

No. 773,045.

PATENTED OCT. 25, 1904.

O. WOLTERS.

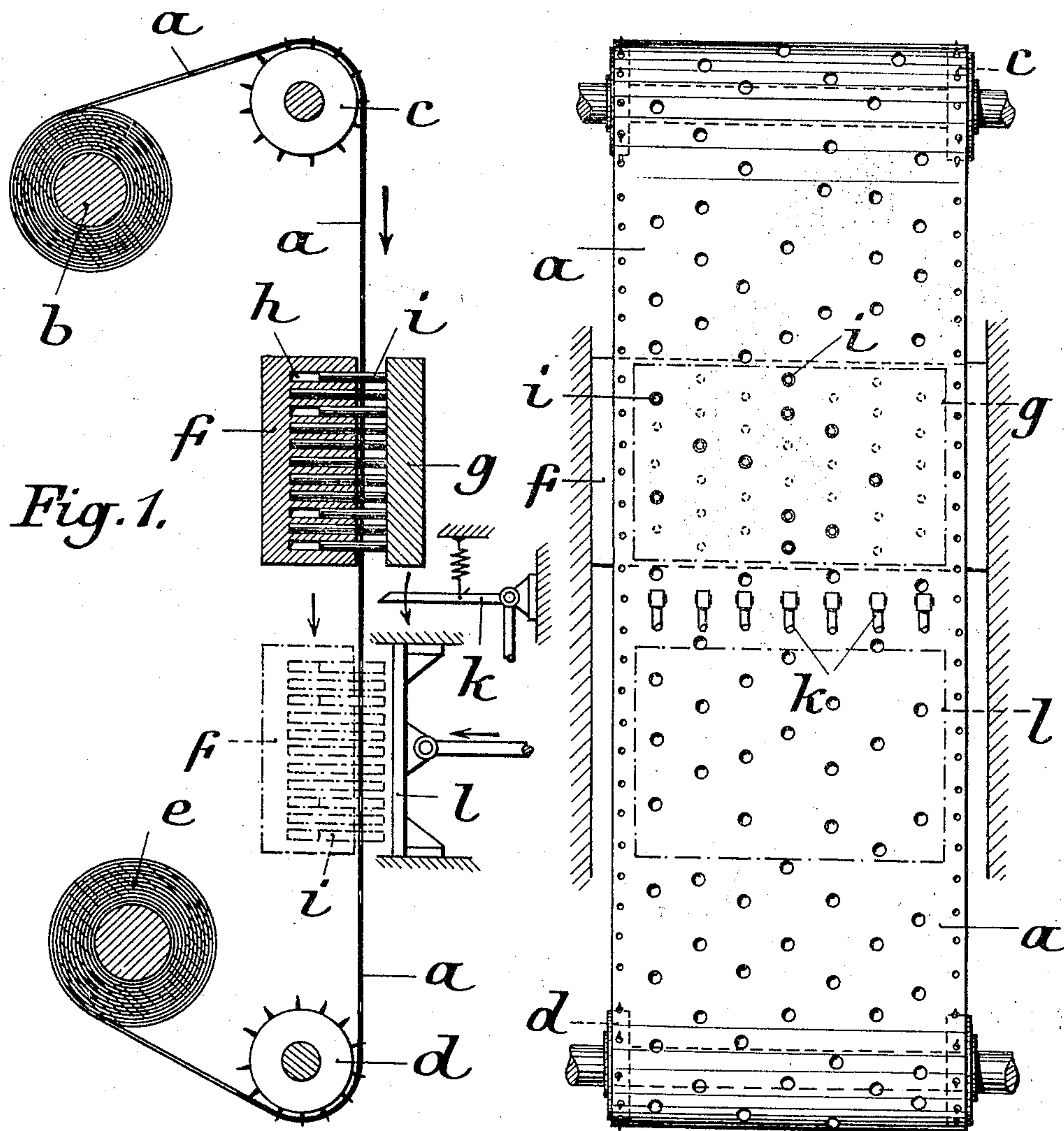
APPARATUS FOR MECHANICALLY OPERATING KEYBOARD MACHINES  
AND INSTRUMENTS.

APPLICATION FILED NOV. 11, 1903.

NO MODEL.

4 SHEETS—SHEET 1.

*Fig. 2.*



WITNESSES

W. A. Alexander  
D. C. Betzeman

INVENTOR

Otto Wolters

By *Forster & Byssou*  
ATTORNEYS

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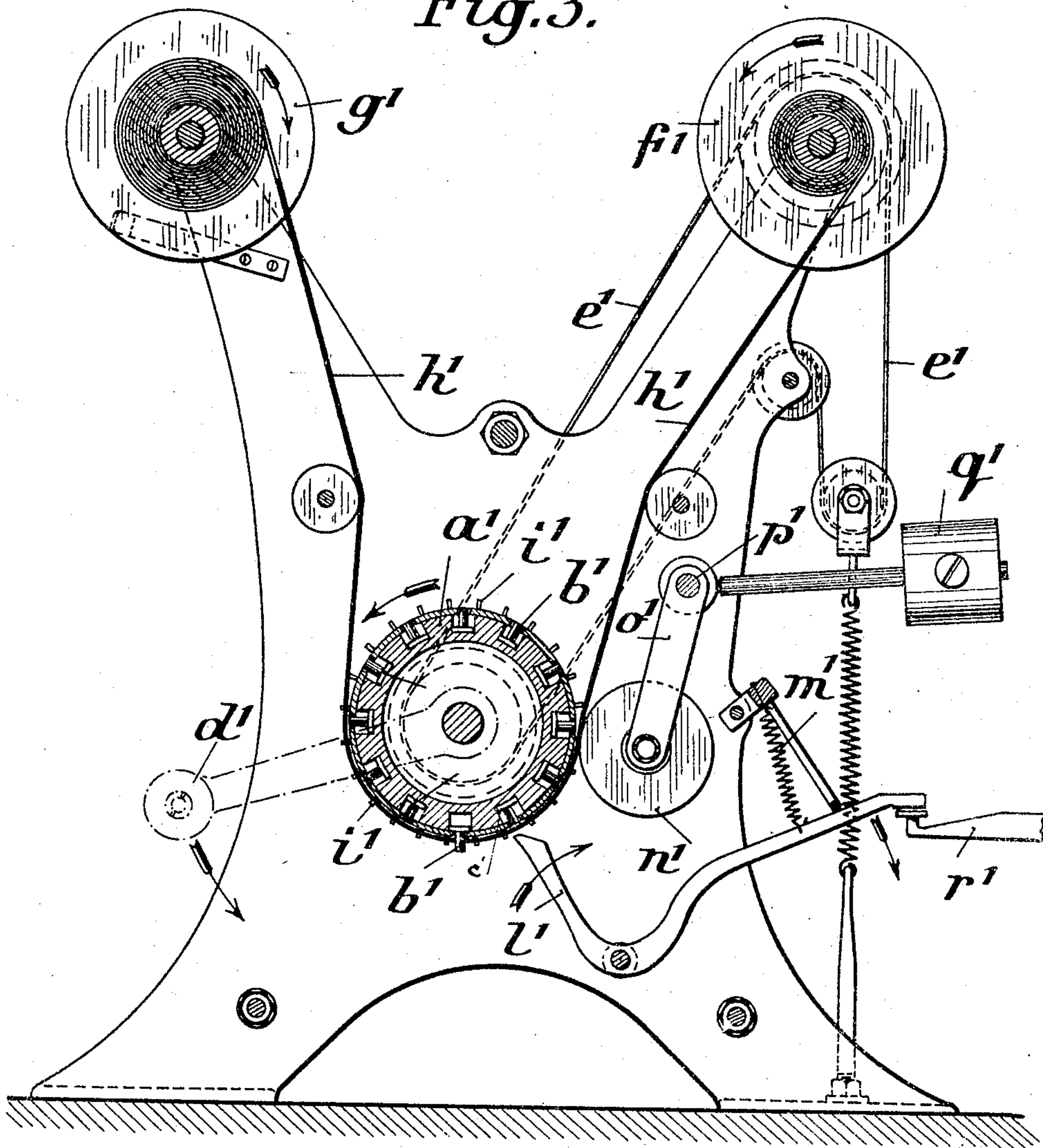
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4 SHEETS—SHEET 2.

*Fig. 3.*



WITNESSES

W. A. Alexander  
O. C. Betzner

INVENTOR

Otto Wolters

By *Lowell B. Byson*  
ATTORNEYS



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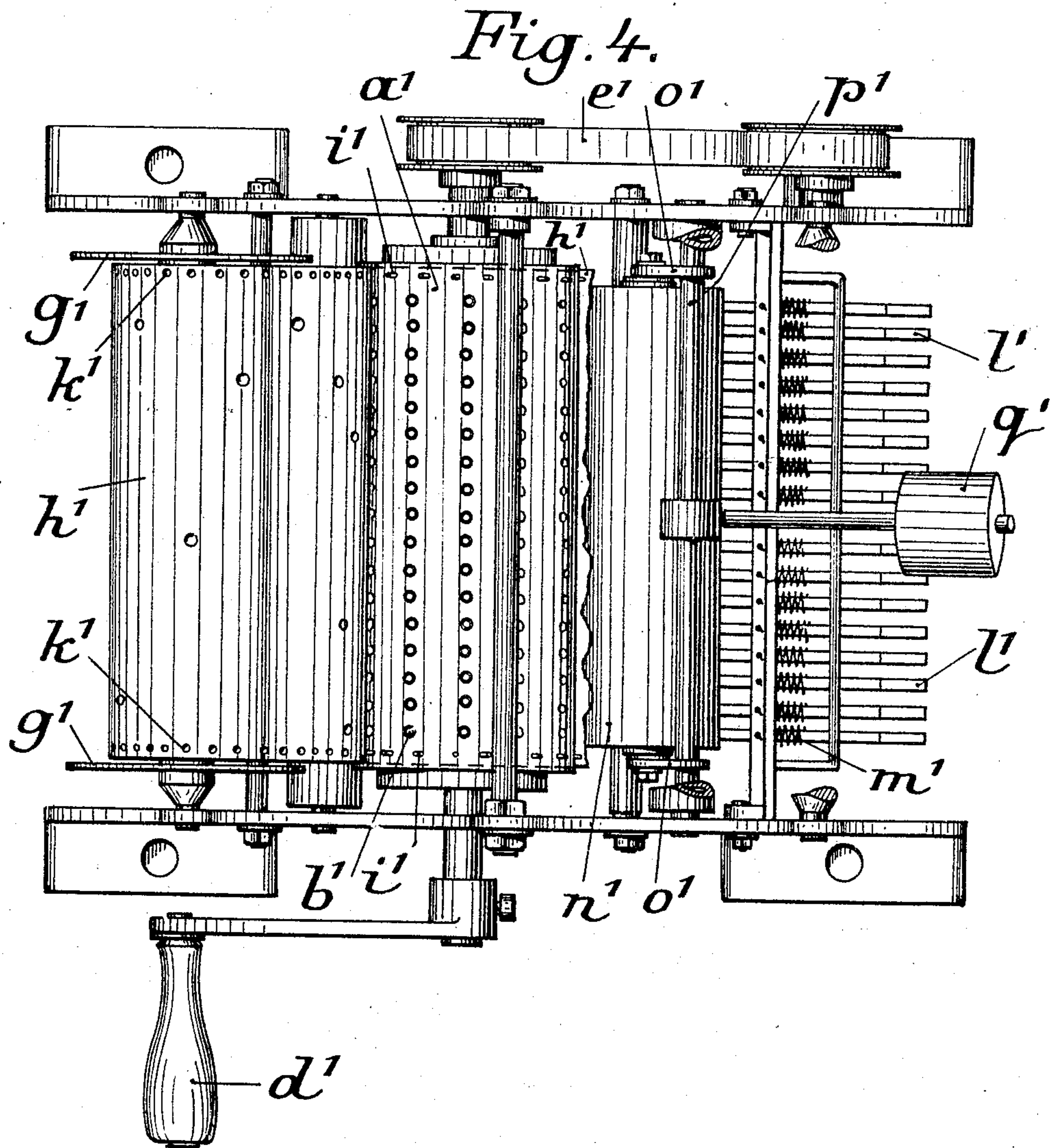
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4 SHEETS—SHEET 3



WITNESSES

W. A. Alexander

D. C. Betjeman

INVENTOR

Otto Wolters

By *Lowell & Bryson*  
ATTORNEYS

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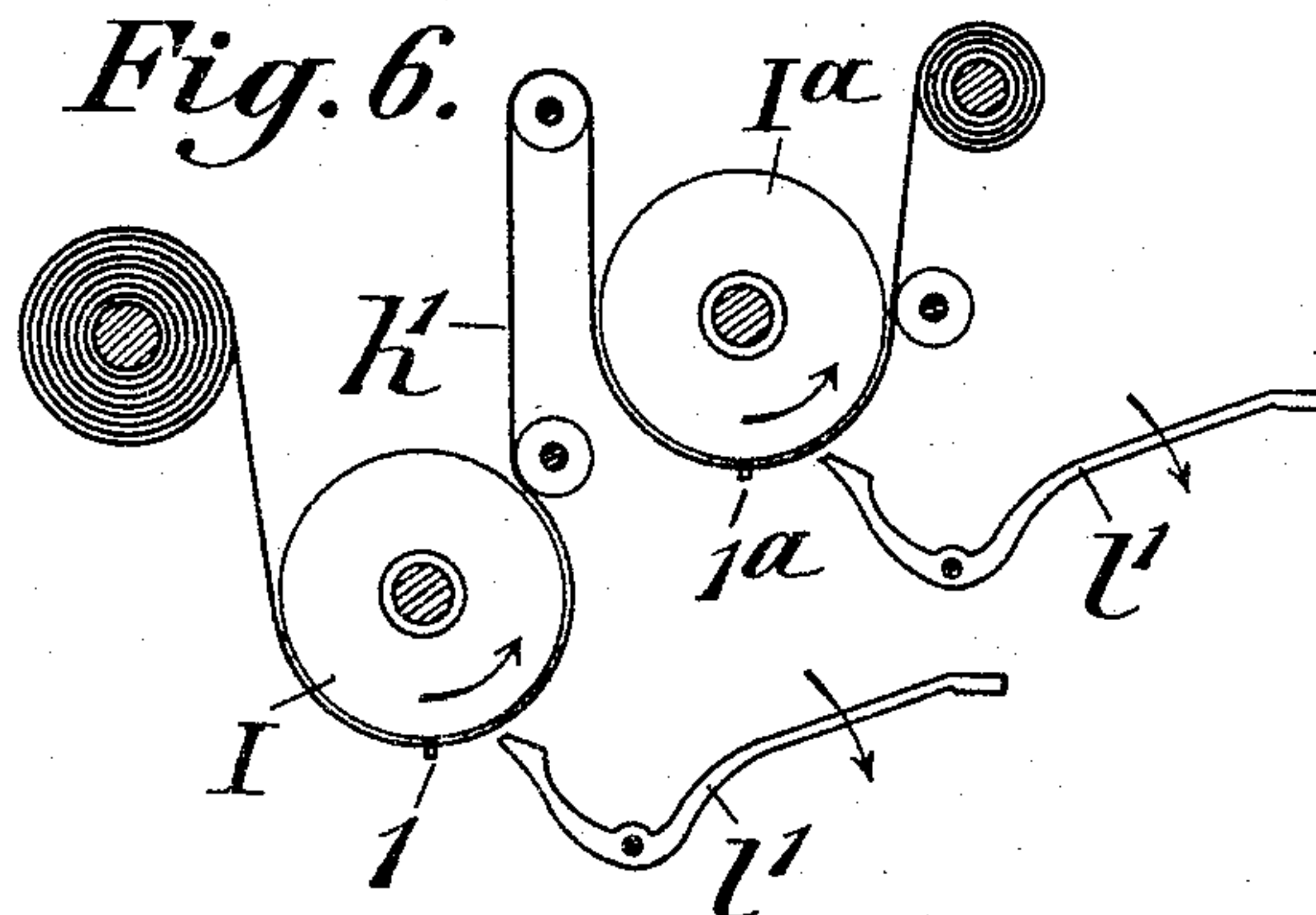
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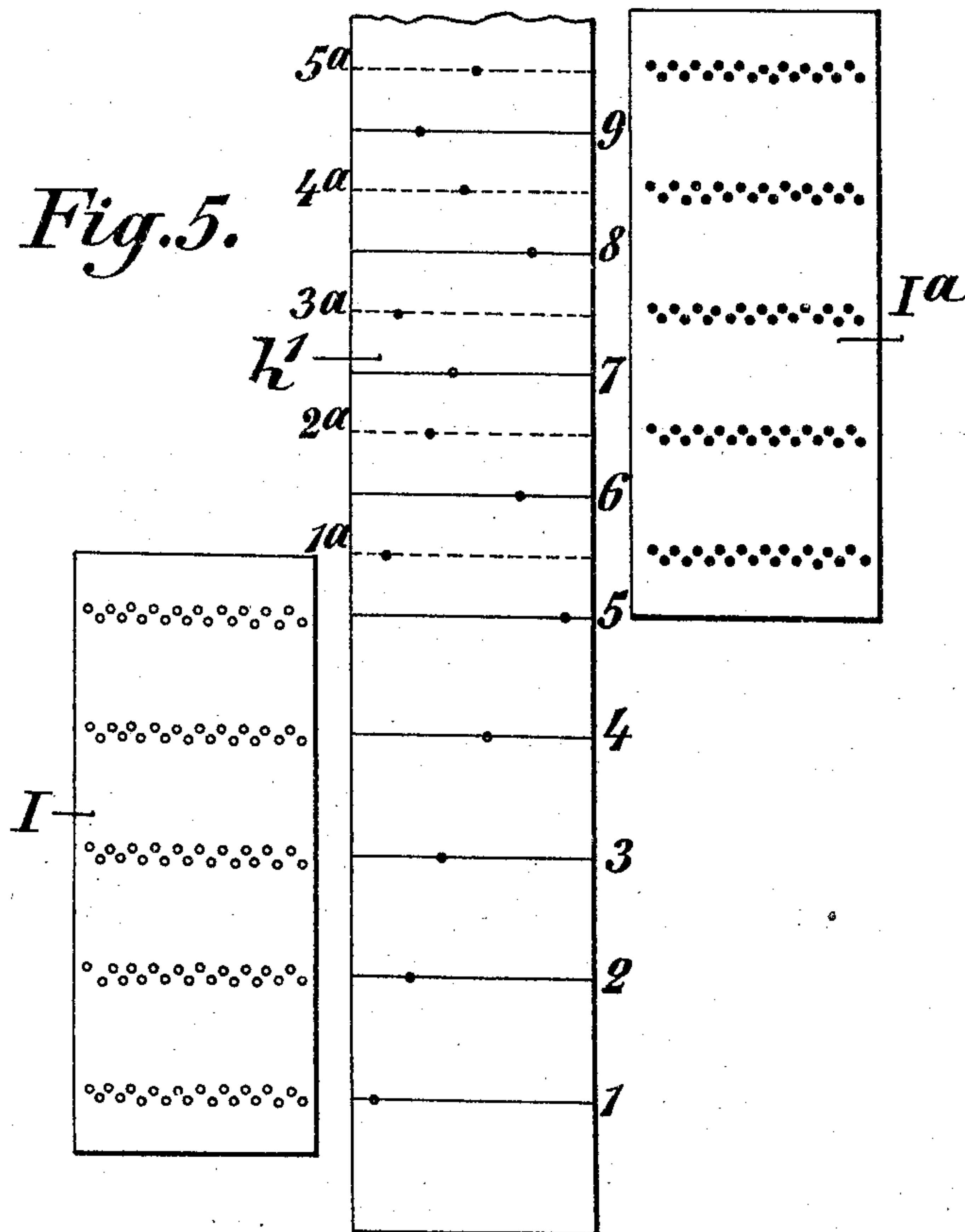
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NO MODEL.

4 SHEETS—SHEET 4.



*Fig. 5.*



WITNESSES

*W. A. Alexander*  
*D. C. Bejeman*

INVENTOR

Otto Wolters

By *Lowell & Byson*  
ATTORNEYS



# UNITED STATES PATENT OFFICE.

OTTO WOLTERS, OF HANOVER, GERMANY.

APPARATUS FOR MECHANICALLY OPERATING KEYBOARD MACHINES AND INSTRUMENTS.

SPECIFICATION forming part of Letters Patent No. 773,045, dated October 25, 1904.

Application filed November 11, 1903. Serial No. 180,768. (No model.)

*To all whom it may concern:*

Be it known that I, OTTO WOLTERS, merchant, a subject of the German Emperor, residing at Lemförderstrasse 5, Hanover, Germany, have invented a certain new and useful Improvement Relating to Apparatus for Mechanically Operating Keyboard Machines and Instruments; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention has for its object a machine for mechanically operating keyboard machines and instruments by means of perforated register-strips, these latter being caused to travel past or over a magazine in which are arranged pins, one of which falls through each hole in the perforated strip as it passes by, whereupon owing to the movement imparted to the magazine the pin is carried past levers, one of which it strikes, the displacement of the lever being transmitted by suitable means to the corresponding key of the keyboard or other member of the machine to be operated.

Several constructional forms of the machine which forms the subject of the invention are illustrated in the accompanying drawings by way of example.

Figure 1 represents a vertical section through one of these arrangements, the driving mechanism being omitted for the sake of clearness. Fig. 2 is a front elevation corresponding to Fig. 1. Fig. 3 is a vertical section through another form of the appliance. Fig. 4 is a corresponding plan view. Fig. 5 shows diagrammatically a modification of the arrangement represented in Figs. 3 and 4, and Fig. 6 shows diagrammatically the construction for the same.

In the arrangement illustrated in Figs. 1 and 2 the pins are placed in a reciprocating magazine. The perforated register-strip *a* passes from the supply-spool *b* over conveyer-rollers *c* and *d* to the receiving-spool *e*. On its way it passes between a vertically-reciprocating magazine *f* and a magnet *g*. The magazine *f* is provided with a suitable number of superposed rows of holes *h*, each of these rows containing as many holes as there

are spaces for holes in the width of the register-strip. Steel pins *i* are arranged in the holes in the magazine. When the perforations in the strip of paper register with the holes in the magazine *f*, the magnet *g*, which, if desired, may receive a reciprocating movement to and away from the register-strip, attracts the corresponding steel pins through the perforations, as represented in Fig. 1 with respect to one pin in each row and in Fig. 2 by section-lines. By means of suitable mechanism the magazine is then caused to move downward with the register-strip, the projecting pins *i* striking in succession against those levers *k* which lie in the corresponding longitudinal lines of the register-strip. The movement is transmitted by these levers to the keyboard of the machine or instrument—for example, of a type-setting machine or of a musical instrument. As soon as the magazine has passed by the levers *k* the projecting pins are caused to recede into the magazine by means of a pusher *l* or the like, which at this moment is moved toward the register-strip, the magazine then being very rapidly returned to its initial position. The operation described above is then repeated. Of course the movement of the perforated register-strip is intermittent and corresponds with the forward movements of the magazine, so during the return movement of the magazine none of the rows of perforations shall pass by unutilized. Obviously with this arrangement the pins in every row of the magazine will be released simultaneously. By this means such speed is attainable that the slight delay caused by the return movement of the magazine is quite insignificant.

In the arrangement shown in Figs. 3 and 4 the pin-magazine presents the form of a rotary cylinder, over which the register-strip is carried in such a manner that the pins fall out through the perforations in the strip under the influence of gravity. The magazine consists of the rotary cylindrical roller *a'*, in which the pins *b'* are movably arranged. The pins are preferably provided within the roller with heads *c'*, whereby they are prevented from completely leaving the roller. The cylindrical magazine is caused to rotate



in the direction indicated by the arrow, Fig. 3, by means of the crank  $d'$  or by any other convenient means. This movement may be transmitted by the intermediary of a belt  $e'$ , provided with a tensioning device, to a spool  $f'$ , upon which the register-strip  $h'$ , coming from the spool  $g'$ , is wound. This strip is carried round the under part of the cylinder  $a'$ , which to this end is provided upon both sides with pins  $i'$ , engaging in rows of lateral perforations of the register-strip  $h'$ , so as to insure synchronism in the movement. When one of the perforations registers with one of the pins  $b'$ , this latter falls, as shown at the lower part of Fig. 3, and displaces the corresponding lever  $l'$  when it encounters the same, owing to the rotation of the cylinder  $a'$ . The lever  $l'$  is returned to its normal position by a spring  $m'$  after the pin  $b'$  has passed it. The projecting pins are pressed back into the magazine by means of a roller  $n'$ . This roller  $n'$  is mounted in arms  $o'$ , rigidly fixed upon a rocking shaft  $p'$ . A counterweight-lever  $q'$  may be attached to this shaft at any desired degree of inclination and presses the roller  $n'$  against the cylindrical magazine  $a'$ , its action being capable of variation owing to the adjustability of its weight. This movement of the levers  $l'$ , actuated by the pins  $b'$ , is transmitted to the keys  $r'$  or equivalent parts of the keyboard-machine which it is desired to operate.

In machines of the kind described above it is advantageous to keep the perforated register-strip as narrow as possible; but this is attended with difficulty, owing to the number of signs to be represented. In order to restrict the width of the strip, each row of holes in the pin-cylinder may be converted into a double row, the holes in one half of this double row being situated opposite the intervals between the holes in the other half of the row. This invention, however, permits of the employment of yet another means for considerably reducing the width of the perforated register-strip. This arrangement is represented diagrammatically in Figs. 5 and 6, Fig. 5 illustrating the principle and Fig. 6 the arrangement of the parts. In this arrangement a number of pin-cylinders I and I<sup>a</sup> are employed. These are shown in development in Fig. 5. They may advantageously be provided with double rows of pin-holes. The cylinder I receives only the pins corresponding to one half of the signs to be represented and the cylinder I<sup>a</sup> the pins of the other half. In order to reproduce the signs of the alphabet, for example, in the cylinder I are arranged in each row or double row the pins corresponding to the letters "A" to "L" and in the cylinder I<sup>a</sup> the pins corresponding to the letters "M" to "Z." In order to indicate this distinction, the pins of the cylinder I are represented by empty or skeleton circles and those of the cylinder I<sup>a</sup> by full cir-

cles. The perforated register-strip is so formed in any convenient manner that upon its transverse lines 1 2 3 4 5 6 7 8 9 only the letters in the group "A" to "L" are perforated, as is indicated in Fig. 5 by the skeleton circles shown on the strip  $h'$ , represented between the developments of the two cylinders. On the other hand, the letters of the group "M" to "Z" are perforated on the transverse lines 1<sup>a</sup> 2<sup>a</sup> 3<sup>a</sup> 4<sup>a</sup> 5<sup>a</sup> 6<sup>a</sup> 7<sup>a</sup> 8<sup>a</sup> 9<sup>a</sup>. This perforated register-strip is carried over the cylinders I and I<sup>a</sup>, as shown in Fig. 6, in such a manner that the rows 1 2 3 register with the rows of pins in the cylinder I, as represented diagrammatically in Fig. 5, while the transverse lines 1<sup>a</sup> 2<sup>a</sup> 3<sup>a</sup> register with the rows of pins in the cylinder I<sup>a</sup>. Obviously the transverse line 1 on the cylinder I must occupy the operative position—that is to say, the position in which the pins fall through—at the same moment as the transverse line 1<sup>a</sup> of the strip on the cylinder I<sup>a</sup> is operative. Likewise the projecting pins must strike against the keys or come against the levers  $l'$ , serving to operate the keys, at the same moment. Now in order that in obtaining the necessary synchronism in the operation of the lines 1 and 1<sup>a</sup> it shall not be requisite to mount the cylinders I and I<sup>a</sup> too close together the lines 1 and 1<sup>a</sup> (and of course the succeeding lines also) are arranged at a larger interval upon the register-strip, this interval being such that it corresponds to the path of the register-strip from the point 1 to the point 1<sup>a</sup> in Fig. 6. By this means it is rendered possible to arrange the cylinders at a convenient distance apart. Obviously the subdivision into groups may be carried still further, and more than two cylinders may be provided. This arrangement may of course be adapted to the reciprocating-magazine arrangement by providing two or more reciprocating magazines or one such of greater length.

In the arrangement described with reference to Figs. 3 to 6 the pins may also be caused or assisted to leave the holes in the magazine by arranging a magnet beneath the cylindrical magazine, which attracts the pins (which in this case must necessarily be of iron or steel) through the perforations in the register-strip. This is especially desirable when owing to considerations of space it is not possible to give the pins sufficient play in the holes in the magazine. In such a case if a magnet were not provided to assist the movement the various pins might not fall out sufficiently readily or speedily. Instead of a magnet other means may be employed, if necessary, for insuring that the pins shall leave their recesses. Thus, for example, the interior of the cylinder may be filled with mercury, the weight of which acts upon the pins, or compressed air may be conducted into the cylinder, or, again, an eccentric ring may be arranged around the shaft of the cylinder,



which hangs down into the cylinder and bears upon the lower pins. A device operating from outside may be constituted by a small hammer, which by striking uniform blows upon the cylinder causes it to vibrate, and thus facilitates the projection of the pins.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed,

I declare that what I claim is—

1. In a keyboard-operator, the combination with a perforated record-strip, of a plurality of magazines coöperating with said record-strip at different points in its length, movable members carried by said magazines, and operating connections for actuating the keyboard from said movable members.

2. In a keyboard-operator, the combination with a perforated record-strip, of a plurality of rotary cylindrical magazines coöperating with said record-strip at different points in its length, movable members carried by said magazines, and operating connections for actuating a keyboard from said movable members.

3. In a keyboard-operator, the combination with a record-strip provided with two sets of perforations arranged out of alinement, of a

pair of magazines arranged at different points in the length of such strip, movable members in one of said magazines coöperating with one set of perforations, movable members in the other of said magazines coöperating with the other set of perforations, means for moving said record-strip, and connections for actuating a keyboard from said movable members.

4. In a keyboard-operator, the combination with a record-strip provided with two sets of perforations arranged out of alinement, a pair of rotary cylindrical magazines arranged at different points in the length of said strip, movable members in one of said magazines coöperating with one set of perforations, movable members in the other of said magazines coöperating with the other set of perforations, means for moving said record-strip, and connections for operating a keyboard from said movable members.

In testimony whereof I have hereunto set my hand and affixed my seal in the presence of the two subscribing witnesses.

OTTO WOLTERS. [L. s.]

Witnesses:

H. HALL HALL,  
LEONORE RASCH.