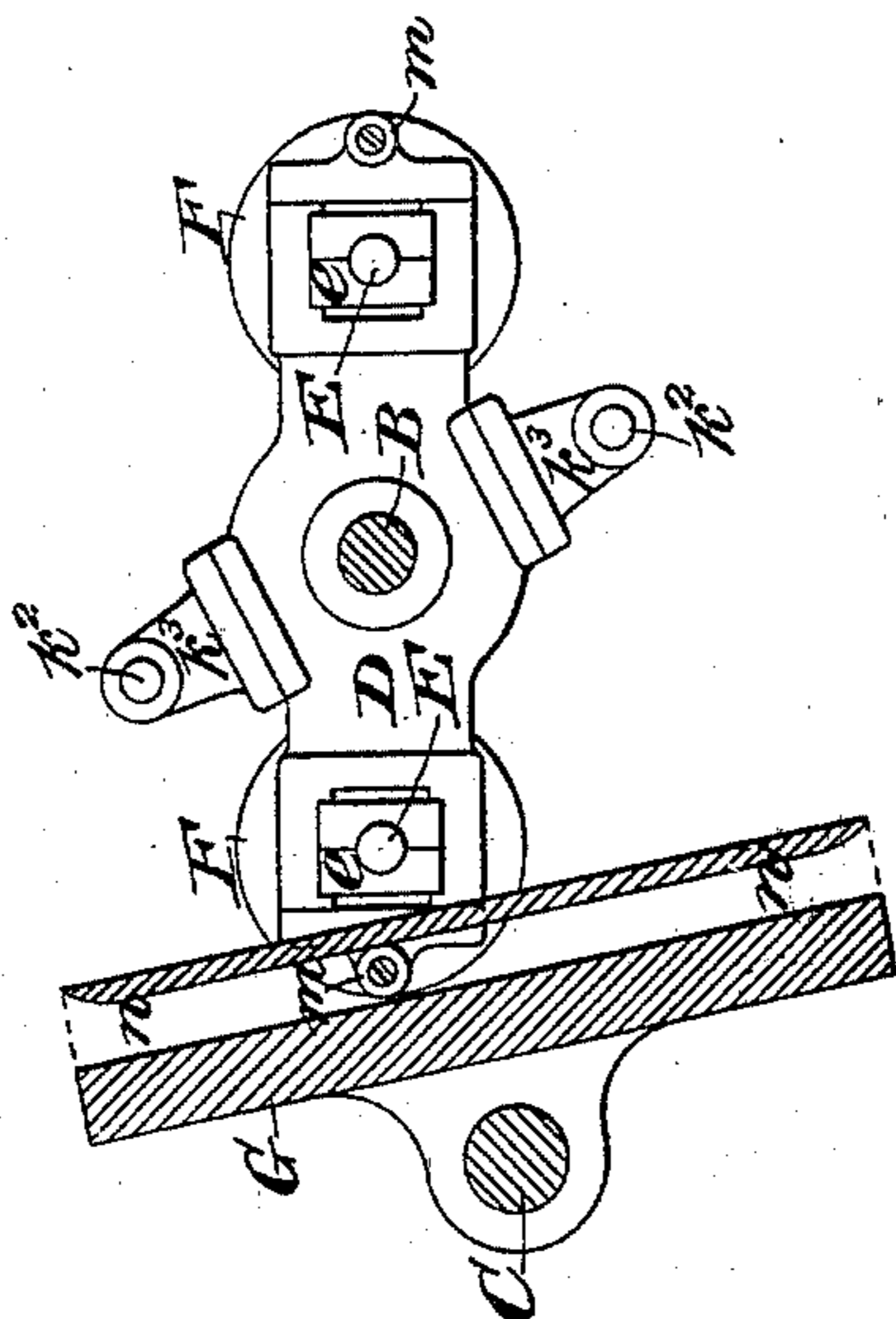
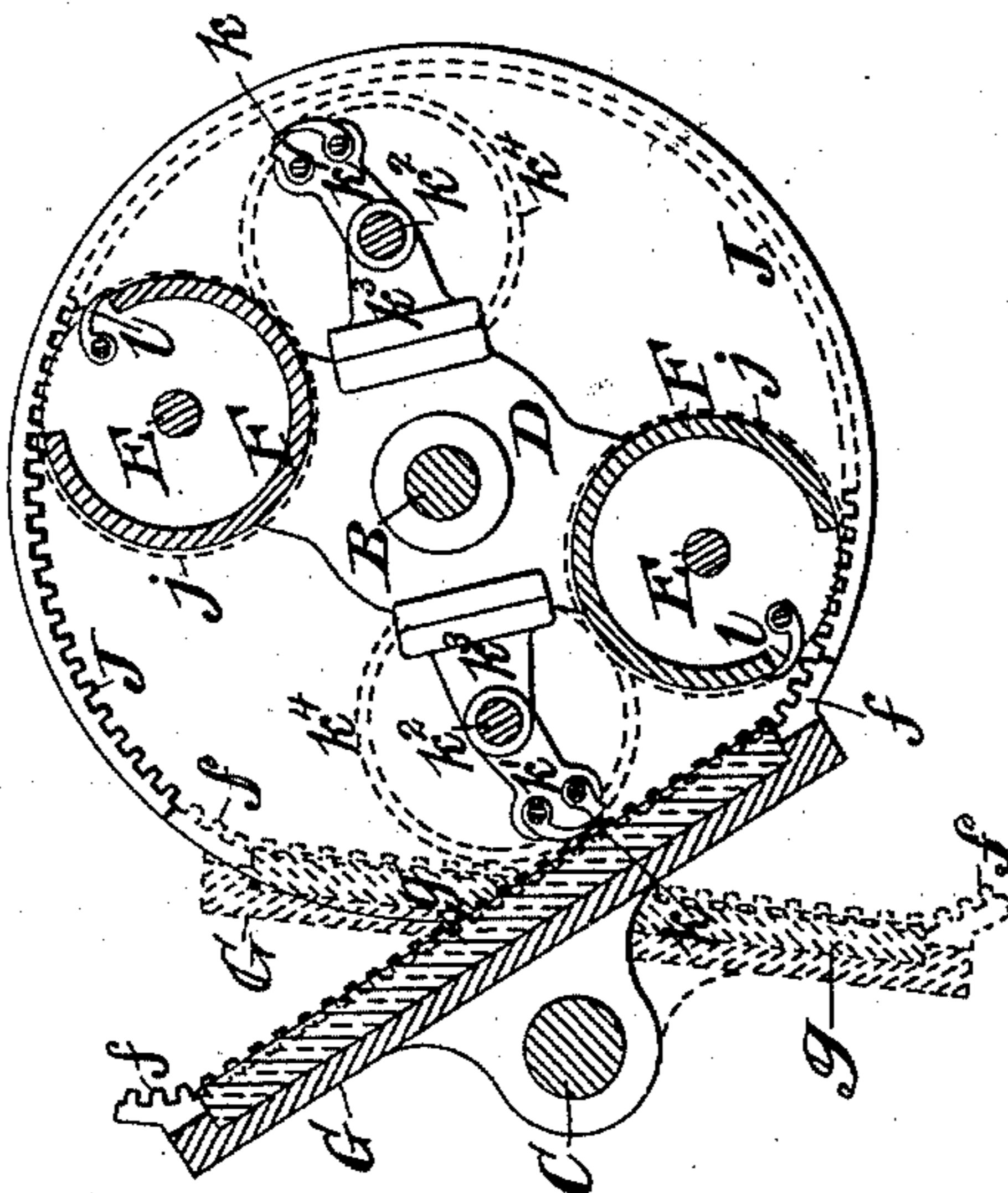


Fig. 4.



Witnesses:

O. Lundgren
W. H. Hayward

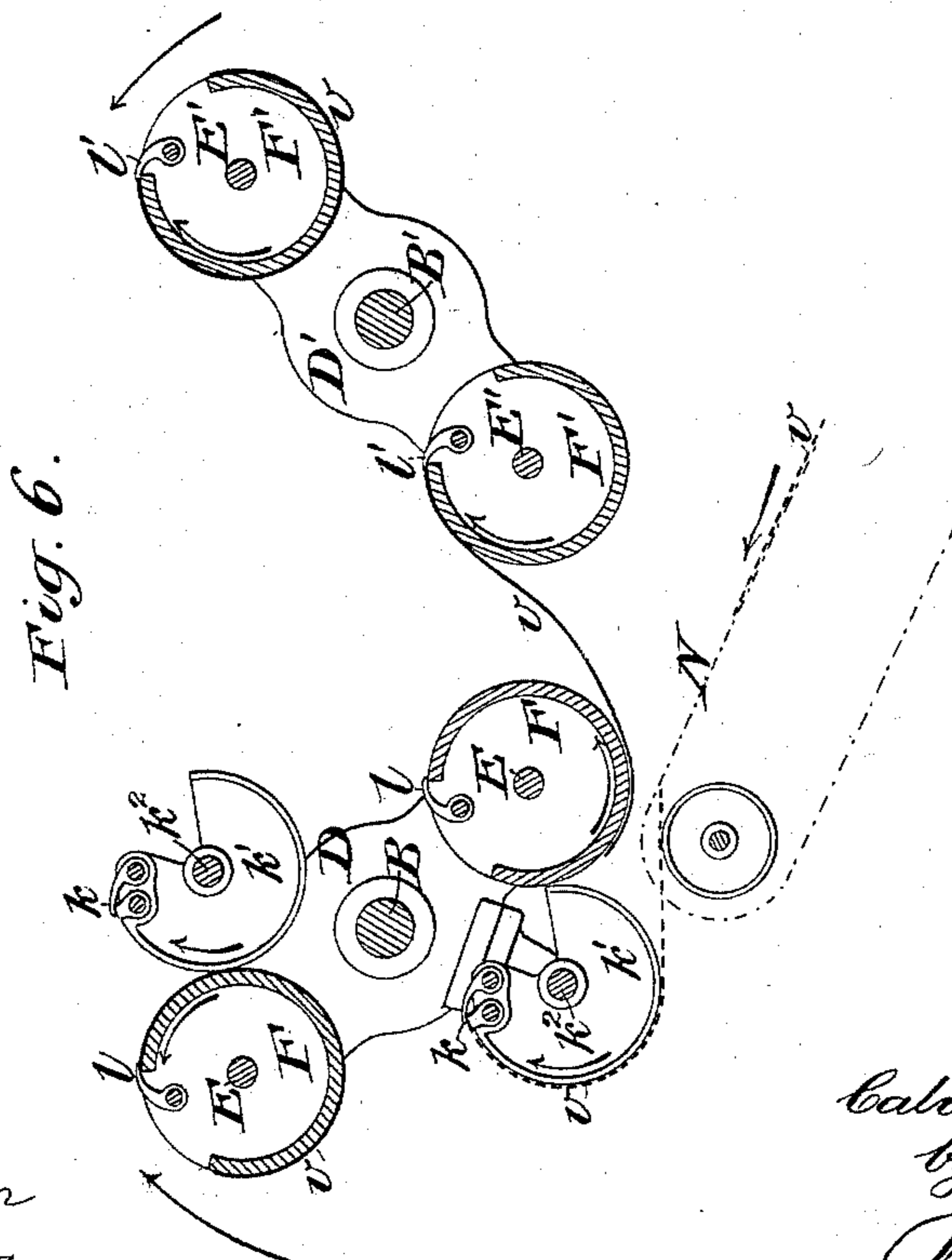
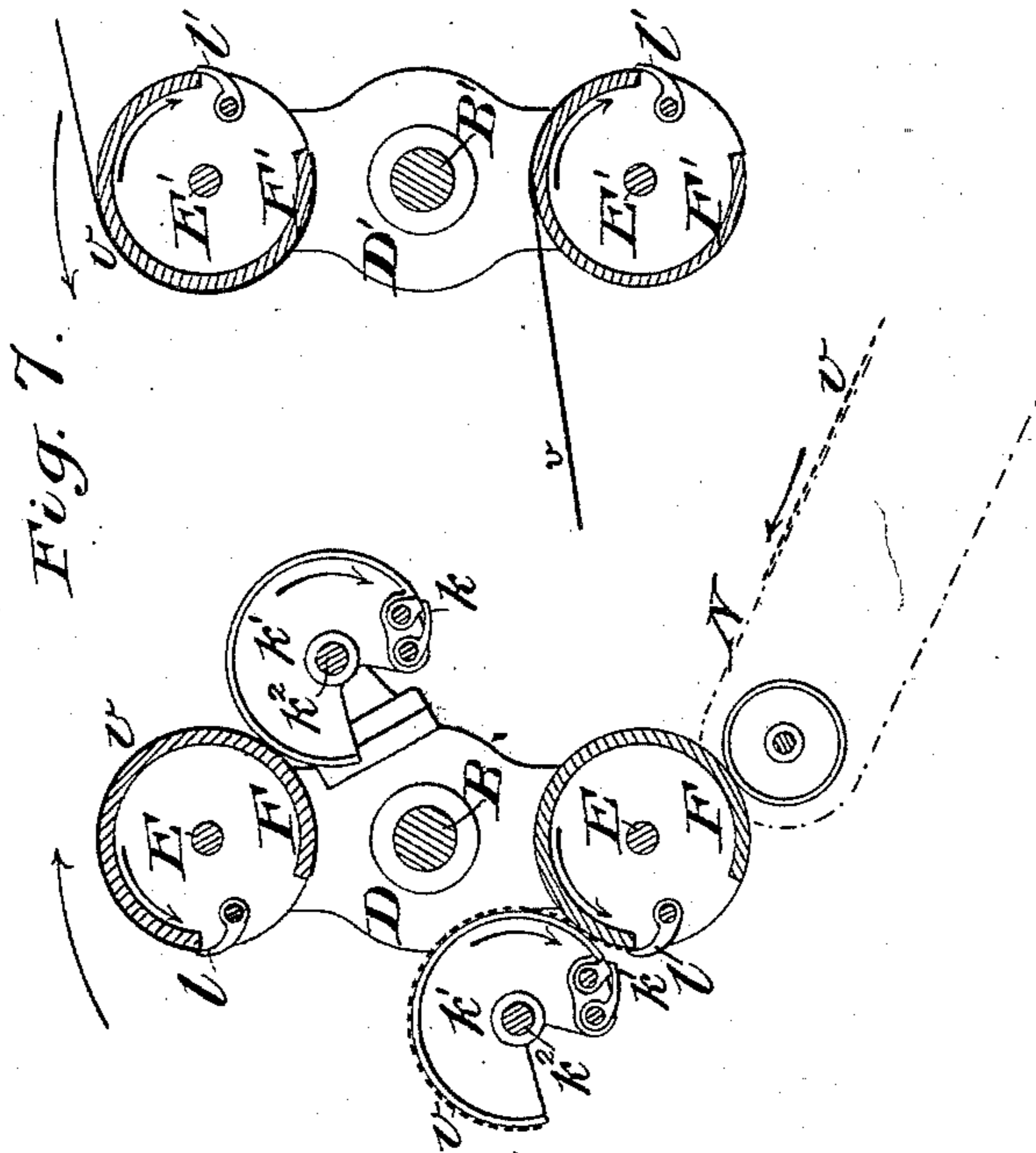
Inventor

Calvert B. Cottrell
by his attorneys
Brown & Seward

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Witnesses:

O. Sundgren
D. H. Hayward

Inventor:
Calvert Cottrell
by attorneys
Brown & Seward

UNITED STATES PATENT OFFICE.

CALVERT B. COTTRELL, OF WESTERLY, RHODE ISLAND.

PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 448,775, dated March 24, 1891.

Application filed May 28, 1890. Serial No. 353,495. (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 Printing-Machines, of which the following is a specification, reference being had to the accompanying drawings.

This invention is more especially designed for perfecting-machines, but is in part applicable to machines for printing on one side only of the sheet.

The leading feature of my invention is a combination comprising one or more rotary impression-cylinders, the axis or axes of which revolves or revolve about a fixed axis, and an oscillating bed or form-carrier which presents a printing-form to the said impression cylinder or cylinders. In a perfecting-machine requiring two forms the combination above mentioned is duplicated, one or more separate impression-cylinders being combined with each of two oscillating beds or form-carriers, each of which carries one of the forms.

Figure 1 in the drawings represents a side elevation of the principal parts of a perfecting-press embodying my invention. Fig. 2 is a plan view of the same, partly in section, on the line xx of Fig. 1. Fig. 3 represents a vertical section parallel with Fig. 1, taken nearly in the center of the machine. Fig. 4 is a view corresponding with a portion of Fig. 3, but showing the parts in different positions. Fig. 5 represents a side view, partly in section, on the line yy , Fig. 2, representing one of the oscillating beds and its corresponding rotary cylinders. Figs. 6 and 7 are diagrammatic views, which will be hereinafter explained.

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

A A designate the framing of the machine containing the fixed bearings $b b'$ for two rotary shafts B B', and bearings $c c'$ for two rock-shafts C C'. The two rotary shafts B B' have firmly secured to them carriers D D', consisting of arms secured to the said shafts and containing bearings $ee e'e'$ for the shafts E E' E' E' of the rotary impression-cylinders F F F' F', of which there are represented two in the carrier D and two in the carrier D'.

The two rock-shafts C C' have firmly secured to them the oscillating beds or form-carriers G G', to which the printing-forms $g g'$ are secured.

The axes of the shafts B B' constitute fixed axes, about which the impression-cylinders F F' may revolve while they rotate about their own axes—namely, the axes of their shafts E E'. The bearings $b b'$ for the shafts B B' are arranged at such distance apart and the bearings $e e'$ of the cylinder-shafts are arranged at such distance from the shafts B B' and the impression-cylinders are of such diameter that as the cylinders revolve around the axes of the shafts B B' the cylinders F F' of the set belonging to one of the said shafts may pass very nearly in contact with the set of cylinders F' F' belonging to the other of said shafts, as may be understood by reference to Fig. 3. The bearings $c c'$ of the rock-shafts C C' are arranged in such positions that both sets of cylinders are between the beds or form-carriers G G' on said rock-shafts, and that while said beds or form-carriers oscillate with the said rock-shafts the impression-cylinders of one set may rotate in contact with and print sheets against the printing-form on one bed, and the impression-cylinders of the other set may rotate in contact with and print sheets against the printing-form on the other bed as the axes of the said cylinders revolve about the axes of the shafts B B'. In the machine represented the cylinders F F' print the first side of two sheets from the form g on the bed G and the cylinders F' F' print the second sides of two sheets from the form g' on the bed G'.

H designates the main shaft of the printing-machine, supported in suitable bearings in the framing A and furnished with a spur-gear h , (see Figs. 1 and 2,) which is geared through a spur-gear i on a shaft I with a spur-gear d on the cylinder-carrier shaft B. This gear d gears with a similar spur-gear d' on the other cylinder-carrier shaft B'. The gears $h i d d'$ are so proportioned that the gear i and its shaft I, driven by the gear h , make one revolution for every two of the main shaft H, and that the cylinder-carrier shafts driven by the gears $i d d'$ make one revolution for every two revolutions of the shaft I. The shaft I extends across the machine, being sup-

ported in bearings i' in the two side frames, and it is furnished with a cam I' and bevel-gear i^2 , the purposes of which will be hereinafter explained.

5 Firmly secured to the interior of one of the side frames are two fixed toothed racks $J J'$, which are of circular form, one concentric with the cylinder-carrier shaft B and the other concentric with the cylinder-carrier shaft B' .
 10 These racks are considerably less than whole circles, the interruptions of their circles being toward the oscillating beds or form-carriers $G G'$, as shown in Fig. 3. Toothed racks $f f'$ are also provided on the sides of the beds G
 15 G' . These racks are straight for the greater portion of their length, but turned up at their ends in the form of short arcs of circles corresponding with the circles of the racks $J J'$, so that by the oscillation of the beds to either
 20 of two positions the racks on the beds may form a continuation of the circular racks, as may be understood by reference to Fig. 4, wherein the bed G is shown in full outline at one end of its oscillation with the lower end
 25 of its rack in connection with the rack J , and is shown in dotted outline at the other end of its oscillation with its upper end in connection with the said rack J .

The cylinder-shafts $E E'$ are severally provided with spur-gears $j j'$ to gear with their
 30 respective racks $J f J' f'$. In order that these gears may be permitted to pass each other while gearing with their respective racks, the said racks are laterally offset the one from
 35 the other, as shown in Fig. 2, and the gears $j j'$ are arranged on their respective shafts in different planes to engage with the offset racks. As the cylinders revolve with their
 40 respective carriers $D D'$, the teeth of their spur-gears $j j'$ cause the rotation of the cylinders about their own axes.

In the carrier D of the first impression-cylinders $F F'$ are arranged two sets of grippers
 45 $k k$, one set for each cylinder, for taking the sheets from a feeding apparatus and presenting them to the said cylinders. These grippers are supported in arms k' , secured to shafts k^2 , which are fitted to rotate in bearings k^3 in or on the carrier D . The said shafts
 50 k^2 are furnished with spur-gears k^4 , which gear with the gears j on the cylinders F , for the purpose of producing the rotary motion of the said shafts k^2 and grippers k , the said grippers rotating at the same speed as the
 55 cylinders F for the purpose of presenting the sheets at the proper time to the said cylinders, which latter are furnished with grippers l , like those commonly employed on impression-cylinders for the purpose of taking the
 60 sheets.

The second impression-cylinders F' are furnished with grippers l' like those l of the cylinders F . These grippers are intended to take sheets directly from the first impression-cylinders, and therefore no other grippers are
 65 shown provided in the carrier D' .

The oscillating movement given to the

shafts $C C'$ and the beds or form-carriers $G G'$ is for the purpose of presenting the printing-forms $g g'$ on the said beds or carriers in
 70 proper relation to the impression-cylinders for printing while the said cylinders in their revolution with the carriers $D D'$ are passing the said forms. This oscillation is produced
 75 on the bed G by means of the cam I' , hereinbefore mentioned, on the shaft I operating between the truck-rolls o of a sliding yoke I^2 , which is connected with an arm p , secured to the rock-shaft C of the said bed. The oscillation of the bed G' is produced by a rod K^2 ,
 80 which connects with an arm K on the rock-shaft C and an arm K' on the rock-shaft C' of the bed G' . In the example represented, in which there are two cylinders in each cylinder-carrier, the bed is required to oscillate
 85 twice back and forth during each revolution of the cylinder-carrier, and hence the cam-shaft I and cam I' make two revolutions for each revolution of the cylinder-carriers. The gearing of the cylinders, with their stationary
 90 racks $J J'$ and bed-racks $f f'$, must be such that the cylinders will make a certain number of complete rotations and no more during every one of their revolutions with the carriers. In the example represented the cylinders make
 95 three rotations for each revolution.

In order to keep the oscillating beds in proper relation to their respective printing-cylinders at the time of printing more positively than it could be done by a cam, a projection m is provided on each of the carriers
 100 $D D'$ to run in a straight groove n in the side of its respective bed. In the example represented this projection is furnished with truck-rollers. The oscillation of the bed in the direction for printing may be produced entirely
 105 by this truck-roll connection between the beds and their respective cylinder-carriers, the cam I' then being only used for producing the return movement of the beds.
 110

In the machine represented paper is supplied in a continuous web L from a roll L' , suitably arranged and supported, and passes therefrom between rollers $M M'$, thence to an
 115 endless carrier $N q$, in which it is cut into sheets by rotary cutters $r r'$, and by which it is conveyed to the rotary grippers k , hereinbefore mentioned.

The endless carrier represented consists of a pair of endless toothed chains or racks N and
 120 spring-closing grippers q , which are represented sidewise of the chains or racks, for the purpose of taking the edges of the web and sheets. The said endless toothed chains or racks are supported on wheels $N' N^2$, the said wheels
 125 N' being fast on a shaft N^3 , supported in bearings in the side framing, and the said wheels N^2 turning freely on fixed studs N^4 , secured in the framing of the machine. The endless carrier and rotary cutters need no
 130 particular description here, more than to say that they are substantially like those represented in other patents of mine, and particularly in Patent No. 422,572, dated March 4, 1890.

The grippers g are opened at the proper time to take the web by passing stationary cams s near the shaft N^3 , and again opened to present the sheets to the grippers k by passing other stationary cams s' near the wheels N^2 .

The cutter-shafts r^* r'^* , which work in bearings in the side framing of the machine, are geared together by spur-gears r^2 r'^2 and derive motion through a bevel-gear r^4 (see Fig. 2) on the shaft r^* of the cutters r through the bevel-gear i^2 , hereinbefore mentioned, on the shaft I , the said bevel-gear i^2 gearing with a bevel-gear i^3 on a shaft i^4 , which gears with a second bevel-gear i^5 , gearing with said bevel-gear r^4 on the cutter-shaft r^* . This shaft i^4 is arranged on one side of the machine-framing parallel therewith and supported in bearings i^7 , secured to the said framing. The endless carrier derives motion from the cutter-shaft r^* through spur-gears r^5 on the said shaft gearing with the teeth of the endless chains or racks N of the carriers.

I have shown arranged in proper relation to the second cylinder-carrier D' a delivery apparatus consisting of endless chains O , running on wheels O' O^2 , and furnished with grippers t , to constitute an endless carrier for taking the sheets from the impression-cylinder F' of said cylinder-carrier and delivering them to a receiving-board P . This delivery apparatus is represented as driven from the spur-gear d' on the shaft B' of the cylinder-carrier D' , gearing with a spur-gear O^4 on a shaft O^3 of the wheels O' .

It is obvious that suitable inking apparatus must be employed for inking the forms g g' , and thus suitable means must be employed for opening and closing the cylinder-grippers l l' and the transfer-grippers k ; but I have not shown such inking apparatus or gripper opening and closing devices, as they constitute no part of the present invention.

The operation of the machine represented is as follows: The web L , being taken by the grippers g of the endless toothed chains or racks N , is carried between the rotary cutters r r' , by which it is cut into sheets, which are carried by the said grippers g to the grippers k in the impression-cylinder carrier D , by which latter grippers they are presented to the two impression-cylinders F F' alternately, being taken by the grippers l of the said cylinders. The sheets on the said cylinders are carried by the rotary motion of the said cylinders in the carriers and by the revolution of the said cylinders with the carriers into contact with the printing-surfaces of the form g on the bed G , and by the continued revolution of the said cylinders with the carriers after the said cylinders leave the form g the sheets printed on one side are presented by the said cylinders to the impression-cylinders F' of the second carrier D' for printing the second side of the sheets from the form g' on the second oscillating bed G' . The grippers l' of these cylinders F' take the sheets from the grippers l of the cylinders F , and the said

cylinders F' are caused to take the sheets to the form g' by the revolution of the said cylinders with the carrier D , the printing being performed by the rotation of the said cylinders on their own axes against the form g' . After having had their second sides printed the sheets are taken by the revolution of the cylinders F' , with their carrier D' , to the endless carrier O O' O^2 O^3 t , to be deposited on the receiving-board P .

To make the above-described operation more intelligible, I will explain it further with reference to Fig. 3 and to the diagrammatic views, Figs. 6 and 7, which represent the cylinder-carriers, the cylinders, and the rotary grippers which take the unprinted sheets from the endless carrier N g and present them to the first printing-cylinders F F' . In Figs. 6 and 7 the sheets are shown in transit through the machine and designated by letters v v , the unprinted sheets being shown by dotted lines and the printed sheets by unbroken lines. In Fig. 3 the cylinder F , which is to the left in the first carrier D , is rolling over the first form g , as it does in taking the first impression from said form, the cylinder F , which is to the right in said carrier, has just arrived in the position in which the cylinder F' , which is to the left in the second carrier D' , commences to take from the last-mentioned cylinder F a sheet which has been thereby printed on one side, and the cylinder F' , which is to the right of the carrier D' , is rolling over the second form g' , as it does in taking the impression on the second side of a sheet, the first side of which has been printed by one of the cylinders F from the form g , while the grippers k , which feed the cylinder F , which is now to the right in the carrier D , are in position to commence taking a new sheet from the endless carrier N g . The diagram, Fig. 6, represents the carriers D D' as having made one-eighth of a revolution beyond the position shown in Fig. 3. The cylinder F , which was to the left of its carrier D in Fig. 3, has now finished printing, and that which was to the right has had the sheet which it had printed on one side almost taken from it by the cylinder F' , which was at the left of its carrier D' in Fig. 3, and the new unprinted sheet, which has been taken from the endless carrier N g by the grippers k , is being carried over, to be taken by the grippers l of the said cylinder F , from which the said sheet printed on one side is being taken by the last-mentioned cylinder F' . In the meantime the other cylinder F' of the carrier D' is carrying the sheet which has been printed on the second side from the form g' toward the delivery apparatus. The diagram, Fig. 7, represents the carriers D D' as having made another eighth of a revolution. The unprinted sheet is now being taken from the grippers k by the cylinder F , which was described with reference to Fig. 3 as at the right of its carrier D , and is being carried toward the first form g

to be printed, while the other cylinder F is carrying forward the sheet printed on one side to meet one of the second impression-cylinders F' of the carrier D', and the other
 5 second impression-cylinder F' is giving to the delivery apparatus (not shown) a sheet printed on both sides. In order to prevent the dragging of the sheets over the gripper-shafts k^2 in their transference from the grippers k to
 10 the cylinder-grippers l , the arms k' , which carry the said grippers k , are represented in Figs. 6 and 7 as being extended backward from the said grippers in circular form to support the said sheets.

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

1. The combination, in a printing-machine, of a rotary impression-cylinder, the axis of which is caused to revolve about a fixed axis,
 20 and an oscillating form-carrier for presenting a printing-form to said cylinder, substantially as herein described.

2. The combination, in a printing-machine, of a revolving cylinder-carrier, a rotary impression-cylinder journaled in said carrier at
 25 a distance from the center thereof, and an oscillating bed or form-carrier for presenting a printing-form to said cylinder during the rotation of the latter on its own axis and its
 30 revolution with the first-named carrier, substantially as herein described.

3. The combination, in a printing-machine, of a revolving impression-cylinder carrier, a rotary impression-cylinder journaled in said
 35 carrier at a distance from the axis thereof, an oscillating bed or form-carrier, a stationary interrupted circular rack, a rack on the said bed or form-carrier adapted to connect with said stationary rack, and a gear on said cyl-
 40 nder for running in said two racks, substantially as herein set forth.

4. The combination, in a printing-machine, of a revolving impression-cylinder carrier, a rotary impression-cylinder journaled in said
 45 carrier at a distance from the axis thereof, and a cam-actuated form-bed for presenting a printing-form to said impression-cylinder, substantially as herein described.

5. The combination, in a printing-machine,
 50 of a revolving impression-cylinder carrier, a rotary impression-cylinder journaled in said carrier, and an oscillating bed or form-carrier having a way in one side thereof to engage with a portion of said impression-cylinder
 55 carrier to maintain the said bed or form-carrier in proper relation to the cylinder for printing, substantially as herein set forth.

6. The combination, in a printing-machine, of a revolving impression-cylinder carrier, a plurality of rotary impression-cylinders jour-
 60 naled in said carrier at a distance from the axis thereof, and an oscillating bed or form-carrier, which is caused during every revolution of said carrier to oscillate back and forth as many times as there are cylinders in said
 65 carrier, substantially as herein set forth.

7. The combination, in a printing-machine, of two oscillating form-beds, two revolving impression-cylinder carriers, one for each of
 70 said beds, a rotary impression-cylinder journaled in one of said carriers distant from the axis thereof for printing one side of a sheet from a form on one of said beds, and a rotary impression-cylinder journaled in the other
 75 of said carriers distant from the axis thereof for printing the other side of said sheet from a form on the other of said beds, substantially as herein set forth.

8. The combination, in a printing-machine, of two oscillating form-beds, two revolving
 80 impression-cylinder carriers, one for each of said beds, rotary impression-cylinders journaled in said carriers, a cam for imparting motion to one of the said beds, and a connection, substantially as herein described, be-
 85 tween the said beds, whereby one is caused to derive motion from the other.

9. The combination, in a printing-machine, of a revolving impression-cylinder carrier, a rotary impression-cylinder journaled in said
 90 carrier at a distance from the axis thereof, an oscillating bed, a rotary gripper-carrying shaft journaled in said carrier and geared with said impression-cylinder, and grippers carried by said shaft for presenting sheets to
 95 said impression-cylinder, substantially as herein set forth.

10. The combination, in a printing-machine, of a revolving impression-cylinder carrier, a rotary impression-cylinder journaled in said
 100 carrier at a distance from the axis thereof, a form-bed, an endless carrier for feeding the paper to be printed, a rotary gripper-carrying shaft journaled in said impression-cylinder carrier, and grippers carried by said shaft
 105 for transferring sheets from said endless carrier to said cylinder, substantially as herein set forth.

CALVERT B. COTTRELL.

Witnesses:

HENRY T. BROWN,
 FREDK. HAYNES.