

N. J. GOLDFARB.
CALCULATING MACHINE.
APPLICATION FILED JAN. 4, 1906.

2 SHEETS—SHEET 1.

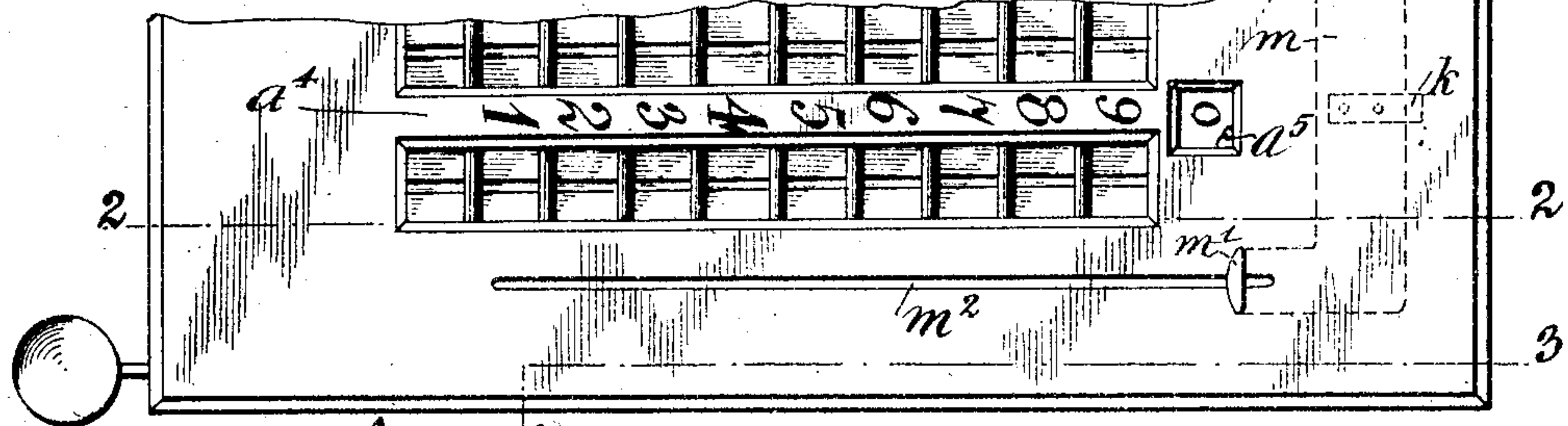


Fig:1.

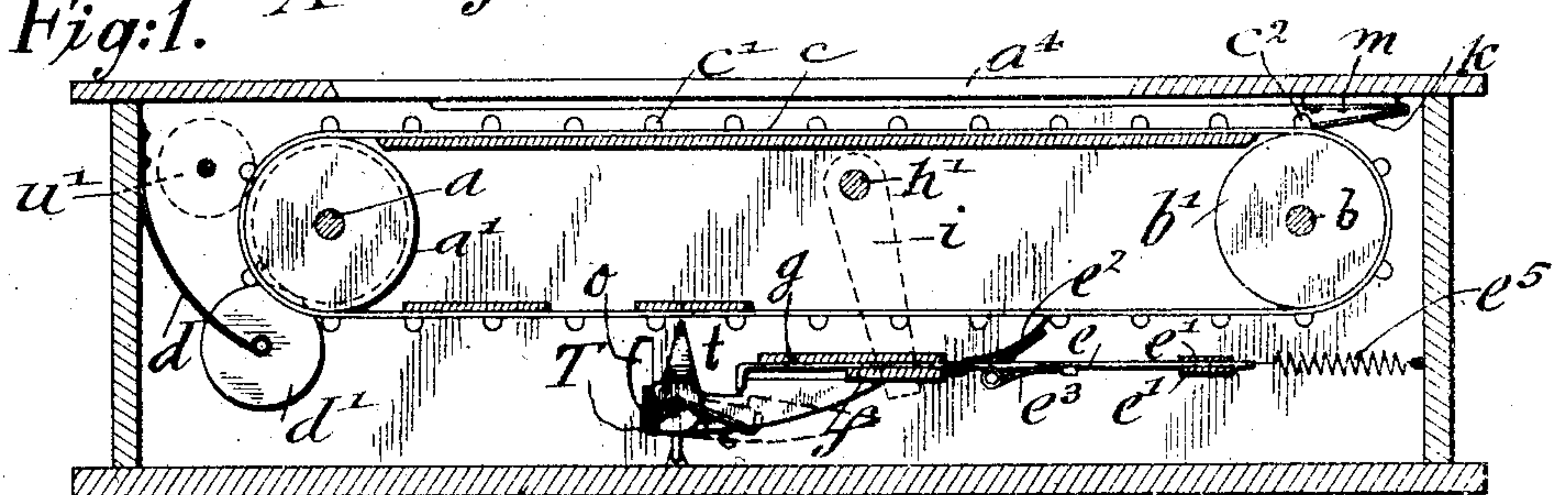


Fig:2.

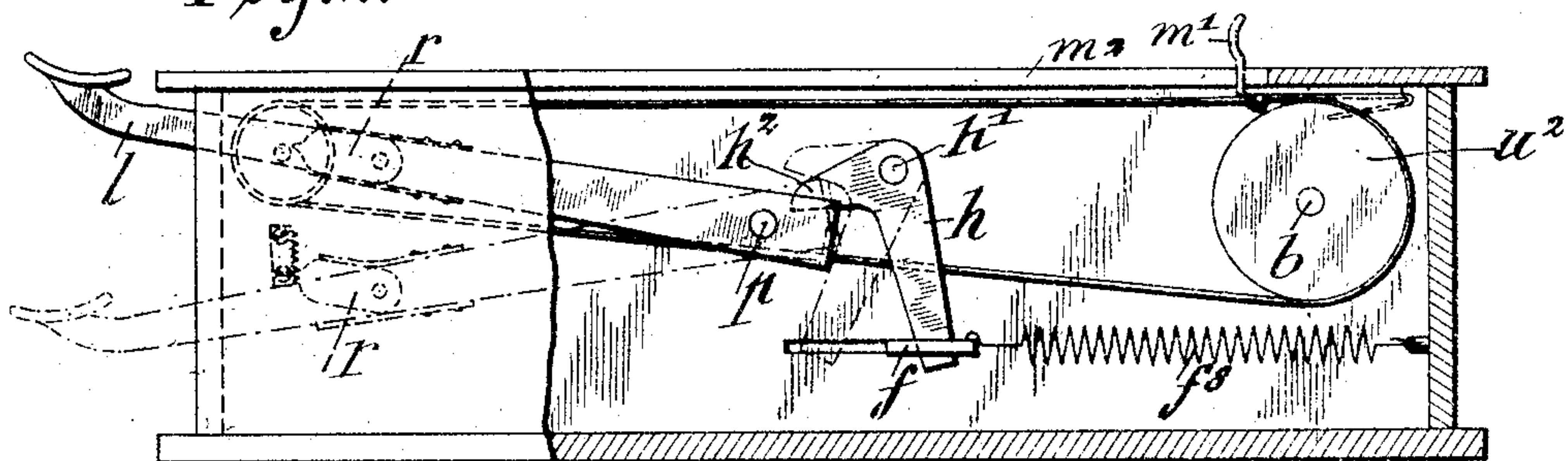


Fig:3.

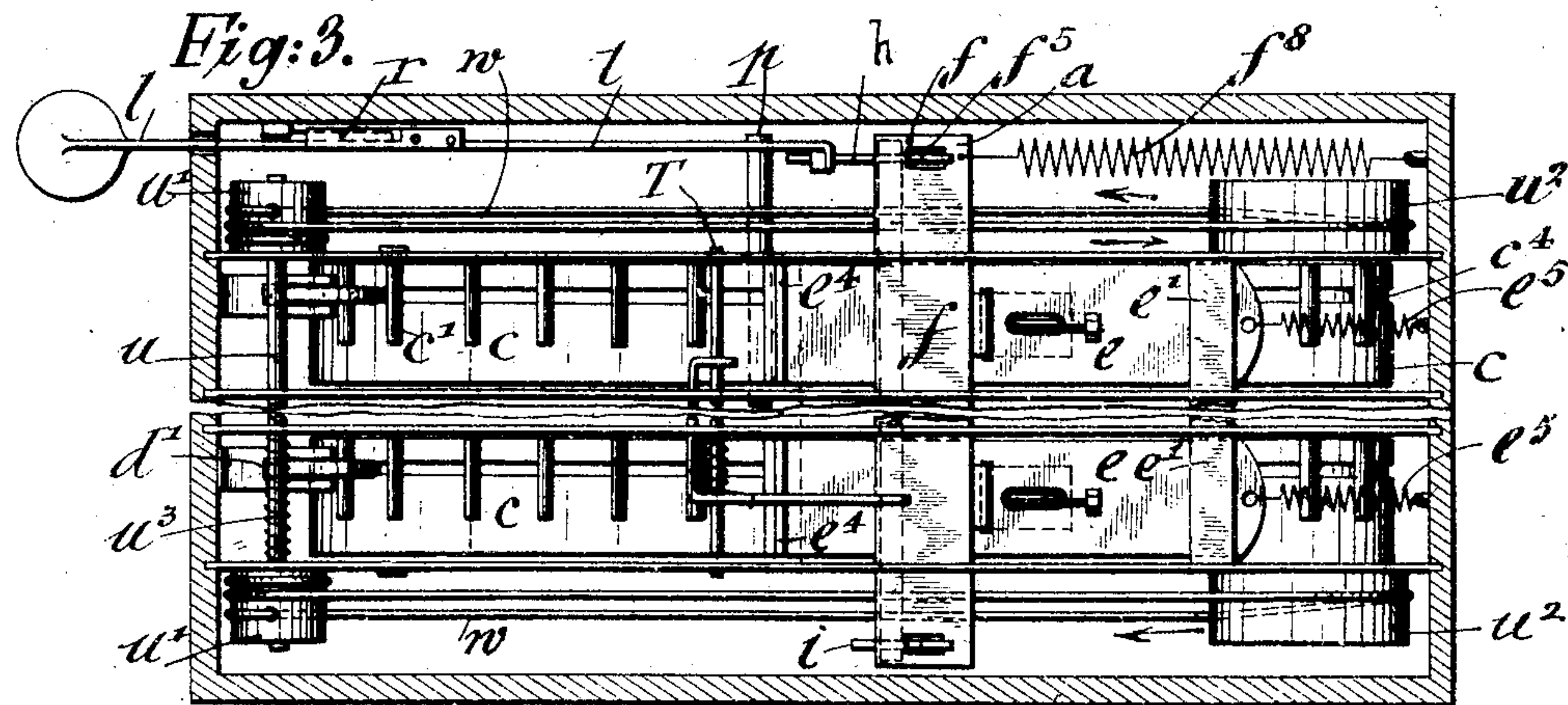


Fig:4.

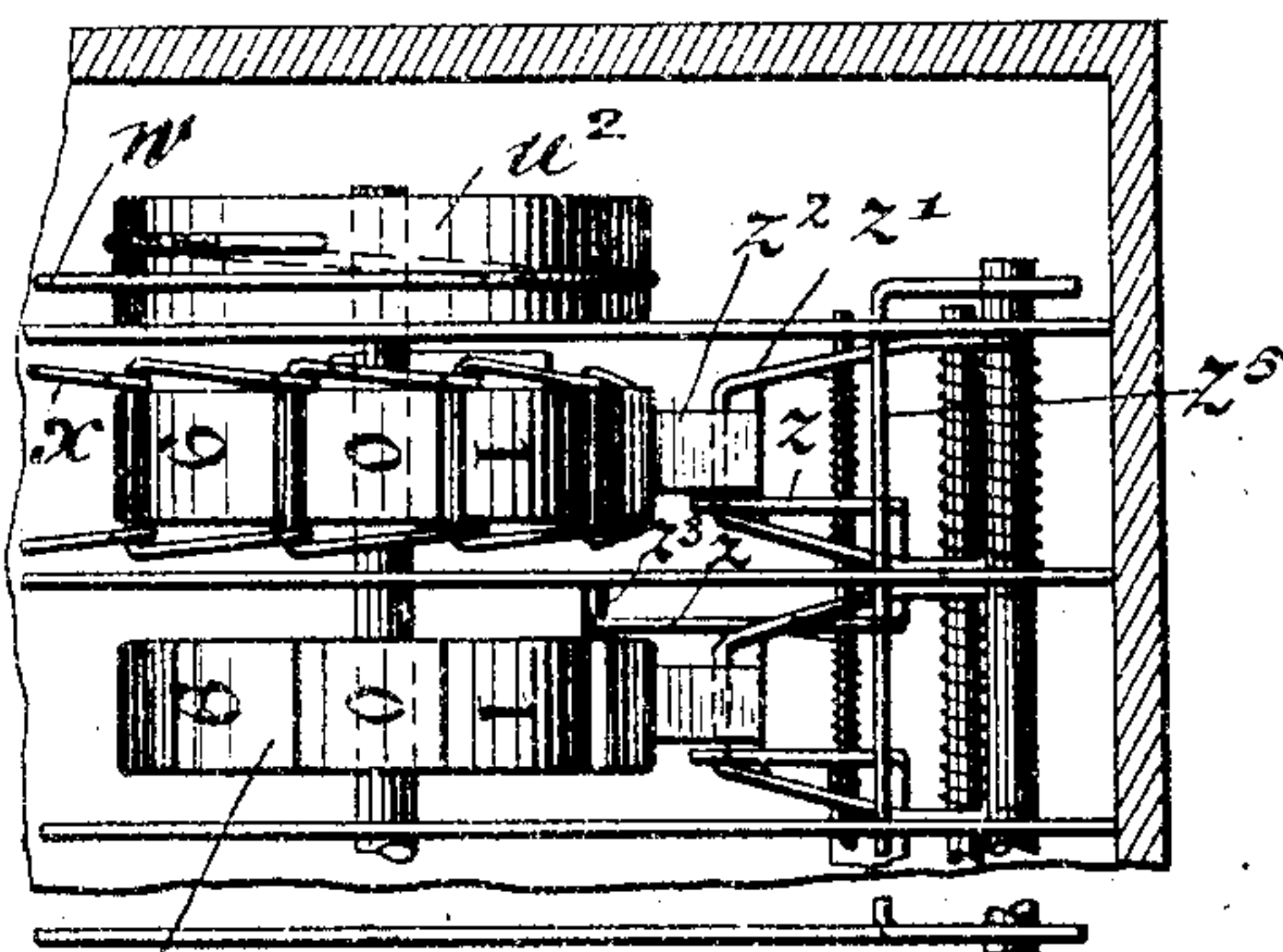
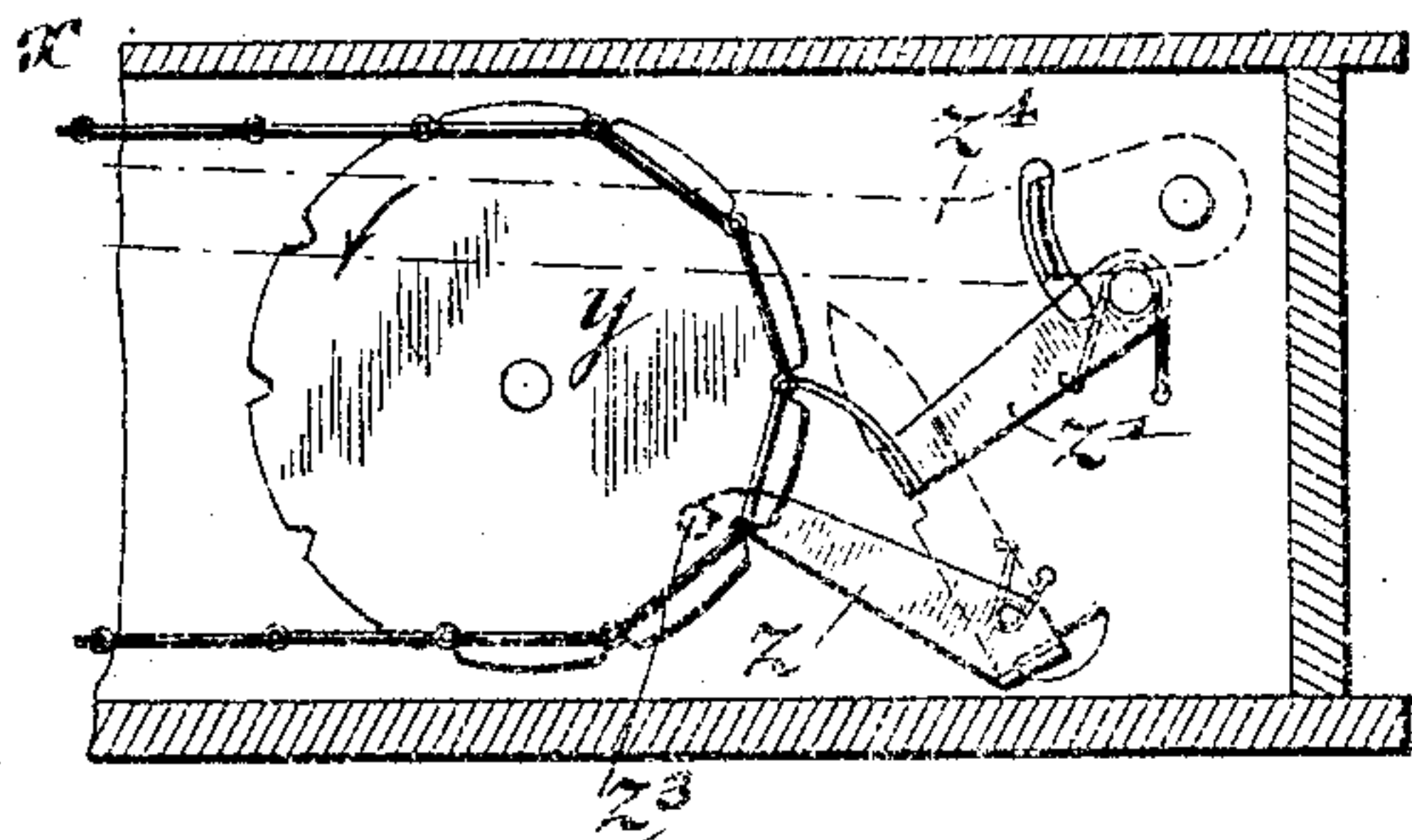
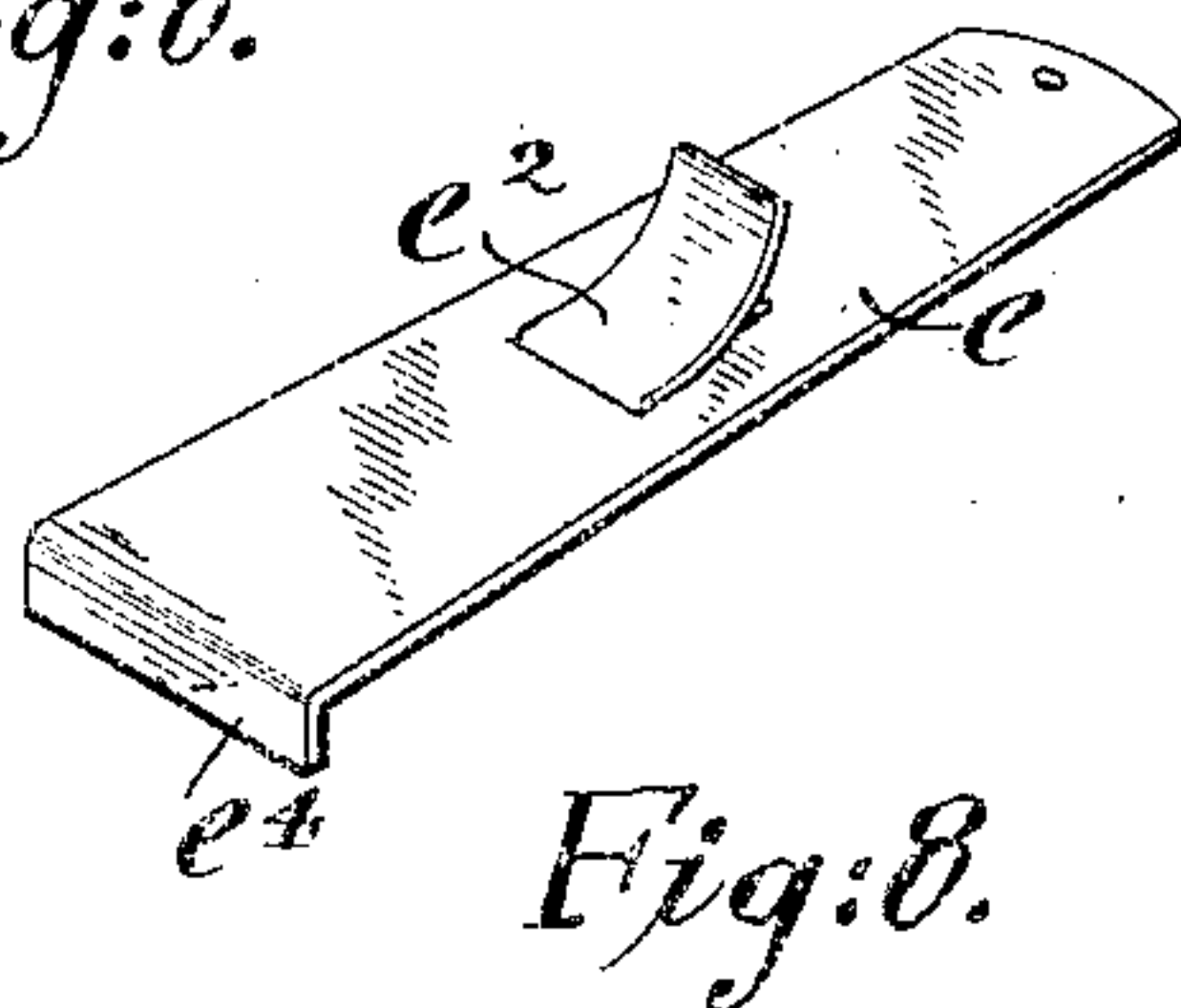
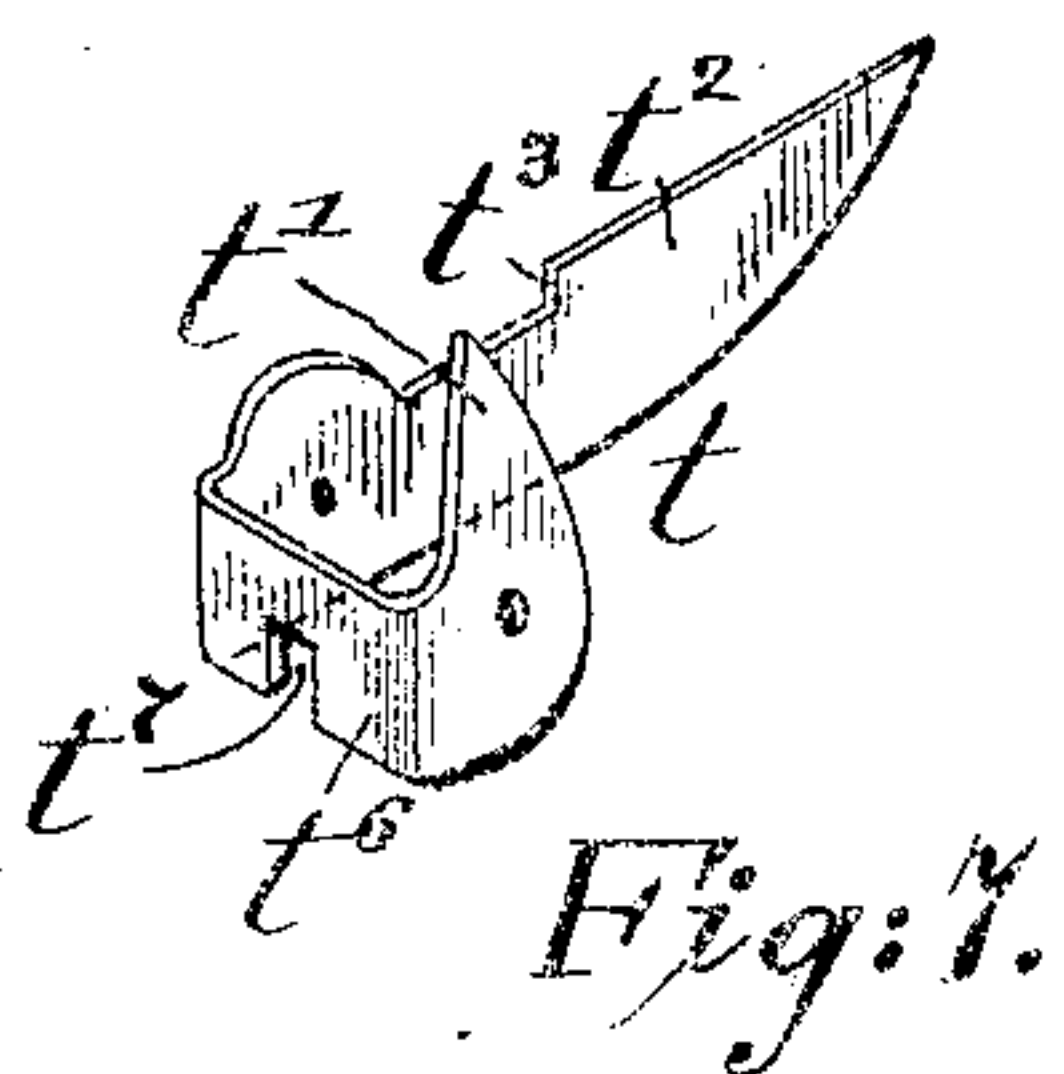
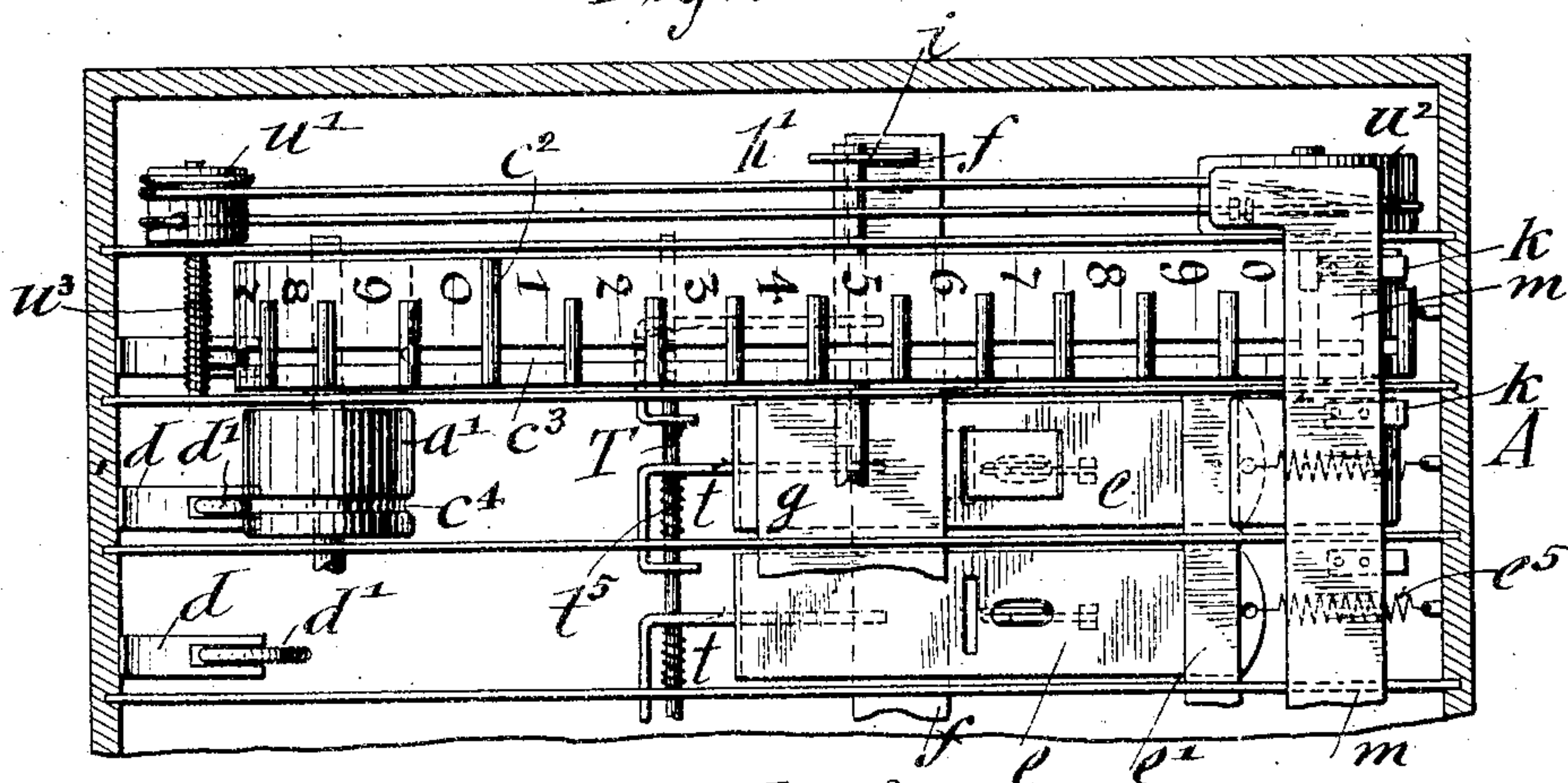
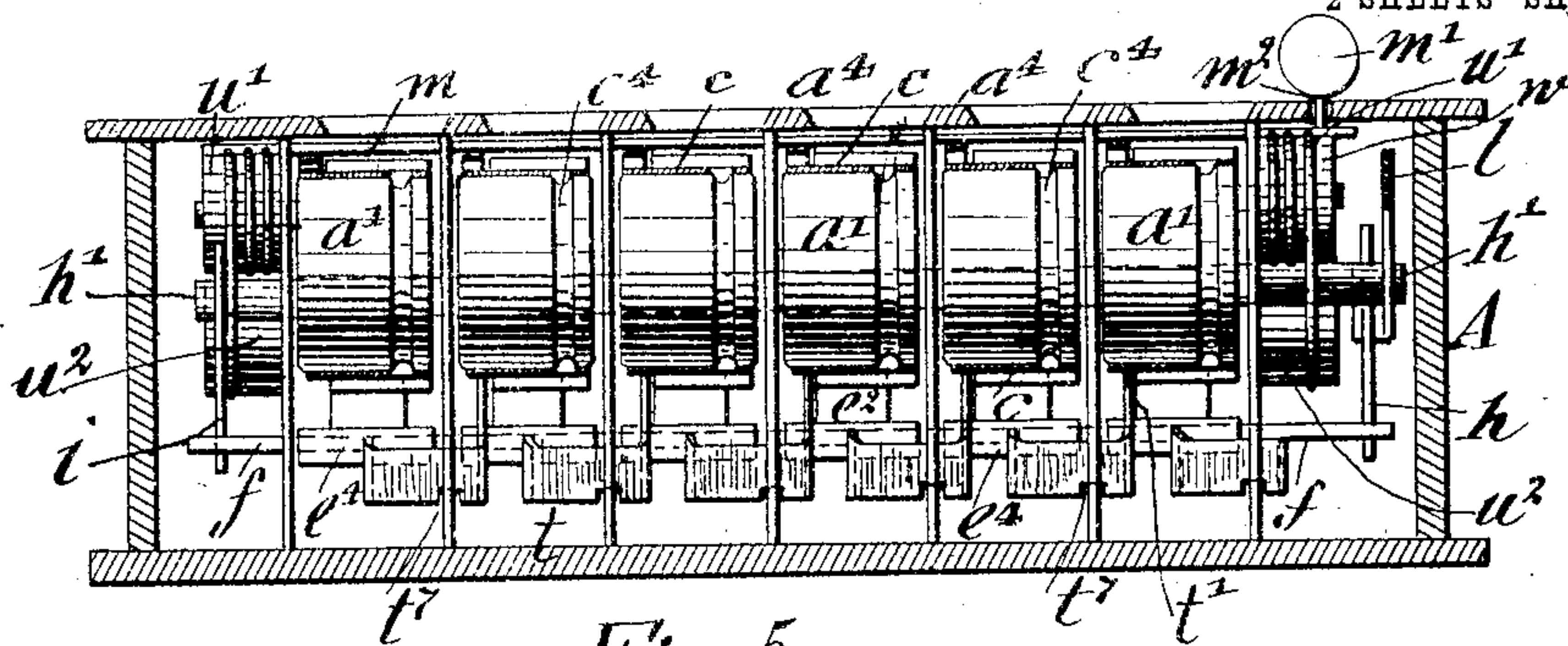
Witnesses
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W. E. Schaefer

Inventor
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By his Attorneys
Grimm & Grimm

N. J. GOLDFARB.
CALCULATING MACHINE.

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2 SHEETS—SHEET 2.



Witnesses, Fig: 9.
H. S. S. S. S.
H. S. S. S. S.

Fig: 10. Inventor
By his Attorneys Nathan J. Goldfarb
James Cooper

UNITED STATES PATENT OFFICE.

NATHAN J. GOLDFARB, OF NEW YORK, N. Y., ASSIGNOR TO THE COMMERCIAL
ADDING MACHINE CO., OF NEW YORK, N. Y., A CORPORATION OF NEW
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CALCULATING-MACHINE.

No. 844,120.

Specification of Letters Patent.

Patented Feb. 12, 1907.

Application filed January 4, 1906. Serial No. 294,572.

To all whom it may concern:

Be it known that I, NATHAN J. GOLDFARB, a citizen of the United States, residing in New York, in the borough of Manhattan, county and State of New York, have invented certain new and useful Improvements in Calculating-Machines, of which the following is a specification.

This invention relates to calculating-machines of the type set forth in Letters Patent No. 725,242, granted to me on April 14, 1903.

The present invention has among its objects to provide an improved carrying mechanism—that is to say, mechanism operated from one of the numeral-carrying elements to actuate the adjacent one in order to carry the number from units to tens or from tens to hundreds, and so on.

It is an object of this invention to furnish means for effecting this operation which may be very readily operated and which are simple in construction and positive in action.

A further object of the invention is to provide an improved mechanism whereby after each calculation said numeral-carrying elements may be simultaneously set at zero.

The invention also aims to generally improve the construction of machines of this type.

In the accompanying drawings, in which similar parts are denoted by the same reference characters throughout the several views, Figure 1 is a top plan view of a portion of a calculating-machine constructed in accordance with the invention. Fig. 2 is a transverse section on line 2-2 of Fig. 1. Fig. 3 is a section on line 3-3, Fig. 1. Fig. 4 is a bottom plan view of the machine, the bottom being removed in order to clearly show the parts. Fig. 5 is a longitudinal section on line 5-5, Fig. 6. Fig. 6 is a plan view of a portion of the machine, the cover and certain of the interior parts being removed. Fig. 7 is a detail perspective view of the carrier-setting trigger. Fig. 8 is a similar view of the carrier. Fig. 9 is a detail transverse section of a modified arrangement of the carrying mechanism, and Fig. 10 is a top plan view of Fig. 9.

Referring to the drawings, A denotes the casing of the machine, which is of the form shown in my previous patent heretofore mentioned and divided, as in said patent, by a plurality of partitions into a plurality of transversely-disposed compartments. Ex-

tending longitudinally of the machine at the front and rear of the same and journaled in said partitions are rotary shafts *a b*, the former having keyed to it in each compartment a band-guiding pulley *a'*, while the latter shaft carries a plurality of similarly-arranged pulleys *b'*. Movable over the pulleys *a' b'* in each compartment are numeral-carrying calculating-bands *c*, provided, as in the patent heretofore mentioned, with a plurality of equidistantly-spaced transversely-disposed teeth or ribs *c'*, every tenth tooth *c'* being of greater length than the other teeth, so as to extend entirely across said band. As shown in the drawings, the teeth *c* extend a little more than half-way across each band *c*. In each band, midway of the teeth *c*, is arranged a longitudinally-disposed slot *c''*, which registers with grooves *c'''* in the pulleys *a' b'*.

Applied to the front wall of the machine at the interior of the same are depending leaf-springs *d*, each carrying a terminal roller *d'*, which engages the corresponding slot in the band or tape *c* and which rides over teeth *c'* when the bands are manually actuated and after actuation insures the stoppage of said bands in the proper position. The calculating-bands *c* are moved to the required extent by inserting the finger in the space between the teeth opposite to the number which is to be added or subtracted, as the case may be, said numbers being arranged on cross-pieces *a''*, extending transversely of the machine between the several bands or tapes and pulled toward the front of the machine as far as is possible with the finger in the position indicated. In the cover of the casing at the rear of each numeral-carrying cross-piece *a''* is arranged an aperture *a'''*, through which the numbers carried by the calculating-bands *c* are visible. These apertures extend in a row disposed longitudinally of the machine and in conjunction show the result of the calculation.

The carrying mechanism of the improved machine is constituted by a plurality of carrier-plates *e*, one of which is arranged in each compartment and adapted to move the corresponding calculating-band forward to the extent of one tooth. The machine shown is adapted for the addition of numbers, and consequently the carriers move the bands in forward direction; but it is obvious that by a reversal of the parts the bands may be op-

erated in the opposite direction in order to do subtraction. Each carrier e is guided at its rear portion by plates e' , which are disposed above and below the same and extend through the several partitions longitudinally of the machine. At their forward portions the plates e are guided by a retracting-bar f , which extends across the entire machine and is slidable in forward-and-backward direction in horizontal slots of the partitions. The particular arrangement and function of the retracting-bar f will be more particularly described hereinafter. Above each carrier e is located a relatively wide guide-plate g , extending through and fixed to the several partitions. As shown in Figs. 2 and 8, each carrier-plate e is provided intermediately with an upwardly-directed spring tooth or pawl e^2 , maintained in engagement with the corresponding band c by a small spring e^3 , as shown in Fig. 2. Each carrier-plate is further provided at its front portion with a depending lip e^4 . Applied to the rear end of each carrier-plate is a helical spring e^5 , by which the same is connected with the rear wall of the casing and normally retained adjacent said rear wall.

Coacting with several carrier-plates e , by which each band is advanced to the extent of one tooth, are a plurality of triggers t , one for each carrier-plate. Each of said triggers is of the form shown in Fig. 7—that is to say, it is approximately stirrup-shaped and has a short upwardly-extending tooth t' at one side and a longer horizontally-disposed leg or extension t^2 at the other side, said extension being provided at its upper edge with a shoulder t^3 , with which the depending lip e^4 of the corresponding carrier-plate coacts in order to retain said plate in forward position after it has been moved into such position by the reciprocating cross-bar f . Each trigger t is journaled upon a longitudinally-extending shaft T and is normally maintained in the position shown in Fig. 2 by means of a small spring t^5 , wound about said shaft or spindle T and pushing upwardly upon the leg or extension t^2 of the stirrup-shaped trigger.

As shown in Fig. 6, each trigger t is movable in two adjacent compartments, its intermediate or transverse portion t^6 being guided in an opening o in each partition, so that the horizontal extension t^2 is disposed in one compartment in the path of the lip e^4 of the carrier e in said compartment, while the opposite end of the trigger—that is to say, the upwardly-projecting catch or tooth t' —is disposed in the adjacent compartment in the path of the longer teeth c^2 , but not of the teeth c' . For the purpose of guiding each trigger t and preventing its displacement axially along the shaft T it is provided at the lower edge of its intermediate portion t^6 with a small recess t^7 , which engages the edge of the opening o in the corresponding partition.

The retracting-bar f , which extends transversely of all of the carriers e , serves after the release of one or all of the carriers by the actuation of the trigger when the tooth t' of the same is moved by the corresponding calculating-band and said band has been shifted forwardly to the extent of one tooth by the tooth e^2 of the carrier to return one or all of said carriers to the position shown in full lines in Fig. 2, in which the springs e^5 are set to tension and the mechanism is made ready for another actuation. The return movement of each carrier is effected by the forward movement of the retracting-bar f which abuts against the lip e^4 of the carrier and moves the latter forwardly until said lip engages the shoulder t^3 of the corresponding trigger and is retained thereby owing to the action of the trigger-spring. In order to insure the reliable engagement of the lip e^4 against the shoulder t^3 , the bar f carries said lip slightly beyond said shoulder, and after the release of said bar the lip seats itself against said shoulder under the action of the spring e^5 . The retracting-bar f is provided at either end with an opening f^5 , and at one end—the right-hand end, as shown—said opening is engaged by the other end of an elbow-lever h , fixed to a shaft h' , journaled in the partitions and extending across the several compartments to the other side of the machine, where it has fixed thereto a crank i , as shown in dotted lines in Fig. 2 and in full lines in Fig. 4, which crank engages with its lower end in the opening f^5 at the opposite end of the retracting-bar f . The elbow-lever h is provided with a nose or beak h^2 , under which engages the rear end of a fulcrumed actuating-lever l , said lever being fulcrumed to a pin p , extending laterally from the last partition at the extreme right of the machine, as shown in Fig. 4. The lever l extends outwardly from the casing, at the front thereof, where it operates in a suitable slot. By depressing said lever the elbow-lever h , and consequently the lever i , are rocked about their common axis and by their forwardly-moving lower ends shift the retracting-bar f in forward direction against the tension of a spring f^3 , which normally holds said bar at the extreme rearward end of its guide-slots.

In order to insure a complete movement of the retracting-lever l , and consequently of the bar f , the former is provided with a pawl-and-ratchet mechanism r , as shown in Figs. 3 and 4, said mechanism embodying a pawl the movement of which is controlled in opposite directions by two oppositely-acting springs, as indicated, and which engages the teeth of a rack secured to the inner face of the side wall of the machine. By this mechanism it is impossible to release the lever l after the engagement of the pawl until a complete movement of the retracting-bar f has been effected and all of the carriers e are

set in position to be operated, their springs being properly tensioned.

The mechanism for returning the several bands to their initial or zero position after each calculation consists, essentially, of a bar m , extending transversely across all of the bands above the same and movable forwardly and rearwardly in the casing. Said bar carries upon its under surface at points in register with the longer teeth c^2 , but not with the shorter teeth c' , a number of spring-catches k , which are adapted to engage the end portions of the longer teeth and when said bar is moved forwardly to carry the bands to their initial or zero position. In the front portion of the casing a longitudinally-arranged shaft u is journaled in the partitions and carries at either end in compartments beyond the numeral-carrying band pulleys u' , which coöperate with pulleys u^2 , arranged loosely on the shaft b at the rear of the machine in guide-wires or other similar members w , to which the zero-setting bar m is attached, as shown in Fig. 5. The normal position of the zero-setting bar m is shown in Figs. 1 and 2, in which it is hidden from view by the rear portion of the cover of the machine, and it is maintained in this position by means of a helical spring u^3 , acting upon the forward shaft u . The zero-setting bar m is provided at one end with an upwardly-extending finger-piece m' , movable transversely of the machine in a slot m^2 on the cover thereof at one side of the same.

In the modification shown in Figs. 9 and 10 instead of the bands or tapes a number of chains are employed, and instead of having the numerals carried by said members they are arranged upon the wheels y , over which said chains are movable, there being ten teeth for each wheel. In this arrangement triggers z are employed, and said triggers are disposed in two compartments in substantially the manner heretofore described. However, the carriers z' , with which they coöperate, are pivoted and spring-actuated in the manner shown, being provided with terminal teeth z^2 , adapted to engage the teeth of the wheels y and when said carriers are released by the triggers z to actuate said wheel to the extent of one tooth under the influence of the springs acting upon said carriers. The release of the triggers or detents z is effected by pins z^3 , one of which is arranged upon the side of each wheel y , and during each revolution—that is to say, when the band has been moved to the extent of ten numbers—abuts against and releases said trigger. The carriers z' are returned to their initial position by means of a lever z^4 , as indicated in dotted lines in Fig. 9, said lever carrying a cross-strip z^5 , which engages all of the pivoted carriers z' .

The operation of the improved machine is as follows: The several parts being in their

normal position and the bands being set so that the character "0" appears in all the apertures a^5 , the number to be added is recorded by inserting the finger at the right of said numeral as it occurs on the numeral-carrying strip a^4 and in pulling the band toward the front of the machine until said number appears in the aperture a^5 . For the purposes of description it is assumed that the number thus recorded is less than ten, and consequently that the band at the extreme right is so actuated. It is obvious that when one number or several numbers giving a total of less than ten are added that the result will appear on the unit-band through the unit-aperture. However, when a number is added which carries the result from units to tens one of the longer tenth teeth c^2 will engage the upwardly-extending tooth t' located in the unit-compartment, and in so abutting against and rocking said tooth will release the carrier e in the tens-compartment, whereupon said carrier, being retracted by the action of its spring e^5 , will engage by its spring-actuated tooth or pawl one of the teeth c' c^2 and shift forwardly the band to the extent of one tooth, so that a "1" appears in the tens-aperture instead of a "0." When the number or total changes from tens to hundreds, the same operation takes place, the trigger being released by the band in the tens-compartment and setting in motion the carrier in the hundred's-compartment, so that the band in said last-named compartment is advanced one figure. In this manner the addition may continue until the numeral "9" appears in each of the apertures a^5 . In the machine illustrated the largest total which can be registered is "999,999," as there are six numeral-carrying bands. However, it is obvious that the number of bands which may be employed is theoretically unlimited.

In order to insure the proper carrying of the numbers from one column to the other, it is necessary to operate the carrier-energizing lever l . It is manifest that when the number added is insufficient to make necessary the movement of the band at the left that the actuation of the lever l is unnecessary; but for the purpose of avoiding mistakes it is best to actuate said lever after the addition of every number, so that each and all of the carriers are set and ready for operation by their corresponding numeral-carrying bands. The lever l thus serves for setting all of the carriers, and after said lever has been so used the carrying operation is effected automatically.

When the total of the numbers added has been ascertained by observing the apertures a^5 and it is desired to set the machine at zero for another calculation, the finger-piece m' of the zero-setting bar m is pulled forwardly in its slot m^2 , so that said bar m is advanced

and by its catches k , which engage the longer teeth c^2 of each band, carries forward all of the bands until the character "0" appears in all of the apertures. By the provision of the pulleys u^1 , u^2 , and wire w the pressure upon the zero-setting bar m is equalized to a great extent, so that the finger-piece m' moves smoothly in its slot and so that the bar may be actuated with a minimum amount of pulling. By the provision of the spring u^3 , acting upon said pulleys and said wire the zero-setting bar is retracted into its normal position (indicated in dotted lines in Fig. 1) immediately after its release.

In the modified construction shown in Figs. 9 and 10 the operation is essentially the same as that described, the pivoted carriers being released by the trigger z when the latter is in turn engaged by the pin z^2 —viz., once during the rotation of each wheel y . In this arrangement, however, the carriers instead of being slidable are pivoted and instead of directly engaging the bands engage the teeth of the wheel.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a calculating-machine, the combination, with a plurality of endless numeral-carrying bands provided with longitudinally-arranged teeth, of a spring-actuated carrier for engaging the teeth of each band and shifting said band to the extent of one tooth, and a stirrup-shaped trigger operable to hold each carrier in energized position, but releasable by every tenth tooth of the adjacent band.

2. In a calculating-machine, in combination, a casing divided into a plurality of parallel compartments, an endless numeral-carrying band operating in each of said compartments, teeth carried by said band, one for each number, every tenth tooth being of greater length than the other teeth, a spring-actuated carrier in each compartment adapted to engage all the teeth of the corresponding band and shift said band to the extent of one tooth, and a trigger-coacting with each carrier and extending into the adjacent compartment and into the path of the longer teeth of the adjacent band.

3. The combination, with a plurality of numeral-carrying elements, of spring-actuated carriers for shifting said elements to the extent of one number, a trigger coacting with each carrier and releasable by the adjacent element upon a predetermined actuation thereof, and a reciprocating bar for retracting all of said carriers.

4. The combination, with a plurality of numeral-carrying elements, of spring-actuated carriers for shifting said elements to the extent of one number, a trigger coacting with each carrier and releasable by the adjacent element upon a predetermined actuation thereof, a reciprocating bar for retracting all

of said carriers, and a lever mechanism for operating said bar.

5. The combination, with a plurality of endless numeral-carrying elements, of a spring-actuated carrier for shifting each element to the extent of one number, a trigger coacting with each carrier and releasable by the adjacent element upon a predetermined actuation thereof, a reciprocating bar for retracting all of said carriers, a lever for operating said bar, and a pawl-and-ratchet mechanism for insuring a complete movement of said lever.

6. The combination, with the endless numeral-carrying bands c having the teeth c^1 , c^2 , of the carriers e having the pawls e^2 for engaging said teeth, and the triggers t having the lateral extension t^2 to cooperate with said carriers and the upwardly-disposed tooth t' to engage the teeth of the next adjacent band.

7. The combination, with a casing divided by partitions into a plurality of parallel compartments, of endless numeral-carrying bands operating in said compartments, a carrier in each compartment for shifting the corresponding band to the extent of one number, and a trigger operating in an opening in each partition and having one portion to set the carrier in one compartment, and another part to engage and be released by the band in the next adjacent compartment.

8. In a calculating-machine, the combination, with a plurality of numeral-carrying bands, of a carrier to shift each band to the extent of one number, a trigger for setting each carrier, and releasable by the adjacent band, a shaft extending transversely of said bands, levers carried by said shaft, a retracting-bar for said carriers connecting the ends of said levers, and means for rocking said shaft.

9. A calculating-machine including in its construction a plurality of numeral-carrying bands, teeth carried by said bands, one for each number, every tenth tooth being of greater length than the other teeth, and a reciprocating zero-setting bar having means to engage the longer teeth of all of said bands.

10. A calculating-machine including in its construction a plurality of numeral-carrying bands, teeth carried by said bands, one for each number, every tenth tooth being of greater length than the other teeth, a reciprocating zero-setting bar having means to engage the longer teeth of all of said bands, and a spring for normally holding said bar in inoperative position.

11. A calculating-machine including in its construction a plurality of numeral-carrying bands, teeth carried by said bands, one for each number, every tenth tooth being of greater length than the other teeth, a reciprocating zero-setting bar having means to engage the longer teeth of all of said bands, a spring for normally holding said bar in inop-

erative position, pulleys journaled at the front and rear of the machine and at either side thereof, and wires wound about the corresponding front and rear pulleys and attached to said zero-setting bar.

12. The combination, with a casing having a transversely-disposed slot in the cover thereof, at the side of said cover, of a plurality of numeral-carrying bands operating in said casing, and a reciprocating bar, for

setting all of said bands at zero, carrying a finger-piece extending through said slot in the casing.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

NATHAN J. GOLDFARB.

Witnesses:

PAUL GOEPEL,
HENRY J. SUHRBIER.