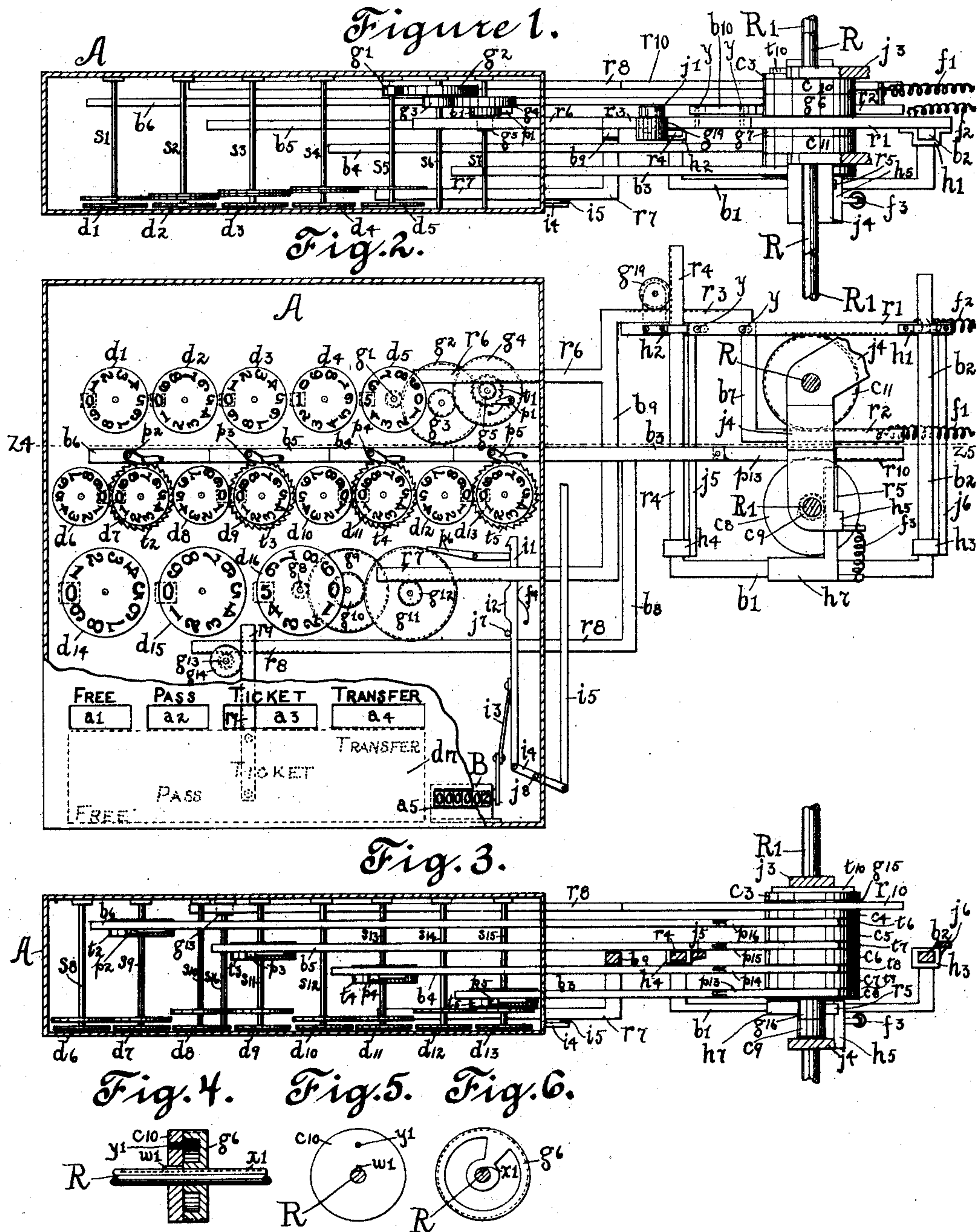


W. H. COOLEY.  
FARE REGISTER.

(Application filed Apr. 2, 1900.)

(No Model.)

5 Sheets—Sheet 1.



Witnesses:

Albert C. Bell.  
Ethel M. Smith.

Inventor  
W. H. Cooley.

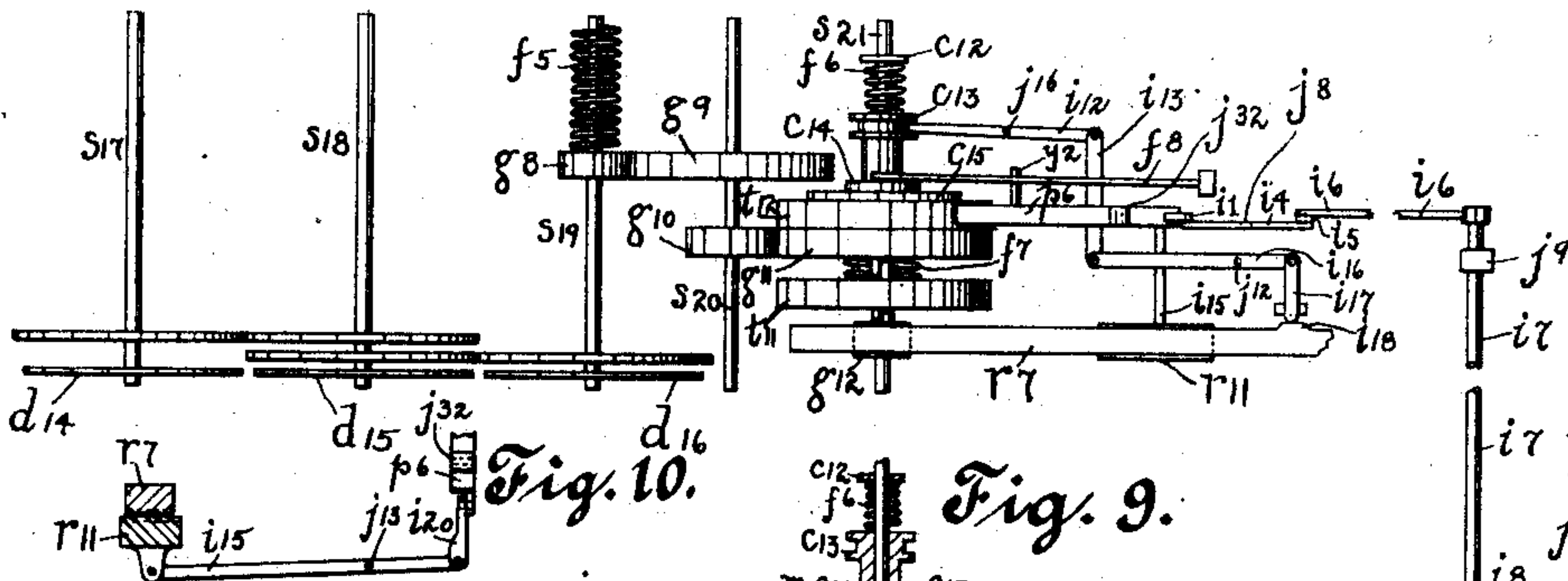
**W. H. COOLEY.**  
**FARE REGISTER.**

(Application filed Apr. 2, 1900.)

(No Model.)

**5. Sheets—Sheet 2.**

Fig. 7.



*Fig. 9.*

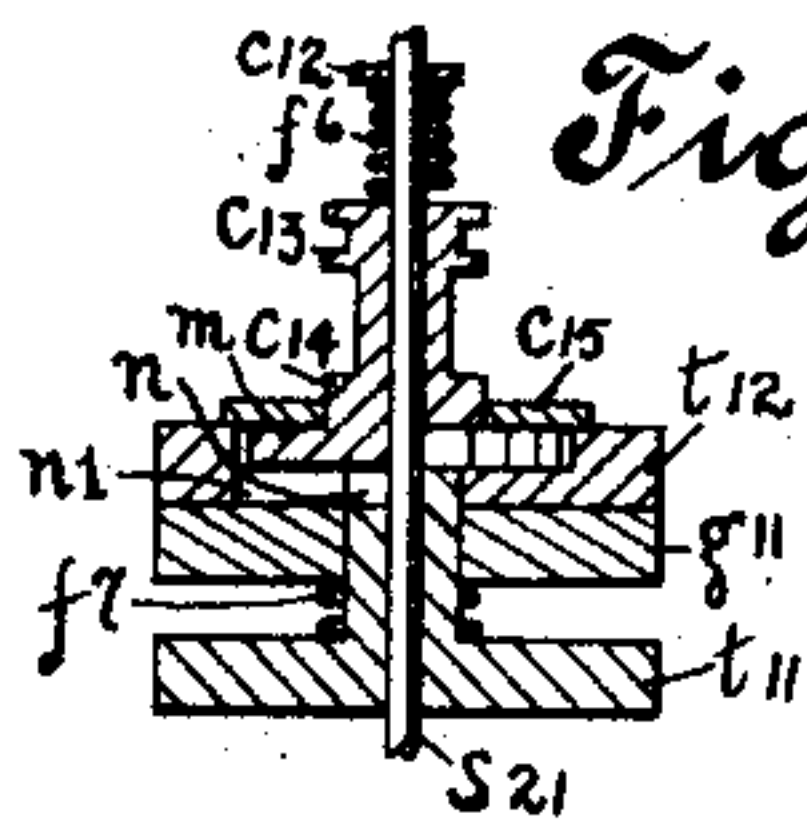
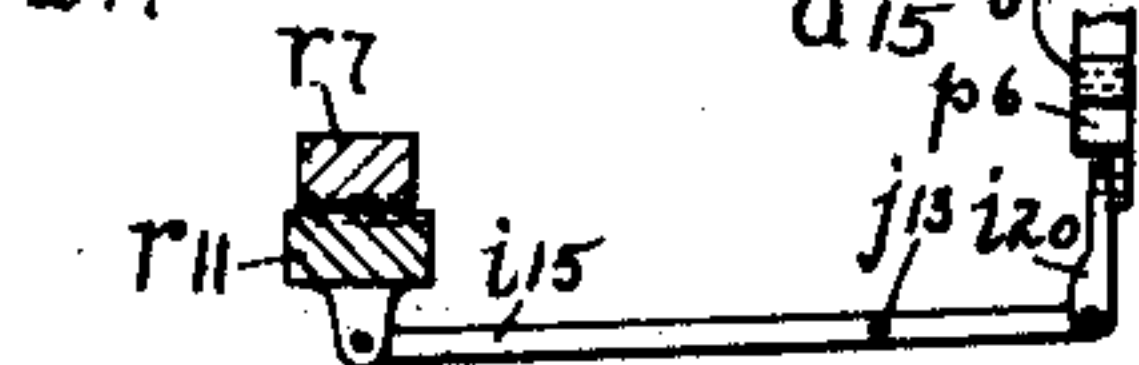
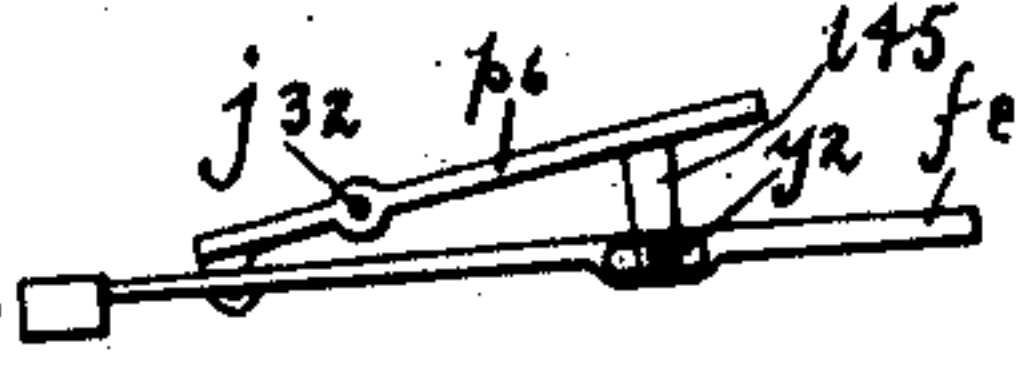


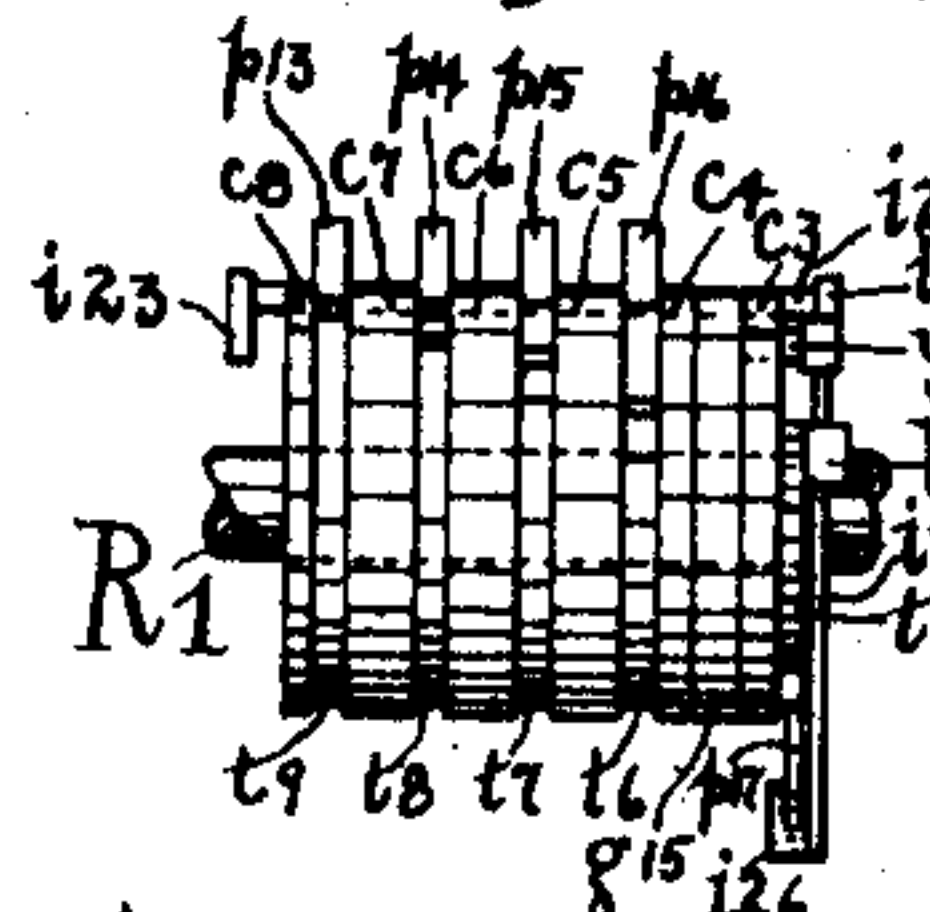
Fig. 10.



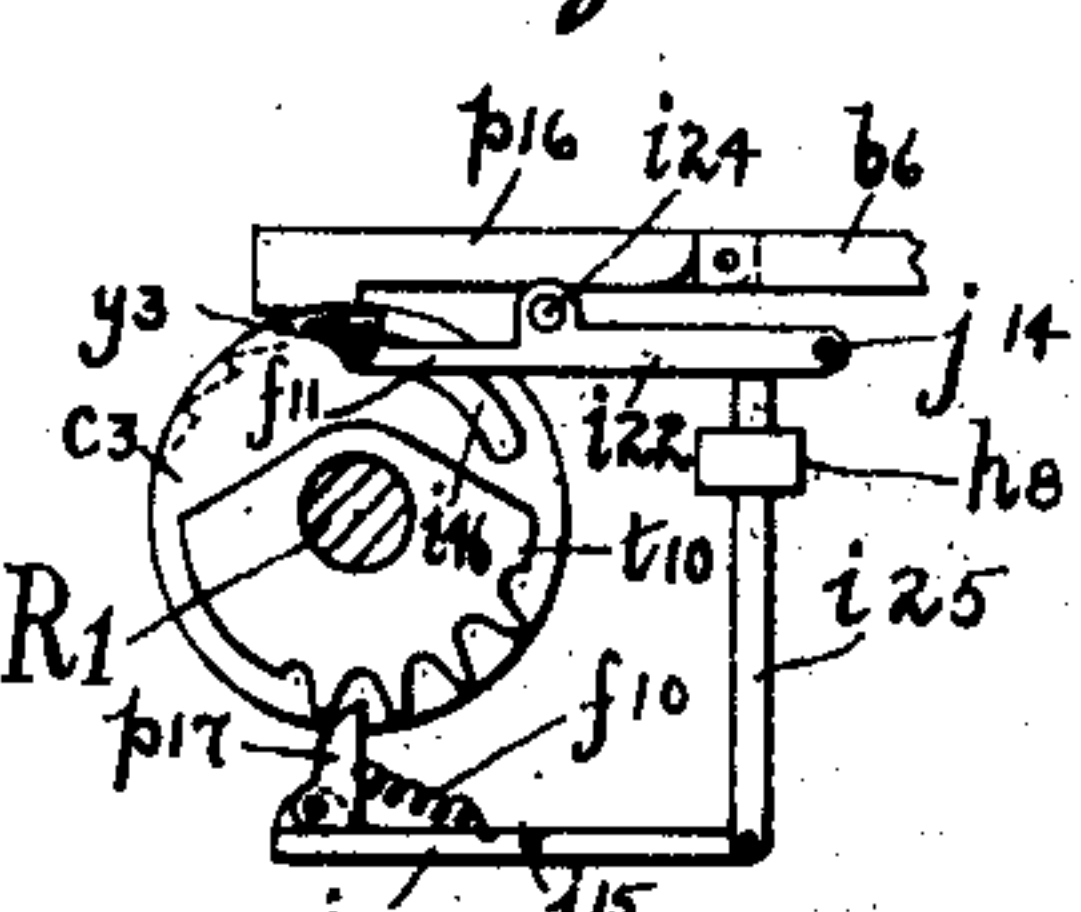
*Fig. 11.*



*Fig. 12.*



*Fig. 13.*



*Fig. 8.*

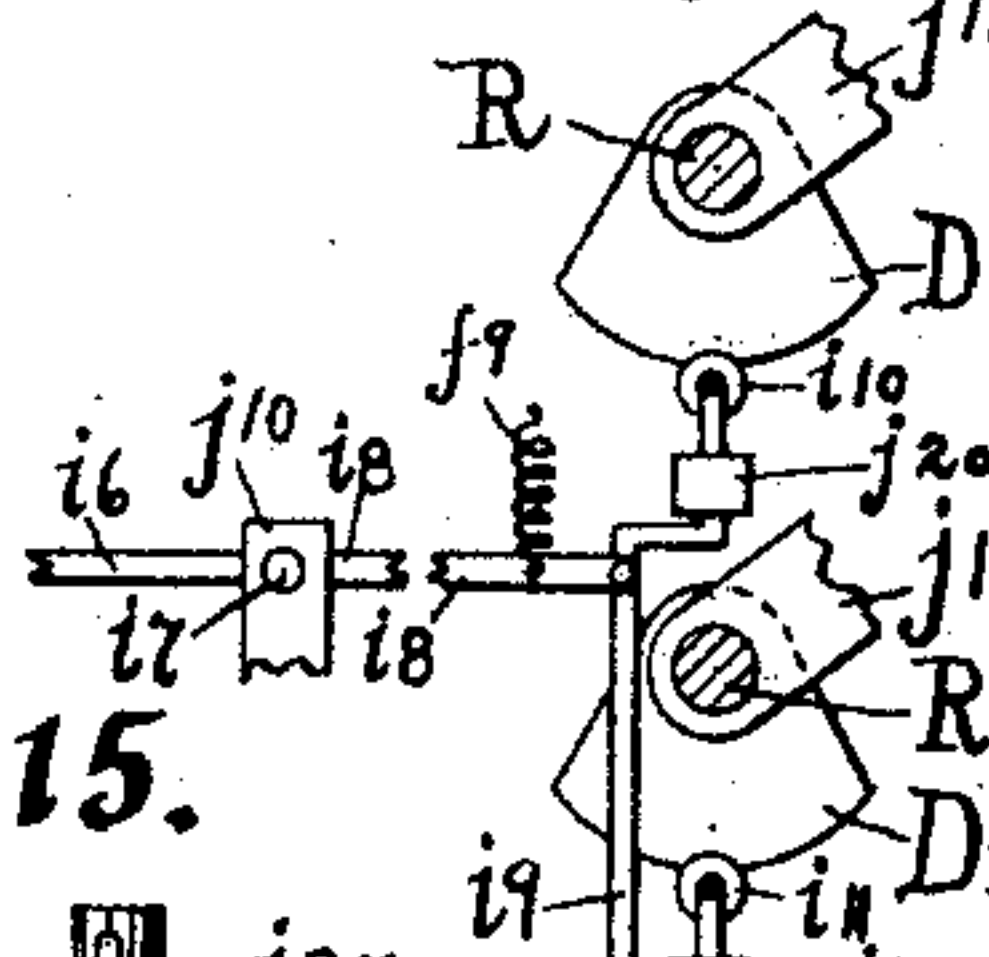
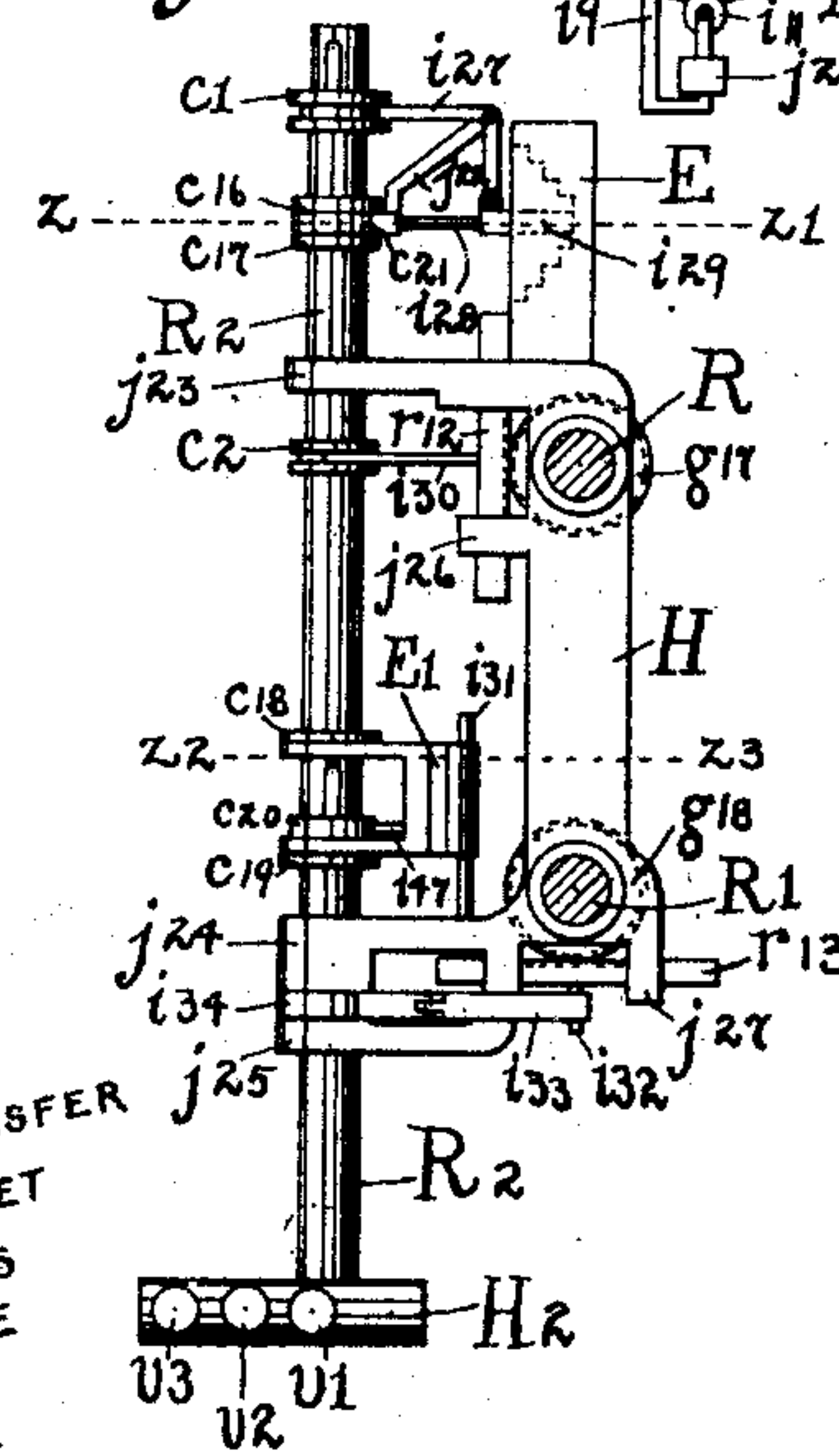


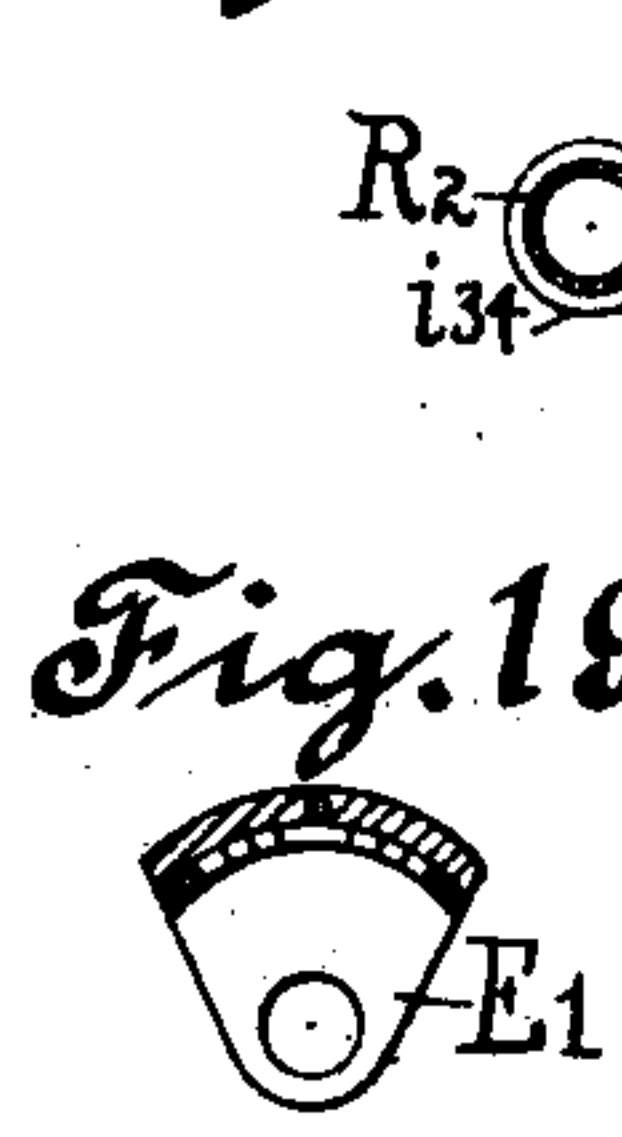
Fig. 15.



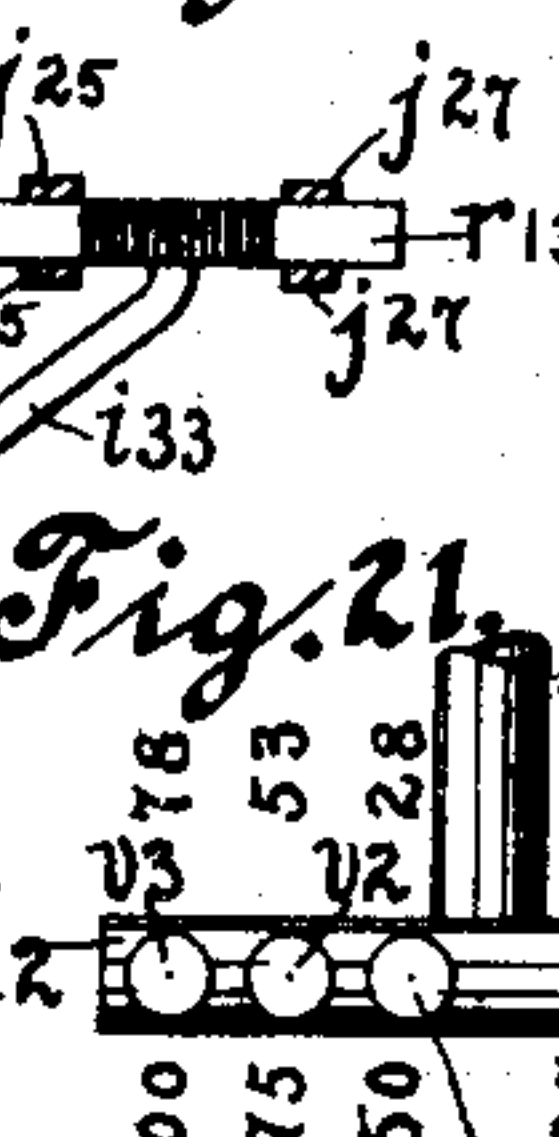
*Fig. 17*



*Fig. 14.*



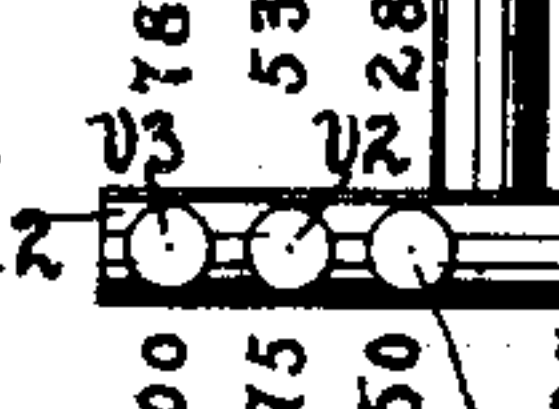
*Fig. 16.*



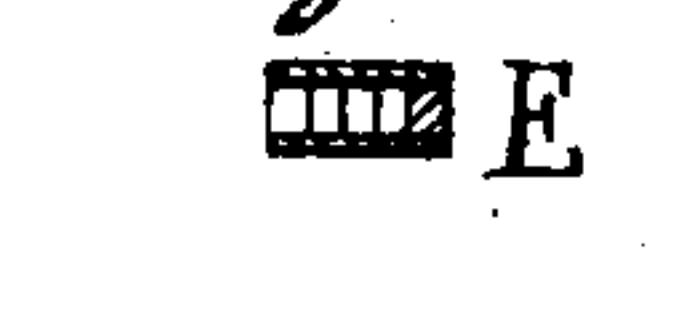
*Fig. 18*



*Fig. 21.*



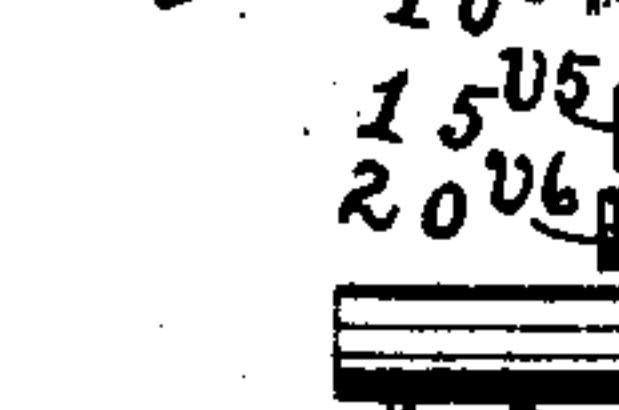
*Fig. 18.*



*Fig 2a*



Fig 22. <sup>R27</sup><sub>5</sub>  
1004



Witnesses:  
Albert C. Bell.  
Ethel M. Smith.

Inventor  
Wm. H. Cooley.



Fig. 23. Fig. 24.

Fig. 25.

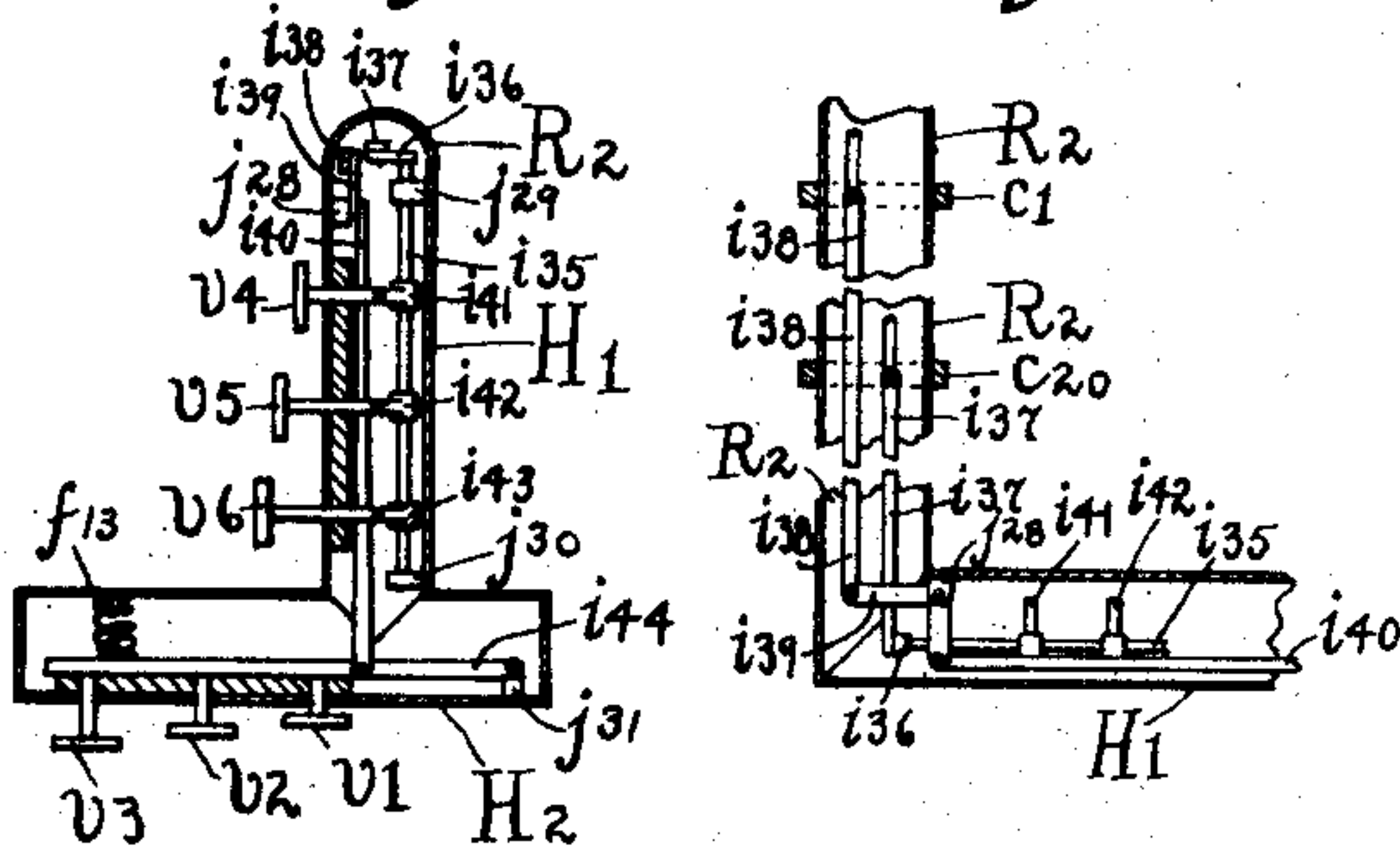


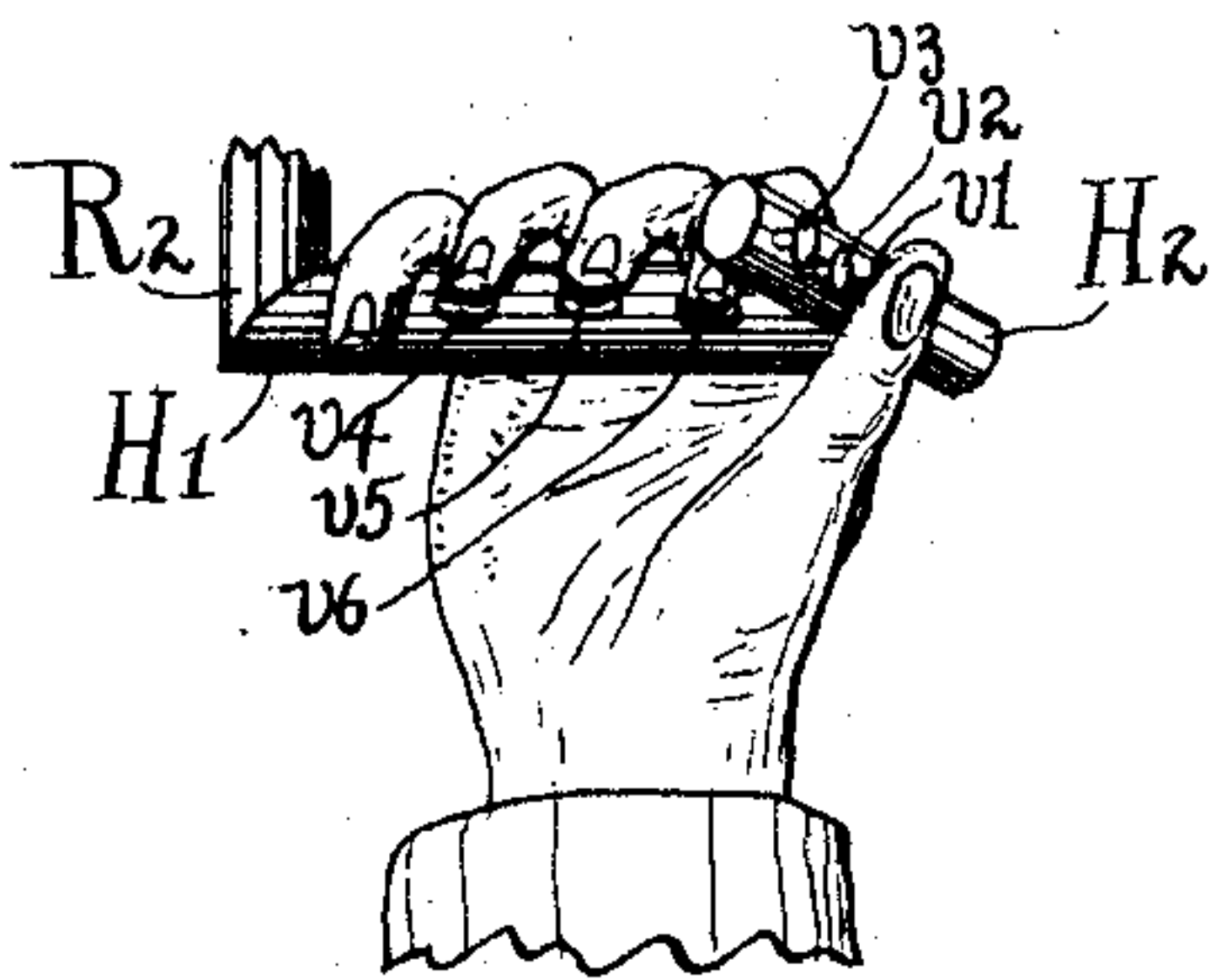
Fig. 26.

Fig. 27.

FREE									
PASS									
TICKET									
TRANSFER									
100	75	50	25	3	28	53	78		
105	80	55	30	5	8	33	58	83	
110	85	60	35	10	13	38	63	88	
115	90	65	40	15	18	43	68	93	
120	95	70	45	20	23	48	73	98	

Sq. 4. FREE									
Sq. 3. PASS									
Sq. 2. TICKET									
Sq. 1. TRANSFER									
100	75	50	25	3	28	53	78		
105	80	55	30	5	8	33	58	83	
110	85	60	35	10	13	38	63	88	
115	90	65	40	15	18	43	68	93	
120	95	70	45	20	23	48	73	98	

Fig. 28.



Witnesses:

Albert C. Bell.

Etha M. Smith.

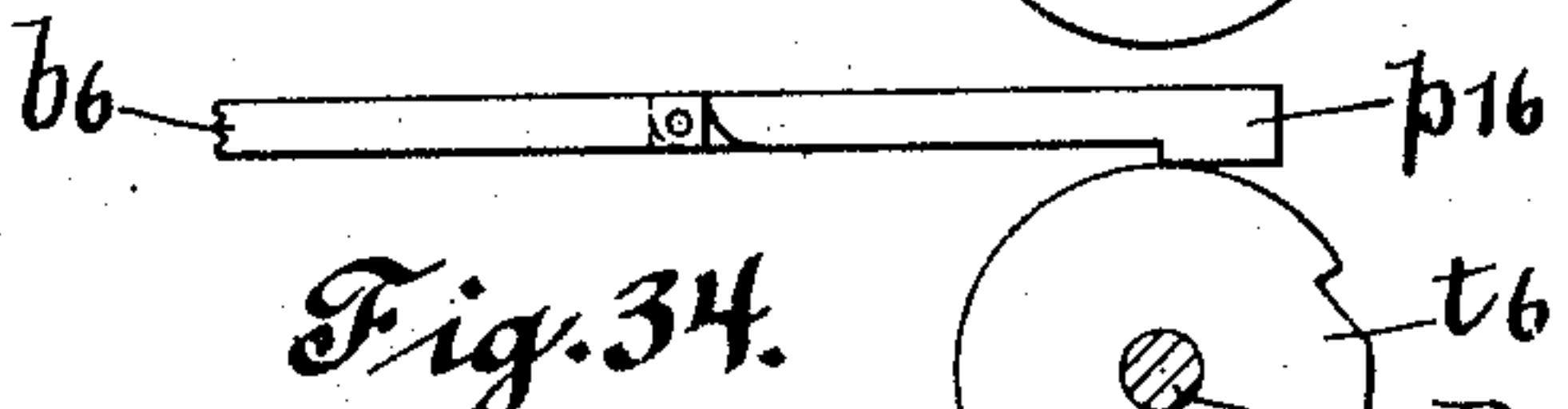
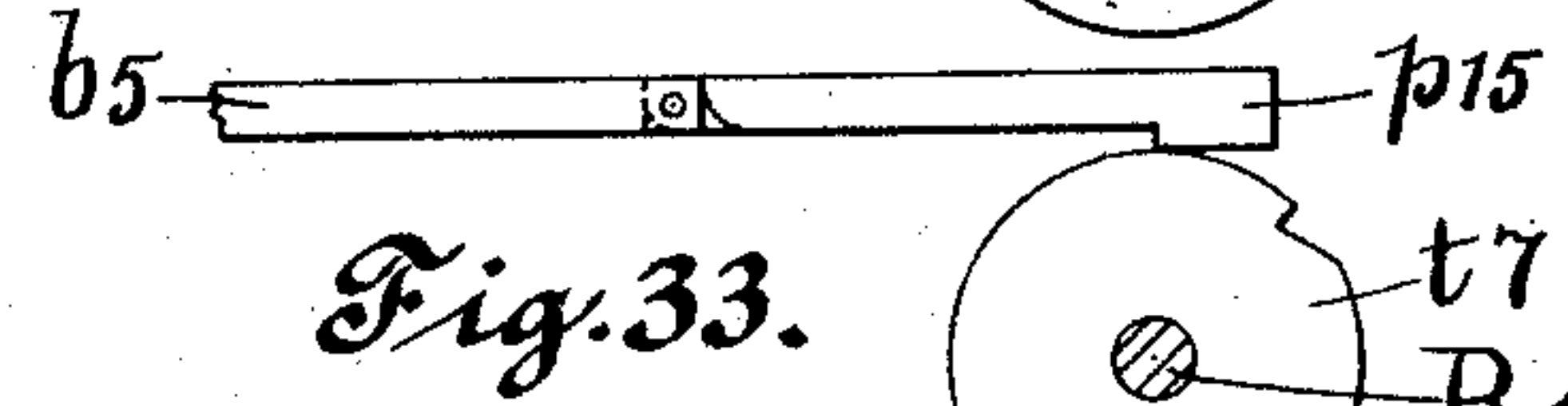
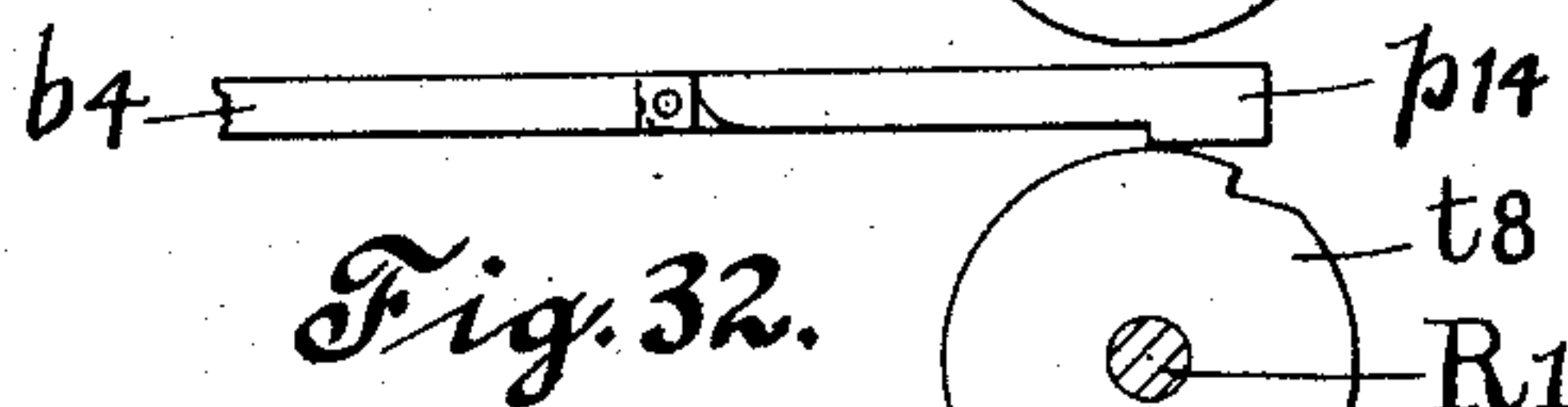
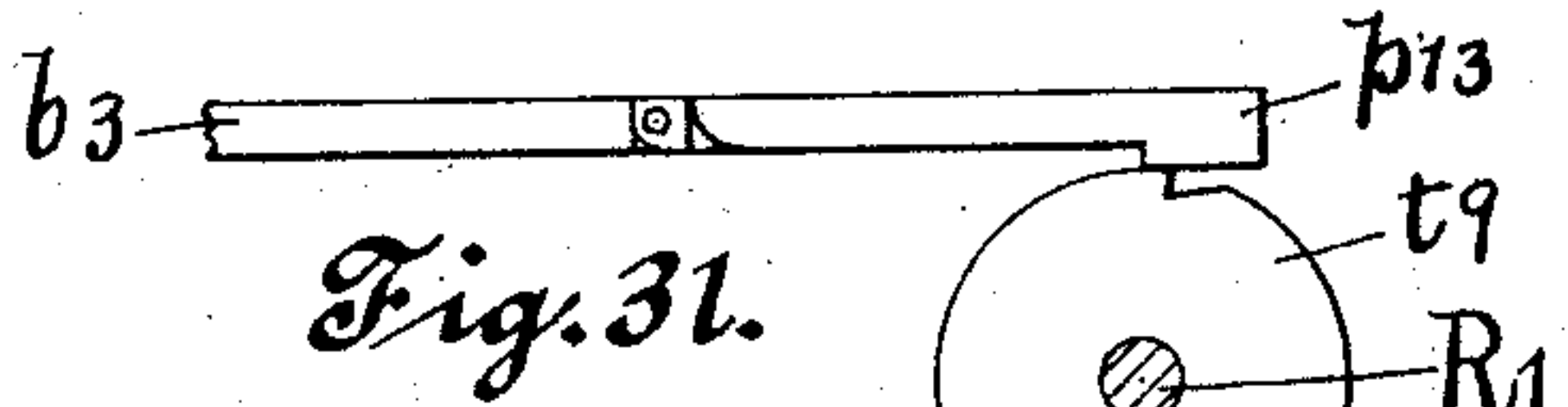
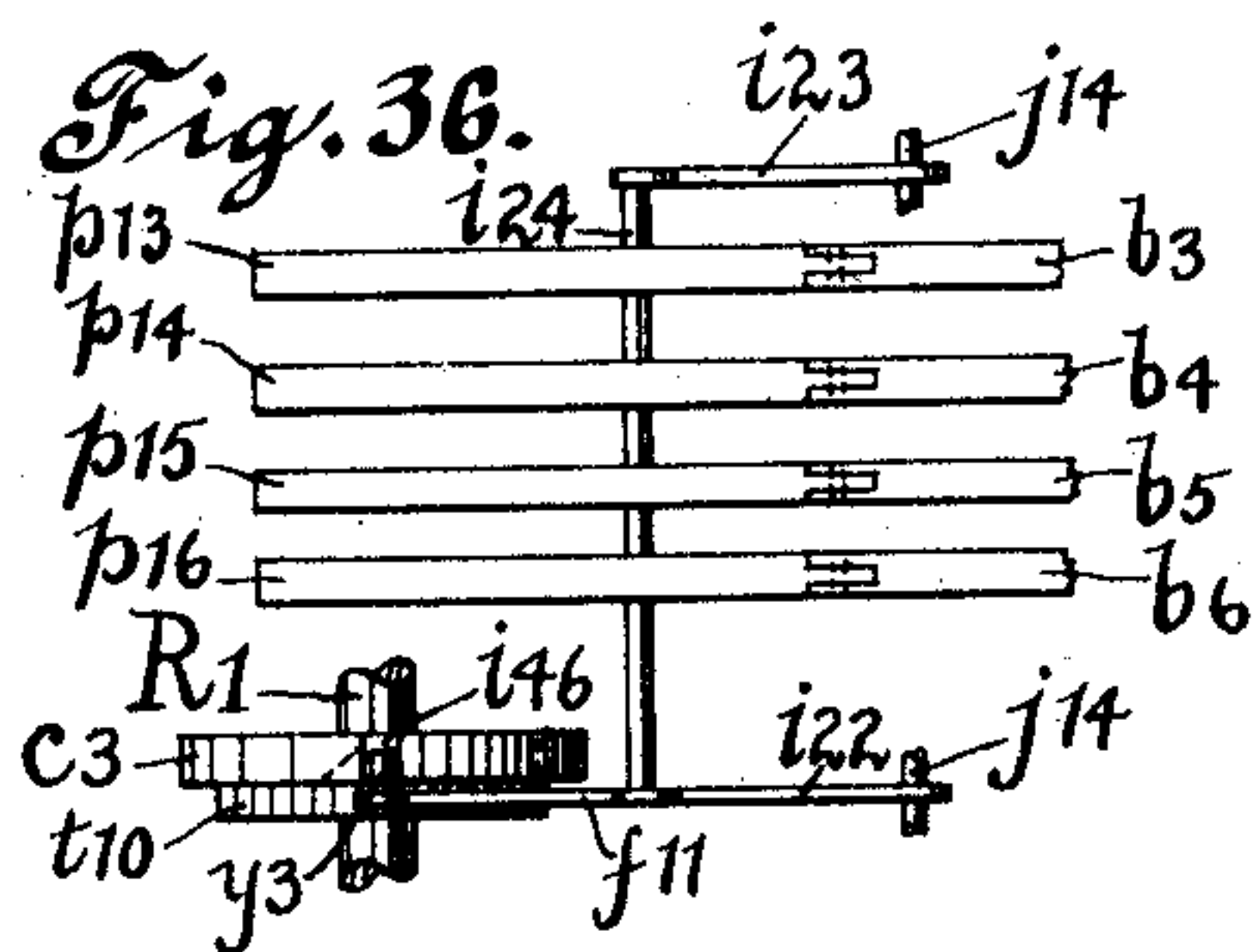
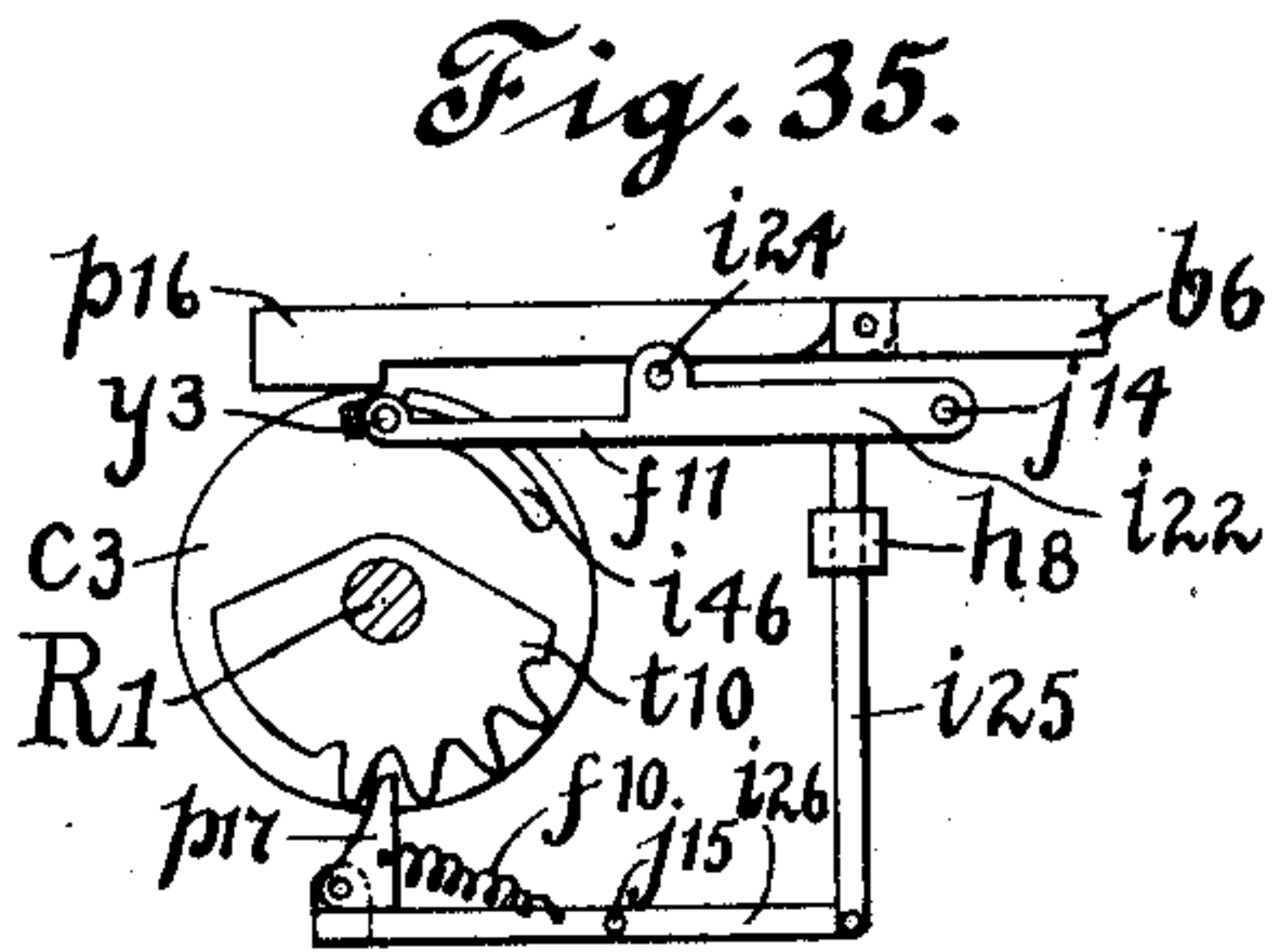
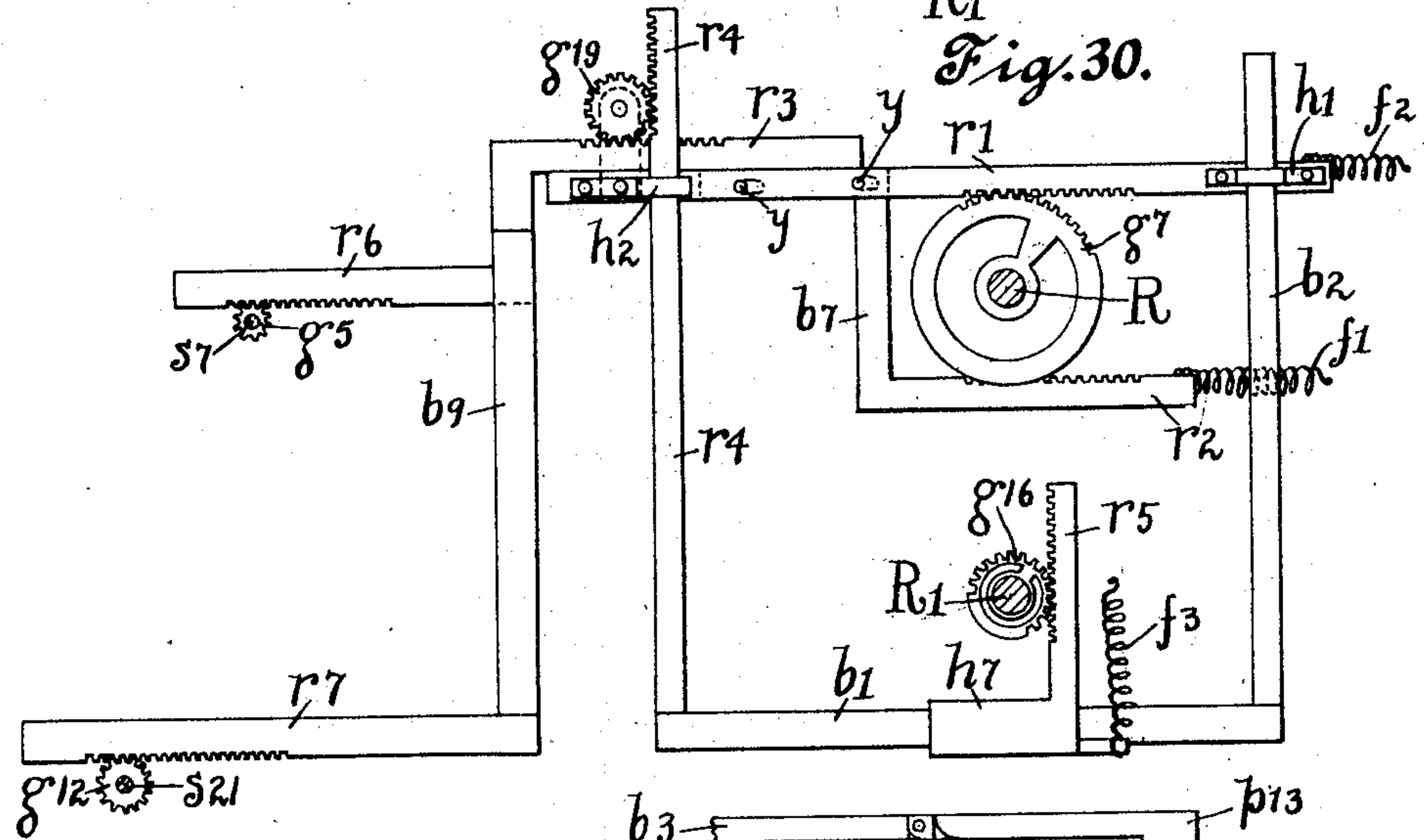
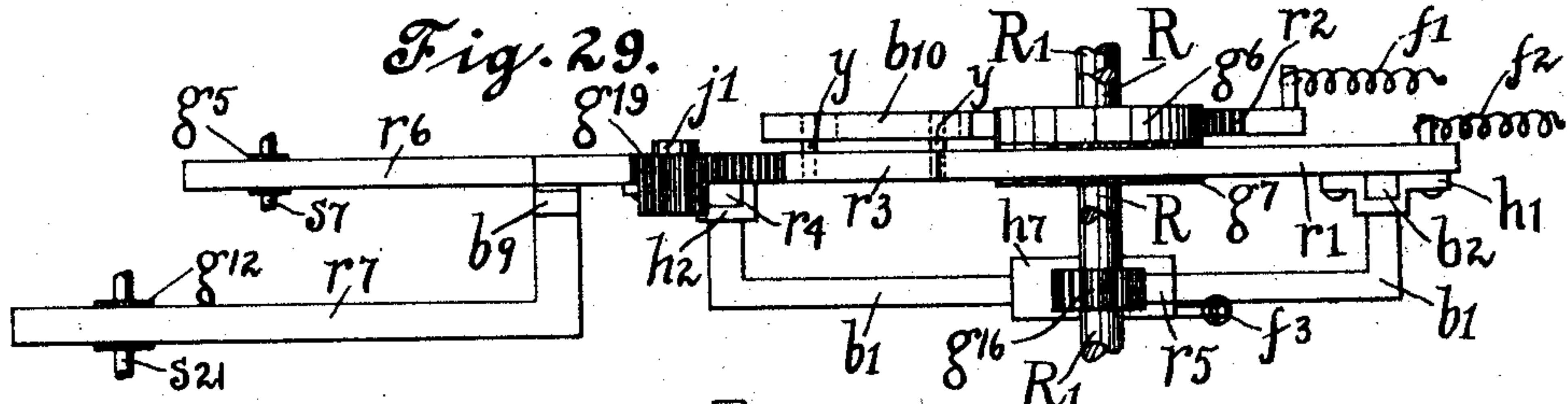
Inventor

W. H. Cooley.

W. H. COOLEY.  
FARE REGISTER.

(Application filed Apr. 2, 1900.)

5 Sheets—Sheet 4.



Witnesses:

Albert C. Bell.  
Ethel M. Smith.

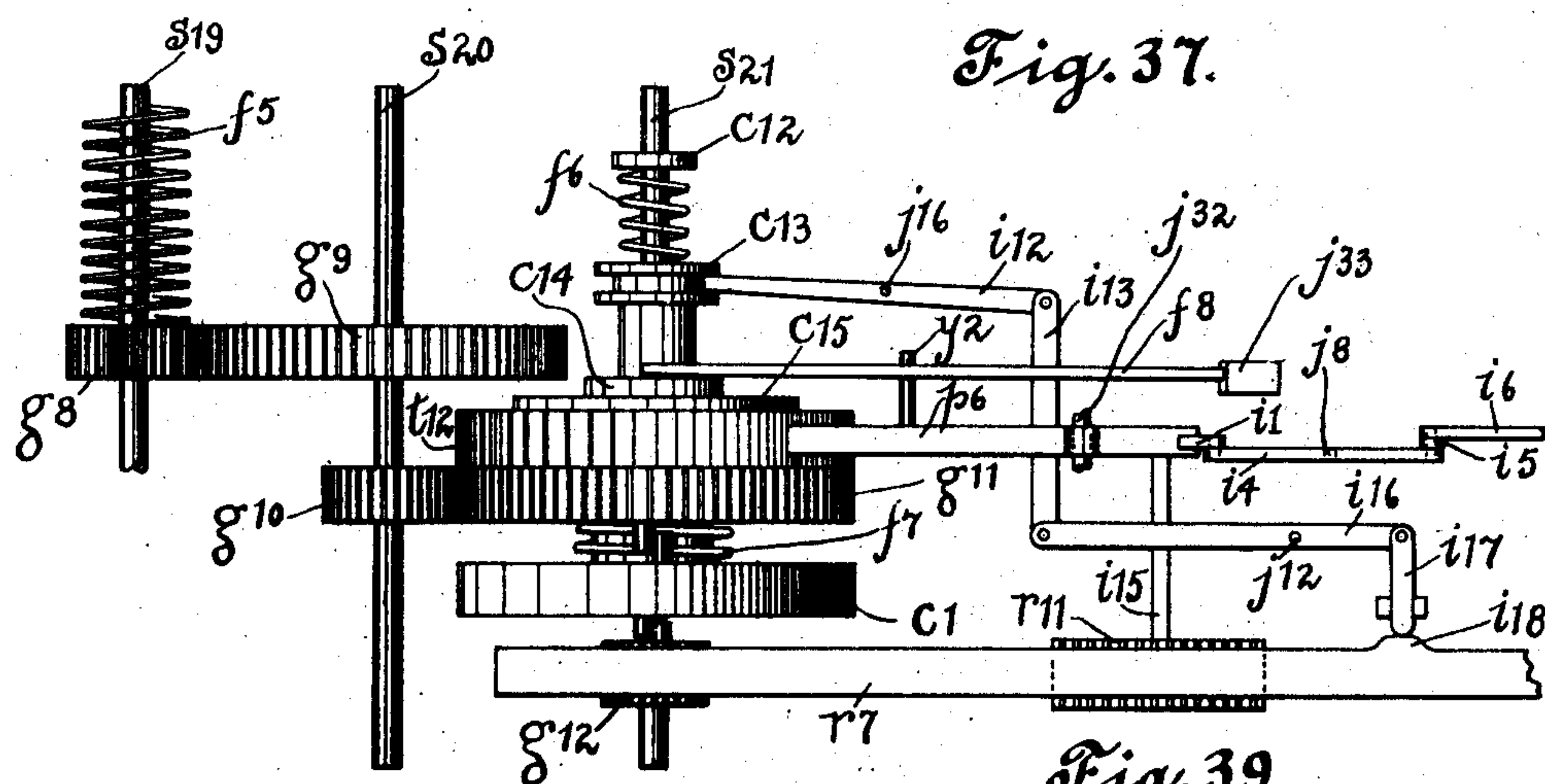
Inventor  
W. H. Cooley

**W. H. COOLEY.**  
**FARE REGISTER.**

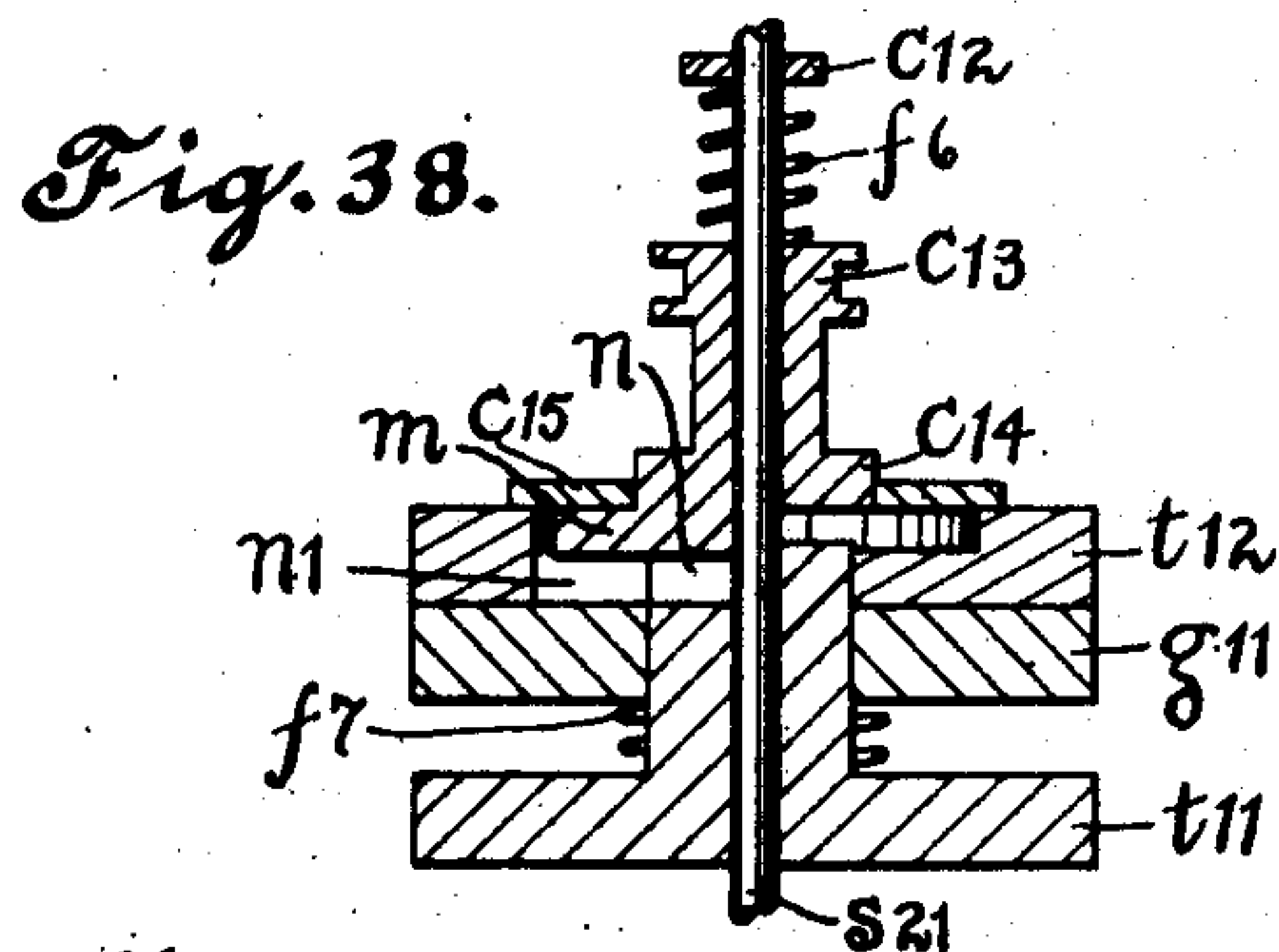
(Application filed Apr. 2, 1900.)

(No Model.)

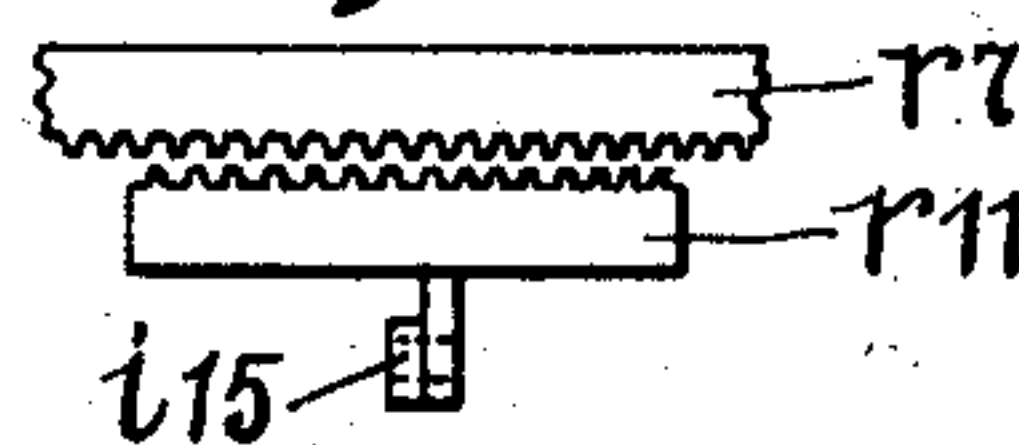
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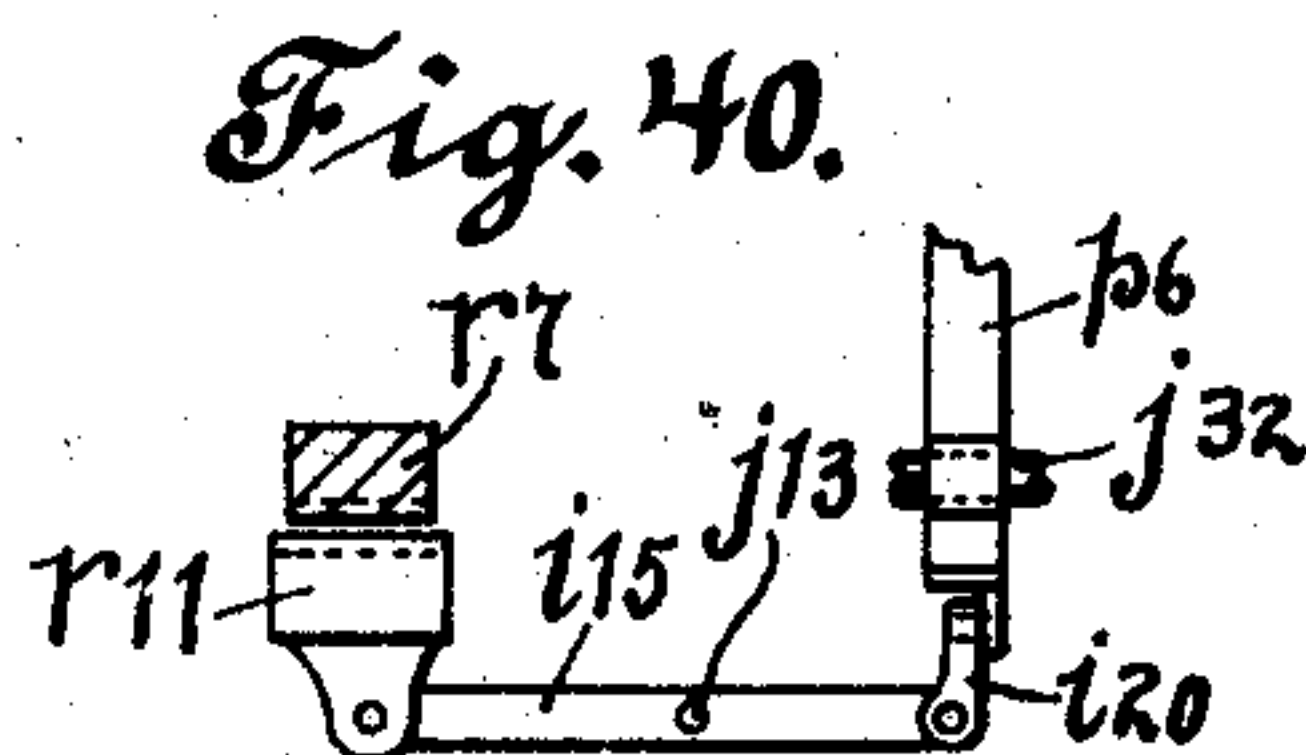
*Fig. 37.*



*Fig. 38.*



*Fig. 39.*



*Fig. 40.*

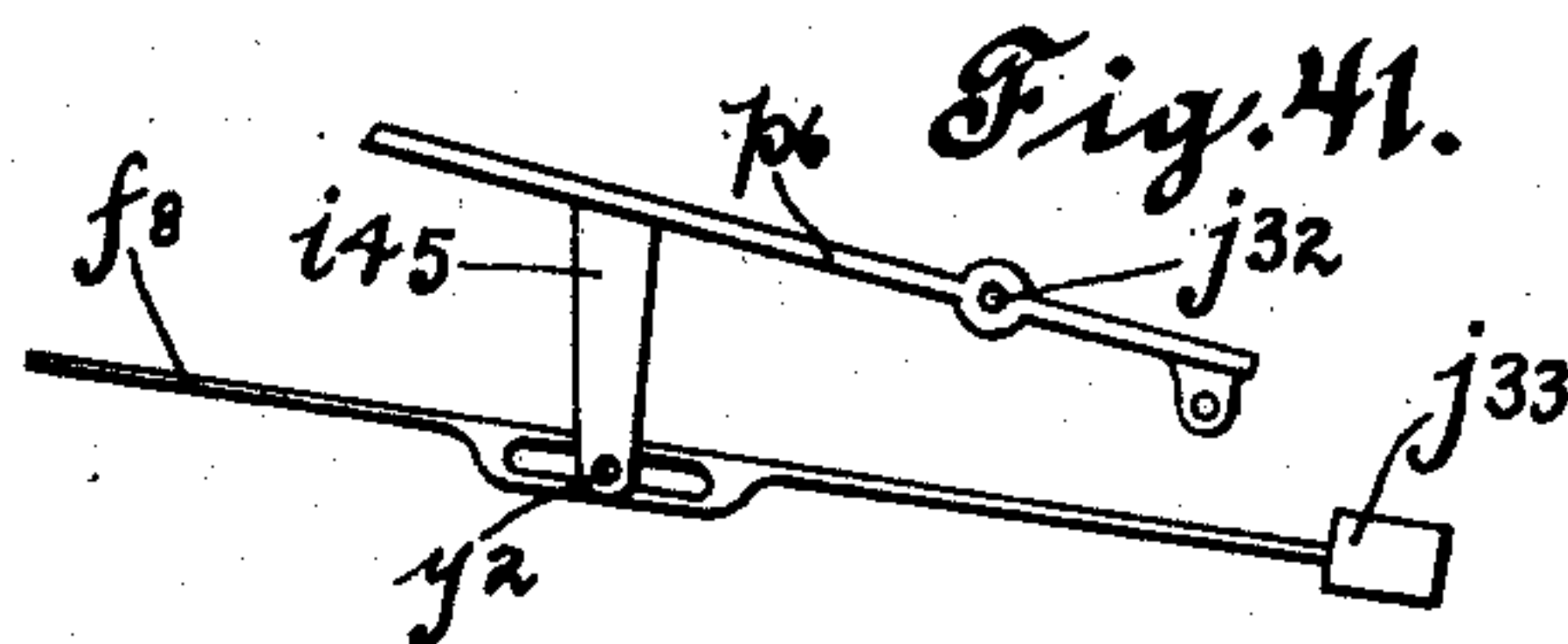
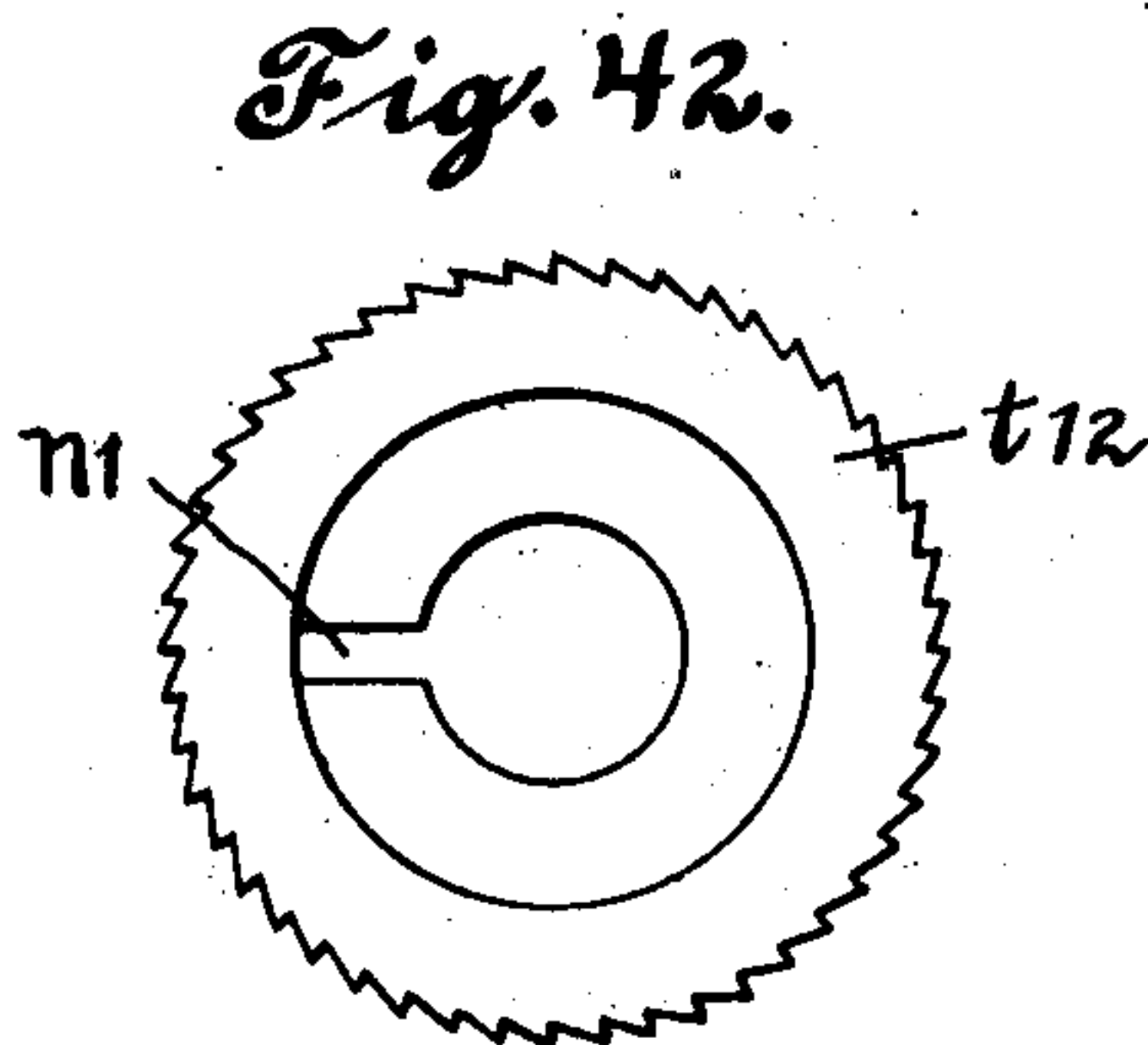
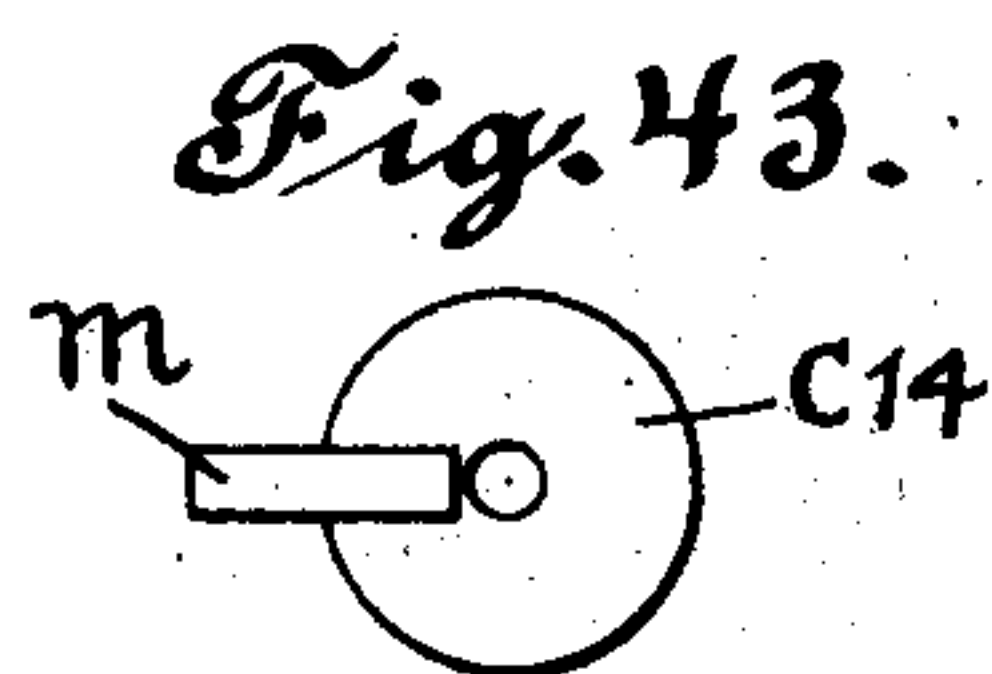


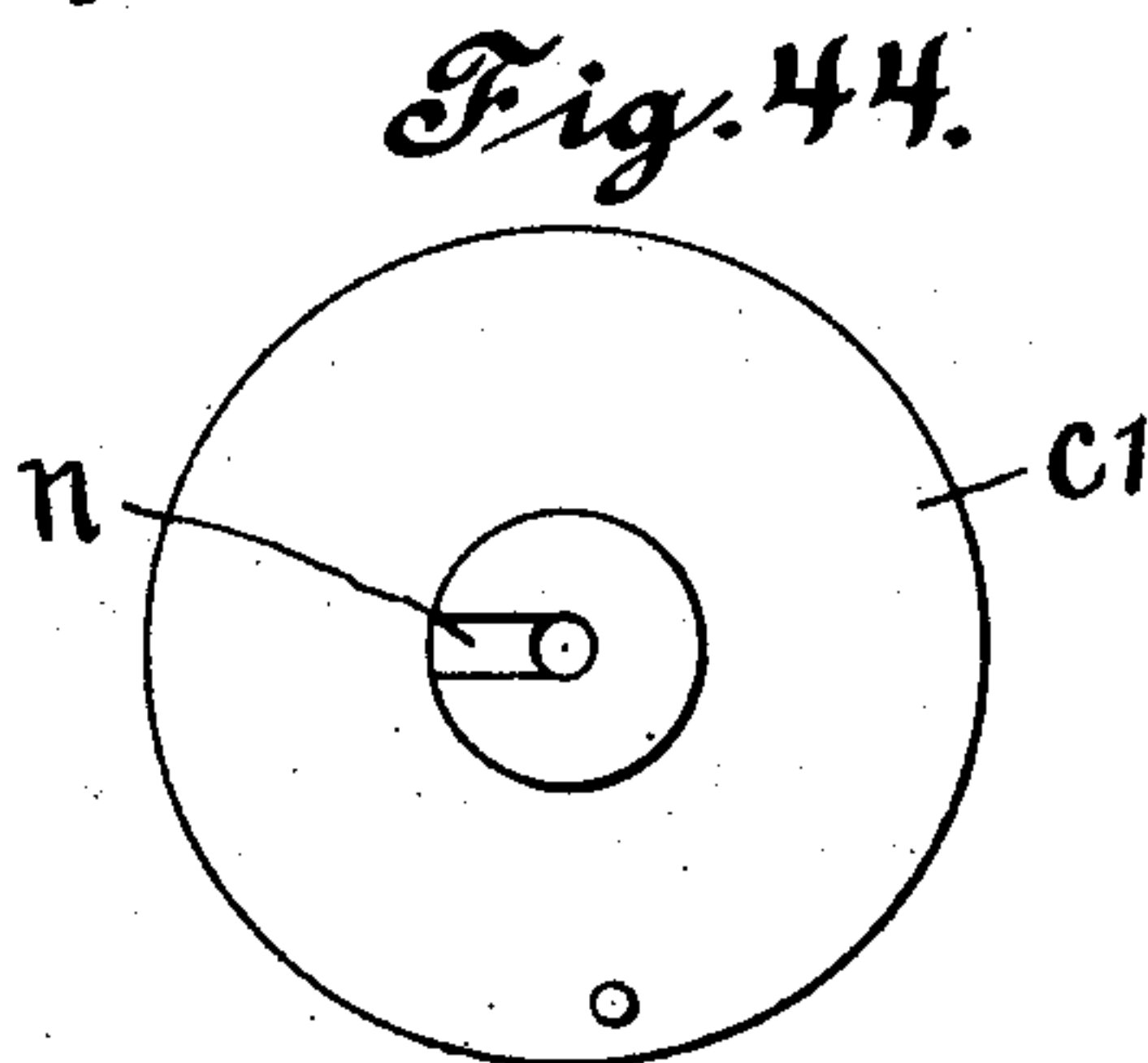
Fig. 41.



*Fig. 42.*



*Fig. 43.*



*Fig. 44.*

**Witnesses:**

Albert C. Bell.

Etha M. Smith.

Inventor  
Wm. H. Cooley



# UNITED STATES PATENT OFFICE.

WILLIAM H. COOLEY, OF BROCKPORT, NEW YORK.

## FARE-REGISTER.

SPECIFICATION forming part of Letters Patent No. 666,469, dated January 22, 1901.

Application filed April 2, 1900. Serial No. 11,156. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM H. COOLEY, a citizen of the United States, residing at Brockport, in the county of Monroe and State of New York, have invented a new and Improved Fare-Register, of which the following is a specification.

One object of my invention is to provide a fare-register and means for actuating the same capable of indicating and registering any desired one of a large number of fares, while requiring but few selections to be made in the device used to operate the register.

Another object of my invention is to provide a register in which the motion of a handle in two directions or of two kinds shall register a fare the value of which shall be determined by the additive sum of the motions in each of such directions.

An important feature of my invention consists in means for accomplishing this last-named result by a motion of such handle which shall be the resultant of two of the primary movements of such handle.

Still further objects of my invention are as follows: first, to provide an indication of the kind of fare registered and also of the total value of any cash fare registered; second, the construction of a total or trip registering mechanism adapted to so coöperate with the other above-mentioned features of my invention as to secure a total registry of the number of fares collected or passengers carried, and, third, to so provide for the registration of a fare by one of the movements of a handle that the character of such fare registered will be determined by the amount of the movement imparted to such handle and that that fare only will be registered which stands for the maximum motion imparted to such handle.

In carrying out my invention I make use of mechanism shown so far as consistent only diagrammatically in the accompanying drawings, in which—

Figure 1 is a top view of my register and a portion of the actuating-rods R and R' thereof and with the top of the case A of the register removed. Fig. 2 shows a front view of the register with a portion of the front of the case removed and with the actuating-rods R and R' shown only in section. From this fig-

ure in order to avoid confusion some parts are omitted, but such parts are fully shown in operative relation in succeeding figures. Fig. 3 shows a plan view of the mechanism shown in Fig. 2 with all such mechanism seen above the dotted line  $z^4 z^5$  removed. Figs. 4, 5, and 6 illustrate details of the mechanism for communicating motion from the actuating-rods R and R' to the racks operating the internal mechanism of the register, as will be explained. Fig. 7 is a plan view of detached portions of my register, showing the mechanism for securing the indication of the total cash fare registered for any one fare. Fig. 8 shows details in the construction of the mechanism for actuating the total-passenger register and also parts of the total-indicating apparatus. Figs. 9, 10, and 11 illustrate details of such cash-indicating apparatus, as will be explained. Fig. 12 is a view from the right-hand side, Fig. 13 a view from the rear side, and Fig. 14 a top view, of the mechanism by means of which the registry of only that fare is secured standing for the maximum amount of one of the motions of the handle without the registration of any fares standing for a lesser amount of such motion. Figs. 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, and 28 illustrate details in the mechanism of the operating-handle and the means by which in registering any desired one of a large number of fares the movement of such handle receives the desired limitations. Fig. 26 shows in diagrammatic relation the several fares which may be registered by the operation of the operating-handle of that modification of my register shown in the other figures of drawings arranged in such a way as to show the relation between the amount and character of the motion of such handle in connection with the fare registered thereby. Fig. 27 is a repetition of Fig. 26 divided off into several squares, contained within which are seen the fares which may be registered by the use of six limiting-stops, four limiting-stops, two limiting-stops, or no limiting-stops, as will be explained. Fig. 29 is an enlarged top view, and Fig. 30 an enlarged end view, taken from the front side of the register, of the operating parts made use of to communicate the motion of either rod R or R' singly



or both of such rods together to the cash-fare indicating and registering mechanism. Figs. 31, 32, 33, and 34 are respectively enlarged end views, taken from the front side of the register, of the ratchet-wheels  $t^9, t^8, t^7$ , and  $t^6$ , the coöperating and hinged pawls  $p^{13}, p^{14}, p^{15}$ , and  $p^{16}$ , and the bars  $b^3, b^4, b^5$ , and  $b^6$ , which are made use of to register a fare corresponding to the maximum motion of the rod  $R'$  without registering any one of those fares corresponding to lesser motions of such rod. Fig. 35 is an enlarged end view from the rear of the register similar to Fig. 13 and shows the mechanism made use of to coöperate with the pawls  $p^{13}, p^{14}, p^{15}$ , and  $p^{16}$  to prevent the registry of a fare corresponding to a motion of the operating-rod  $R'$  less than the maximum motion imparted to such rod. Pawl  $p^{16}$  and bar  $b^6$  alone appear in this figure, as the other pawls and bars are concealed behind them. Fig. 36 is a top view of the parts shown in Fig. 35. Fig. 37 shows in enlarged top view similar to Fig. 7 all of the parts shown in Fig. 7 to the right of the supports  $j^9$  and  $j^{10}$  and to the left of the parts carried by shaft  $s^{19}$ . The spring  $f^5$  and gear  $g^8$ , as well as the portion of the shaft  $s^{19}$  carrying the same, are also shown. Fig. 38 is an enlarged sectional view similar to Fig. 9, taken through the center of shaft  $s^{21}$ , of all the parts carried by such shaft except gear  $g^{12}$ , which is removed. Fig. 39 is an enlarged detail view, taken from the front of the register, of the rack  $r^7$  and the short rack  $r^{11}$ , arranged to engage therewith. Fig. 40 is an enlarged detail view taken from the right-hand side of the register as seen in Fig. 1, showing the mechanism connecting the pawl  $p^6$  with the rack  $r^{11}$ , by means of which the rack  $r^{11}$  engages the rack  $r^7$  when the pawl  $p^6$  is raised in the manner and for the purpose to be explained. Fig. 41 is an enlarged detail view taken from the front of the register, showing the pawl  $p^6$  and spring  $f^8$  and the parts used to communicate motion from one to the other. Fig. 42 is an enlarged end view of the ratchet-wheel  $t^{12}$  as seen from the rear of the register. Fig. 43 is an enlarged end view of the hub  $c^{14}$  and the projection  $m$  thereon as seen from the front of the register. Fig. 44 is an enlarged view of the collar  $c'$  and sleeve projecting therefrom as seen from the rear of the register.

Similar letters refer to similar parts throughout the several views.

For the sake of clearness such a plan of lettering has been made use of that the ratchet-wheels are designated by the letters  $t^2$  to  $t^{12}$ , inclusive, the racks by the letters  $r'$  to  $r^{13}$ , inclusive, and the gears by the letters  $g'$  to  $g^{19}$ , inclusive. By employing such a system of lettering the illustration of teeth on these ratchet-wheels, racks, and gears has been dispensed with in some of the figures, but such teeth are shown where necessary to indicate the details of construction.

Refer to Figs. 1, 2, 3, 29, and 30. In con-

nection with the registering mechanism contained in the case A, I make use of two rods  $R$  and  $R'$ , rotatably supported by means of the brackets  $j^3$  and  $j^4$ , at any suitable height, preferably near one side of the car.

Refer now to Figs. 4, 5, and 6. Fig. 4 is a vertical sectional view through the center of the rod  $R$  of the disk  $c^{10}$  and the gear  $g^6$ . Fig. 5 is an end view of the disk  $c^{10}$ , and Fig. 6 is an end view of the gear  $g^6$  from the rear side of the register. On the rod  $R$  there are rigidly secured the disks  $c^{10}$  and  $c^{11}$  in the manner clearly indicated for the disk  $c^{10}$  in Figs. 4, 5, and 6 by means of the keyway  $x'$  in the rod  $R$  and the key  $w'$  forced therein. Each of these disks  $c^{10}$  and  $c^{11}$  carries a pin, as indicated at  $y'$  in Figs. 4 and 5, working in an opening in the gears  $g^6$  and  $g^7$ , as indicated in Fig. 4. These disks  $c^{10}$  and  $c^{11}$  are so assembled and secured upon the rod  $R$  in connection with the gears  $g^6$  and  $g^7$ , which are freely rotatable upon such rod, that a rotation of the rod  $R$  over to the right carries with it the gear  $g^6$ , but not the gear  $g^7$ , while a rotation of this rod  $R$  over to the left carries with it the gear  $g^7$ , but not the gear  $g^6$ . The conformation of these gears  $g^6$  and  $g^7$  relative to the disks  $c^{10}$  and  $c^{11}$ , respectively, is such, as will at once be seen by reference to Figs. 4, 5, and 6, that nearly a complete revolution of the rod  $R$  is possible in either direction without imparting any rotation to one of such gear. The gear  $g^7$  meshes with a rack  $r'$ , whereby the rotation of the rod  $R$  over to the left moves the rack  $r'$  to the left. This rack  $r'$  carries with it a rack-bar  $r^3$ , secured to which is seen a rack  $r^6$ , engaging a spur-gear  $g^5$  on the shaft  $s^7$ , to which gear  $g^5$  is rigidly secured the ratchet-wheel  $t^{11}$ . The gear  $g^5$  and ratchet-wheel  $t^{11}$  are freely revoluble on shaft  $s^7$ , to which is rigidly secured the spur-gear  $g^4$ . A spring-pawl  $p'$  admits of the return of rack  $r^6$  without the backward rotation of the shaft  $s^7$  and the spur-gear  $g^4$  thereon. This gear  $g^4$  engages a gear  $g^3$  on the shaft  $s^6$ , on which also is secured a gear  $g^2$ , engaging a gear  $g'$  on the shaft  $s^5$ , on which also there is secured the register-wheel  $d^5$ , carrying numerals "0," "1," "2," "3," "4," "5," "6," "7," "8," "9." This register-wheel  $d^5$  is the first one in a train of similar wheels  $d^4 d^3 d^2 d'$ , located, respectively, on shafts  $s^4 s^3 s^2 s'$ . The coöperation of these registering-wheels by means of suitable gear located on the same shafts with such register-wheels is substantially the same as that already well known in the art and by means of which a complete rotation of any one of such register-wheels results in just one-tenth of a rotation of the next succeeding register-wheel to the left. The angular movements over to the left, which may be imparted to the rod  $R$  by means of the operating mechanism yet to be described, are such that the motion thereby imparted to the system of register-wheels  $d^5 d^4 d^3 d^2 d'$  shall be sufficient to register twenty-five, fifty, seventy-five, or one hundred cents. Such



registering-wheels may record total-cash-fare receipts up to nine hundred and ninety-nine dollars and ninety-nine cents. The gear  $g^6$  is arranged to engage a rack  $r^2$ . This rack  $r^2$  carries at its left-hand end an upwardly-extending bar  $b^7$ , as indicated in Fig. 2, which in turn carries the horizontal member  $b^{10}$ , having slots therein which engage the two pins  $y$ , carried by the rack  $r'$ , as indicated in Figs. 1, 2, 29, and 30, whereby the rack  $r^2$  is capable of being moved horizontally for a short distance without carrying with it this rack  $r'$ . The amount of motion which may be imparted to this rack  $r^2$  independently of motion of the rack  $r'$  is just that amount which, if imparted to the rack  $r'$ , would effect the registry of twenty-two cents, whereby for any rotation of the rod  $R$  over to the left which would be sufficient to effect the registry of any sum exceeding twenty-two cents, an equal rotation of such rod  $R$  over to the right would effect the registry of a sum just twenty-two cents less than that effected by such rotation over to the left. The rack  $r'$  carries guide-plates  $h^1$  and  $h^2$ , through which are arranged to slide the upper ends of the bar  $b^2$  and combined guide and rack  $r^4$ , respectively, which are connected by the bar  $b'$ , arranged to move horizontally through the guide-piece  $h^7$ . This rack  $r'$  also carries the bars  $j^5$  and  $j^6$ , at the lower ends of which are formed, respectively, guides  $h^4$  and  $h^3$  for the lower ends of the combined guide and rack bar  $r^4$  and bar  $b^2$ , respectively. The rack formed on the combined guide and rack bar  $r^4$  is arranged, as indicated, to engage a spur-gear  $g^{19}$ , rotatably supported upon a stud carried by any suitable arm, as  $j'$ , projecting from the side of the rack  $r'$ . The upper end of the guide-bar  $h^7$  carries a rack  $r^5$ , supported by an arm  $h^5$  from the bracket  $j^4$  and engaging a spur-gear  $g^{16}$ , located on the rod  $R'$  and immediately behind the disk  $c'$ . (Seen in Fig. 2 in dotted lines and more clearly shown in Figs. 3, 29, and 30.) The construction of this disk  $c'$  and the gear  $g^{16}$  and the coöperation between such disk and gear are similar to that already described between the disk  $c^{10}$  and the spur-gear  $g^6$ , whereby it will be understood that the rod  $R'$  is capable of motion over to the left without imparting any rotary movement to the spur-gear  $g^{16}$ , while the rotation of the rod  $R'$  over to the right carries with it the spur-gear  $g^{16}$ , which in turn results in a downward movement of the rack  $r^5$ , carrying with it the guide-piece  $h^7$ , and thereby also the bar  $b'$ , and at the same time also the combined guide and rack bar  $r^4$  and bar  $b^2$ . The rack formed on the upper end of this combined guide and rack bar  $r^4$  engages the spur-gear  $g^{19}$ , which in turn engages a rack formed on the upper surface of the rack-bar  $r^3$  and results in a movement to the left of such rack-bar  $r^3$  relatively to rack  $r'$ , carrying with it the rack  $r^6$  and the bar  $b^9$ . The proportions of the gear  $g^{16}$  and  $g^{19}$  are such relative to the amount of angular movement over to the

right which may be imparted to the rod  $R'$  in the manner hereinafter to be explained that the rotation of such rod  $R'$  over to the right to any one of four predetermined points results in a movement of the rack  $r^6$  to such an extent as shall effect the registry of five, ten, fifteen, or twenty cents. The racks  $r'$ ,  $r^2$ , and  $r^5$  are normally returned to their neutral positions by means of suitable springs  $f^2$ ,  $f'$ , and  $f^3$ , respectively. We have then means provided by which the rotation of the rod  $R$  over to the left to any one of four predetermined points results in a registry of twenty-five, fifty, seventy-five, or one hundred cents, while the rotation of such rod  $R$  over to the right to any one of four predetermined points results in the registry of three, twenty-eight, fifty-three, or seventy-eight cents. The mechanism is such, as will at once be understood, that the result of the rotation of the rod  $R$  over to the left, in combination with a rotation of the rod  $R'$  over to the right, results in the registry of either twenty-five, fifty, seventy-five, or one hundred cents, and added thereto either five, ten, fifteen, or twenty cents. In a similar way also it will be understood that the rotation of the rod  $R$  over to the right, in connection with a rotation of the rod  $R'$  over to the right, results in the registry of three, twenty-eight, fifty-three, or seventy-eight cents, and added thereto either five, ten, fifteen, or twenty cents.

In the registry of any one of the above-mentioned fares it will be understood that the bar  $b^9$  is moved to the left by means of the mechanism already described an amount standing exactly for the amount of cash fare registered. Refer now to Figs. 2, 7, and 37. This bar  $b^9$  carries at its lower end a horizontally-disposed rack  $r^7$ , engaging a spur-gear  $g^{12}$ , revoluble on the fixed shaft  $s^{21}$ . This spur-gear  $g^{12}$  carries a pin coöperating with a similar pin on the collar  $c'$  in such a way that the rotation of the spur-gear  $g^{12}$  over to the left carries with it this collar  $c'$ , which is also freely revoluble upon the shaft  $s^{21}$ . In a similar way the rotation of this collar  $c'$  over to the left is communicated to a spur-gear  $g^{11}$ , also freely rotatable on shaft  $s^{21}$  and which meshes with and communicates motion to a spur-gear  $g^{10}$ , rigidly secured upon the shaft  $s^{20}$ . There is also rigidly secured on shaft  $s^{20}$  a spur-gear  $g^9$ , engaging still another spur-gear  $g^8$ , rigidly secured upon the shaft  $s^{19}$ . A spring  $f^5$  is so secured to the gear  $g^8$  as to tend to rotate such gear  $g^8$  over to the right, whereby this same spring  $f^5$  tends to rotate the spur-gear  $g^{11}$  over to the right by means of connections between such spring  $f^5$  and such gear  $g^{11}$ , consisting in the gears  $g^8$ ,  $g^9$ , and  $g^{10}$ . A spring  $f^7$ , connected to spur-gear  $g^{11}$ , and to the collar  $c'$ , tends to rotate the collar  $c'$  over to the right relatively to the spur-gear  $g^{11}$ . This spring  $f^7$  is not of sufficient strength to operate the gear  $g^{11}$  against the spring  $f^5$ .

Refer now to Figs. 9 and 38, which show in a



horizontal sectional view the shaft  $s^{21}$  and all the parts carried thereby except the spur-gear  $g^{12}$ . The collar  $c'$  carries a sleeve extending through the spur-gear  $g^{11}$ , and to this spur-gear  $g^{11}$  there is rigidly secured the ratchet-wheel  $t^{12}$ . In this ratchet-wheel  $t^{12}$ , as seen in Fig. 42, there is formed a slot  $n'$ , and in the end of the hub or sleeve formed on the collar  $c'$ , as seen in Fig. 44, there is also formed a slot  $n$ . A sleeve  $c^{14}$ , movable longitudinally upon the shaft  $s^{21}$ , carries a radially-extending projection  $m$ , as seen in Fig. 43, which is arranged to enter the slot  $n$  in the hub of the collar  $c'$  and the slot  $n'$ , formed in the ratchet-wheel  $t^{12}$ , when these slots  $n$  and  $n'$  register with each other. This registry between such slots  $n$  and  $n'$  occurs only when the collar  $c'$  and the spur-gear  $g^{11}$  are so disposed to each other angularly that the pin on the collar  $c'$  engages the cooperating pin on the spur-gear  $g^{11}$ . The projection  $m$  and the slot  $n$  are so proportioned that they are always in engagement whether such projection  $m$  and the slot  $n'$  are in engagement or not. The hub  $c^{14}$  terminates in the end toward the rear side of the register in a grooved collar  $c^{13}$ . A spring  $f^6$ , working at its rear end against the washer or collar  $c^{12}$ , tends to force this hub  $c^{14}$  out toward the front side of the register and thereby also the projection  $m$  on such hub  $c^{14}$  into the slots  $n$  and  $n'$  whenever a registry between such slots is brought about in the manner to be explained. The amount of longitudinal movement of this hub  $c^{14}$  upon the shaft  $s^{21}$  is such that when the projection  $m$  falls in the slots  $n$  and  $n'$  the larger portion of this hub  $c^{14}$  falls within the rear surface of the disk  $c^{15}$ .

A pawl  $p^6$ , pivoted at  $j^{32}$ , is arranged to engage the ratchet-wheel  $t^{12}$ . As indicated in Figs. 10 and 40 in a view from the right-hand side of the register, this pawl  $p^6$  is connected by a link  $i^{20}$  with a lever  $i^{15}$ , which is pivoted at  $j^{13}$  and carries at the end thereof, extending toward the front of the register, a rack  $r^{11}$ , which is the counterpart of the rack  $r^7$ . The cooperation of this pawl  $p^6$  and rack  $r^{11}$  is such, by reason of their connection with the lever  $i^{15}$ , that when the pawl  $p^6$  engages the ratchet-wheel  $t^{12}$  the rack  $r^{11}$  is not in engagement with the rack  $r^7$  to prevent a longitudinal movement of such rack  $r^7$ . It will of course be understood that this rack  $r^{11}$  is so supported by any suitable means (not shown) against longitudinal movement as to effectually obstruct any longitudinal movement of the rack  $r^7$ . A spring-bar  $f^8$ , which may receive any suitable support, as  $j^{33}$ , at its right-hand end, is arranged with a tendency to spring downward against the smaller portion of the hub  $c^{14}$  and also toward the front of the register. This spring  $f^8$ , as indicated in Fig. 11 in a view from the rear side of the register and also in Fig. 41, has a slot formed therein arranged to be engaged by a pin  $y^2$  at the lower end of an arm  $i^{15}$ , carried by this pawl  $p^6$ , whereby any downward motion of

the right-hand end of the pawl  $p^6$ , such as occurs when it is released from the ratchet  $t^{12}$ , results also in the moving of the spring  $f^8$  upward so far as to admit of its springing forward toward the front of the register and resting then on top of the larger portion of the hub  $c^{14}$  and against the disk  $c^{15}$ . The normal tendency of the spring  $f^8$  is to cause the pawl  $p^6$  to engage ratchet-wheel  $t^{12}$  and to disengage rack  $r^{11}$  from rack  $r^7$ . When the pawl  $p^6$  is free to be operated by the spring  $f^8$ , this spring  $f^8$  bears against hub  $c^{14}$  at its larger or smaller diameter, according to whether the hub  $c^{14}$  is toward the rear or the front of the register. The rack  $r^7$  carries a projection  $i^{18}$ , which engages the link  $i^{17}$ , articulating with the lever  $i^{16}$ , pivoted at  $j^{12}$ . This lever  $i^{16}$  articulates at its left-hand end with the link  $i^{13}$ , which by means of its connection with the right-hand end of the lever  $i^{12}$ , pivoted at  $j^{16}$ , communicates motion to such lever  $i^{12}$ , resulting in a longitudinal movement of the hub  $c^{14}$  upon the shaft  $s^{21}$ , because the left-hand end of the lever  $i^{12}$  engages the groove in the collar  $c^{13}$  on such hub  $c^{14}$ . It will be understood that this operation of the hub  $c^{14}$  does not in any way change the position of the pawl  $p^6$ , as the spring  $f^8$  is not lifted by such operation, but is forced toward the rear of the register.

Refer now to Figs. 2, 7, 8, and 37. The rod  $R$ , having supports at this point  $j^{17}$  and  $j^{18}$ , carries a sector of a disk  $D$ . A similar sector of a disk  $D'$  is seen on the rod  $R'$ , having similar supports, of which but one,  $j^{19}$ , is seen. In a point in the periphery of each of these sectors, directly under the center of their respective rods when such rods are in their neutral position, there is seen a notch engaged by the rollers  $i^{10}$  and  $i^{11}$ . These rollers  $i^{10}$  and  $i^{11}$  have bearings in and are connected by rod  $i^9$ , sliding vertically through fixed guides  $j^{20}$  and  $j^{21}$ . A rotation of either of the rods  $R$  or  $R'$ , it will be seen, results in a depression of the bar  $i^9$ , carrying with it the crank-arm  $i^8$ , secured upon the rock-shaft  $i^7$ , working in suitable fixed bearings  $j^9$  and  $j^{10}$ . This rock-shaft  $i^7$  carries on the end thereof toward the rear of the register a crank-arm  $i^6$ , whereby a rotation of this rock-shaft  $i^7$  communicates motion, by means of the connecting-link  $i^5$ , to the lever  $i^4$ , pivoted at  $j^8$  within the register-case  $A$ . This lever  $i^4$  articulates at its left-hand end with a sliding bar  $i'$ , held to the left and against the pin  $j^7$  by means of the spring  $f^4$ . The upper end of this bar  $i'$  terminates in a hook arranged to engage the pawl  $p^6$  and release the same from the ratchet-wheel  $t^{12}$  when by the rotation of either of the rods  $R$  or  $R'$  the bar  $i^9$  is depressed. The movement thus imparted to this sliding bar  $i'$  is sufficient to first release the spring-pawl  $p^6$  from its ratchet-wheel  $t^{12}$ , and afterward by the cooperation between the cam-surface  $i^3$  on this bar  $i'$  and the fixed pin  $j^7$  this bar  $i'$  is forced to the right at its upper end in such a way as



to release again this pawl  $p^6$ . The beveled surface at the upper end of this bar  $i'$  admits of the return of the bar  $i'$  to the position shown in Fig. 2 without affecting the position of the pawl  $p^6$ . This bar  $i'$  carries a connecting-link  $i^3$ , by means of which, in the manner indicated diagrammatically, the total-register B may be actuated. This total-register B, for the inspection of which the opening  $a^5$  is provided in the case A, as seen in Fig. 2, is actuated, as will be seen, every time that either one of the rods R or R' is rotated over to the right or over to the left. All the fares that may be registered by my register are registered by the rotation of one or both of such rods R and R' either to the right or to the left, whereby it will be seen that by the registry of any fare, whether resulting from the rotation of either one or both of such rods R and R', the total-register B is operated.

The operation of the mechanism already described, and illustrated in Figs. 7, 8, 9, 10, 11, 37, 38, 39, 40, 41, 42, 43, and 44, whereby the indicator-wheels  $d^{14}$ ,  $d^{15}$ , and  $d^{16}$  are caused to indicate any desired cash fare that may be registered and also to retain such indication until the beginning of the registry of the next fare, is as follows: Before any fare is registered or indicated by means of the mechanism already described the collar  $c'$  and the ratchet-wheel  $t^{12}$  are assumed to occupy such a position relatively that the notches  $n$  and  $n'$  form one continuous slot, and that the hub  $c^{14}$  is forced toward the front of the register by spring  $f^6$ , so that the larger part of the hub  $c^{14}$  is entirely within the washer  $c^{15}$ , and that spring  $f^8$  therefore rests on the smaller part of the hub  $c^{14}$ —that is, all of the parts are in the position shown in Figs. 7 and 37 except spring  $f^8$ , which rests against washer  $c^{15}$  and hub  $c^{14}$ , which is forced toward the front of the register by spring  $f^6$ . The projection  $i^{18}$  on the rack  $r^7$  is located thereon so as to lie a little to the right of the link  $i^{17}$ . In registering the first cash fare then the rack  $r^7$  is advanced to the left simultaneously with the rack  $r^6$ , in the manner already explained, by the rotation of the rod R over to the right or over to the left, or by the rotation of the rod R' over to the right, or by the rotation of the rod R over to the left or to the right in connection with a rotation of the rod R' over to the right, by means of mechanism yet to be explained. The rotation of either of such rods actuates the bar  $i^9$ , and by means of the lever  $i^8$ , rock-shaft  $i^7$ , arm  $i^6$ , link  $i^5$ , lever  $i^4$ , and bar  $i'$  the pawl  $p^6$  is momentarily released from ratchet-wheel  $t^{12}$  and is allowed to immediately reengage such ratchet-wheel  $t^{12}$ , because the hub  $c^{14}$  is at this time forced toward the front of the register with the projection  $m$  thereon in the notches  $n$  and  $n'$ , as such notches  $n$  and  $n'$  are in registry. Immediately after the pawl  $p^6$  has been released from the hook on the bar  $i'$  as the rack  $r^7$  is moved farther to the left the pro-

jection  $i^{18}$  thereon operates the link  $i^{17}$ , as already described, forcing the hub  $c^{14}$  toward the rear of the register; but as the slots  $n$  and  $n'$  still register when the projection  $i^{18}$  has passed the link  $i^{17}$  the hub  $c^{14}$  is again forced toward the front of the register by the spring  $f^6$ . However, at this time the operation of the hub  $c^{14}$  has in no way changed the operation of the other parts of the mechanism. The motion of the rack  $r^7$  to the left causes the rotation of the gear  $g^{12}$ , collar  $c'$ , gear  $g^{11}$ , and ratchet-wheel  $t^{12}$  thereon. The rotation of the gear  $g^{11}$  is communicated, as already indicated, through the gear  $g^{10}$   $g^9$   $g^8$  to the fare-indicator wheels  $d^{16}$   $d^{15}$   $d^{14}$ , carried by the shafts  $s^{19}$ ,  $s^{18}$ , and  $s^{17}$ , respectively. The pawl  $p^6$  engages the ratchet-wheel  $t^{12}$  and holds the same against backward movement at the completion of the registry and indication of the fare, and upon the return of the operating mechanism, yet to be explained, to its neutral position rack  $r^7$  moves to the right, carrying with it gear  $g^{12}$ ; but collar  $c'$  does not return with gear  $g^{12}$ , as it is held in engagement with ratchet-wheel  $t^{12}$  by the projection  $m$ . Just before the completion of the return movement of the rack  $r^7$  the projection  $i^{18}$  thereon operates the lever  $i^{16}$ , in the manner already clearly indicated and described, in such a way as to force the link  $i^{13}$  toward the front of the register, whereby the hub  $c^{14}$  is forced to the rear of the register by the operation of the lever  $i^{12}$ , which releases the collar  $c'$  from the ratchet-wheel  $t^{12}$ , and then the spring  $f^7$  operates to return the collar  $c'$  to its neutral position relatively to gear  $g^{12}$ , being the position shown in Figs. 7 and 37. At the completion of the return of rack  $r^7$  to its neutral position projection  $i^{18}$  has passed to the right of link  $i^{17}$ , so that as soon as the collar  $c'$  and ratchet-wheel  $t^{12}$  again register hub  $c^{14}$  may be moved toward the front of the register by spring  $f^6$  forcing the projection  $m$  into the notches  $n$  and  $n'$ . When rods R and R' both again occupy their neutral positions at the completion of the return of the operating mechanism from registering and indicating a fare, the rod  $i^9$ , operated by spring  $f^9$ , is moved upward, and hence, by means of the mechanism already described, rod  $i'$  is moved upward, operating the total-register B and also engaging once more pawl  $p^6$ , without, however, at all affecting the position of such pawl. At this time the pawl  $p^6$ , it will be noticed, is in engagement with the ratchet-wheel  $t^{12}$ , still holding the wheels  $d^{14}$ ,  $d^{15}$ , and  $d^{16}$ , so as to indicate the fare just registered. At the commencement of the registry of the next succeeding fare by the downward movement of the bar  $i'$  the pawl  $p^6$  is raised momentarily from the ratchet-wheel  $t^{12}$ , and as the collar  $c'$  and the ratchet-wheel  $t^{12}$  are not in such a position at this time that the slots  $n$  and  $n'$  register the hub  $c^{14}$  occupies such a position that as a result of the raising of the pawl  $p^6$  the spring  $f^8$  rests upon the larger portion of this hub  $c^{14}$ , and hence



the pawl  $p^6$  remains out of engagement with the ratchet-wheel  $t^{12}$ . It will be understood from the operation of the parts as already described, that at this time the rack  $r^{11}$  is brought into engagement with the rack  $r^7$ . The result of this is that the operating mechanism is prevented from further forward movement by the locking of the rack  $r^7$  and that the ratchet-wheel  $t^{12}$ , as well as the gear  $g^{11}$ ,  $g^{10}$ ,  $g^9$ , and  $g^8$ , under the influence of the spring  $f^5$ , are caused to return until the pins carried by the gear  $g^{11}$  and the collar  $c^7$  engage each other, at which time, as the slots  $n$  and  $n'$  register, the hub  $c^{14}$  is forced toward the front of the register by the spring  $f^6$ , which results in the spring  $f^8$  dropping from the larger to the smaller portion of the hub  $c^{14}$  and carrying with it the pawl  $p^6$ . This pawl  $p^6$  again engages the ratchet-wheel  $t^{12}$  and rack  $r^{11}$  releases rack  $r^7$ . All of this occurs before the projection  $i^{18}$  has moved far enough to the left to be opposite the link  $i^{17}$ . The result of this is to necessitate a return of the indicating mechanism nearly or quite to its neutral or zero position before any fare can be registered, and hence to necessitate the correct indication of any fare registered. After the rack  $r^7$  has been released from the rack  $r^{11}$  the projection  $i^{18}$  operates, by means of the link  $i^{17}$ , the lever  $i^{16}$  and the mechanism connected therewith to force the hub  $c^{14}$  toward the back of the register-case and against the spring  $f^6$ ; but since the collar  $c^7$  and the ratchet-wheel  $t^{12}$  are in such a position at this time that the slots  $n$  and  $n'$  register and since the spring  $f^8$  is upon the smaller portion of the hub  $c^{14}$  this movement of the hub  $c^{14}$  does not in any way affect the operation of the apparatus, and when the rack  $r^7$  has moved to the left, so that the projection  $i^{18}$  is at the left of link  $i^{17}$ , hub  $c^{14}$  again returns to its former position and rack  $r^7$  proceeds with the indicating of the second fare in precisely the same manner as the first fare. From this point the operation of the apparatus in registering and indicating the second fare is precisely the same as that in registering and indicating the first fare.

Refer now to Figs. 2, 3, 12, 13, 14, 31, 32, 33, 34, 35, and 36. Upon the rod  $R'$  are rigidly secured the series of ratchet-wheels  $t^6$   $t^7$   $t^8$   $t^9$ , each of which has only one tooth therein. Arranged to engage the one tooth in each of these ratchet-wheels, respectively, are seen the pawls  $p^{16}$   $p^{15}$   $p^{14}$   $p^{13}$ , hinged to the bars  $b^6$   $b^5$   $b^4$   $b^3$ , respectively. The collars  $c^4$   $c^5$   $c^6$   $c^7$   $c^8$  serve to separate these ratchet-wheels and at the same time to furnish suitable guides for these hinged pawls. Each of the bars  $b^6$   $b^5$   $b^4$   $b^3$  carries a spring-pawl, respectively,  $p^2$   $p^3$   $p^4$   $p^5$ , each arranged to engage a units-registering wheel upon a return of the operating-wheels. The pawl  $p^2$  is arranged to engage a ratchet-wheel  $t^2$ , which carries with it a units-registering wheel  $d^7$ , cooperating with a tens-wheel  $d^6$  to register fares of one kind. The pawl  $p^3$  engages the ratchet-wheel  $t^3$ , car-

rying a units-wheel  $d^9$ , cooperating with a tens-wheel  $d^8$ . The pawl  $p^4$  similarly engages a ratchet-wheel  $t^4$ , carrying a units-wheel  $d^{11}$ , cooperating with a tens-wheel  $d^{10}$ , while the pawl  $p^5$  engages a ratchet-wheel  $t^5$ , carrying a units-wheel  $d^{13}$ , cooperating with a tens-wheel  $d^{12}$ . These registering-wheels  $d^6$ ,  $d^7$ ,  $d^8$ ,  $d^9$ ,  $d^{10}$ ,  $d^{11}$ ,  $d^{12}$ , and  $d^{13}$  are carried by the shafts  $s^8$ ,  $s^9$ ,  $s^{10}$ ,  $s^{11}$ ,  $s^{12}$ ,  $s^{13}$ ,  $s^{14}$ , and  $s^{15}$ , respectively, as indicated. I have shown in the drawings only a units and tens wheel operated by each of the pawls just mentioned. In each series there might be added a wheel for hundreds and, if desired, for thousands. The teeth on the ratchet-wheels  $t^9$   $t^8$   $t^7$   $t^6$  are so disposed angularly relatively to each other, as indicated in dotted lines in end view from the rear side, as seen in Fig. 13, and as seen also in Figs. 31, 32, 33, and 34, that they form a continuous rack in which one after the other of the pawls  $p^{13}$   $p^{14}$   $p^{15}$   $p^{16}$ , respectively, may drop in the order named on the angular motion of the rod  $R'$  over to the left. To the rear of the collar  $c^4$  there is seen a gear  $g^{15}$ , the function of which will be explained later, and to the rear of that the collar  $c^3$ , carrying the toothed sector  $t^{10}$ . The teeth in this sector  $t^{10}$  engage the spring-pawl  $p^{17}$ , which by means of the spring  $f^{10}$  is held over to the right against the action of the teeth on this sector  $t^{10}$ . This pawl  $p^{17}$  is hinged to one end of the lever  $i^{26}$ , pivoted at  $j^{15}$  and articulating at its other end, as seen in Fig. 13, with the link  $i^{25}$ , working at its upper end in a suitable fixed guide  $h^8$ . The upper end of this link  $i^{25}$  is arranged to lift the lever  $i^{22}$ , pivoted at  $j^{14}$ , when by the action of the toothed sector  $t^{10}$  the lever  $i^{26}$  is forced downward. The construction, it will at once be seen, is such that there is only one point in the combined system of wheels  $t^9$   $t^8$   $t^7$   $t^6$  in which the pawl  $p^{13}$  may engage a tooth and only one point in which each of the other pawls  $p^{14}$   $p^{15}$   $p^{16}$  may engage a tooth. It will further be seen that a given angular motion of the rod  $R'$  over to the left, as seen in Figs. 2, 31, 32, 33, and 34, or over to the right, as seen in Figs. 13 and 35, will bring the pawl  $p^{13}$  into engagement with its corresponding tooth and that still further angular motions of such rod  $R'$  in the same direction increased by an equal amount will bring successively into engagement with its corresponding tooth each of the pawls  $p^{14}$   $p^{15}$   $p^{16}$ . Each of these pawls except  $p^{16}$  after having been brought into engagement with its corresponding tooth is raised up out of engagement, so as to lie upon the periphery of the corresponding one of the system of wheels  $t^9$   $t^8$   $t^7$   $t^6$ , when by the continued angular motion of this rod  $R'$  in the same direction the next pawl in the series is brought into engagement with its tooth. The lever  $i^{22}$  cooperates with the arm  $i^{23}$ , also pivoted upon the rod  $j^{14}$  to carry the rod  $i^{24}$ . The spring extension  $f^{11}$  of this lever  $i^{22}$  carries a pin  $y^3$ , which works in a circular slot  $i^{46}$  in the rear face of the collar  $c^3$ . This slot  $i^{46}$  in



this collar  $c^3$  terminates in a beveled portion at the upper and left-hand end thereof, as seen in Figs. 13 and 35, whereby the rotation of the rod  $R'$  over to the left, as seen in Fig. 2, or over to the right, as seen in rear view in Figs. 13 and 35, results in forcing this spring-arm  $f^{11}$  on the lever  $i^{22}$  toward the rear of the register. As seen in Figs. 13 and 35, this slot  $i^{46}$  at its upper left-hand end opens out to the periphery of the collar  $c^3$ . Starting, then, with the parts in the position indicated in Figs. 13, 31, 32, 33, 34, and 35, an angular motion of the rod  $R'$  over to the left, as indicated in Figs. 2, 31, 32, 33, and 34, or over to the right, as indicated in Figs. 13 and 35, which for the purpose of this explanation we will say is sufficient to result in the engagement of the pawl  $p^{16}$  with the notch in its corresponding ratchet-wheel  $t^6$ , whereby the bar  $b^6$  is operated, causing the operation of the register-wheels  $d^7$  and  $d^6$ , which in the drawings are arranged to register free rides. This angular motion of the rod  $R'$  results in a series of engagements between the spring-pawl  $p^{17}$  and the teeth on the sector  $t^{10}$ , forcing the upper end of this pawl  $p^{17}$  over to the left. After each of such actions the spring  $f^{10}$  returns the pawl  $p^{17}$  to the position indicated in Figs. 13 and 35. At the beginning of the motion of the collar  $c^3$  over to the right in Figs. 13 and 35 the beveled termination of the slot  $i^{46}$  forces the outer end of the spring  $f^{11}$  toward the rear of the register, so that the pin  $y^3$  rests against the side of this collar  $c^3$ . Then at the beginning of the return of this rod  $R'$  to the neutral point, carrying with it this collar  $c^3$  and causing such collar to move over to the left, the coöperation between the right-hand tooth (in the case assumed) of the sector  $t^{10}$  and the pawl  $p^{17}$  forces the left-hand end of the lever  $i^{26}$  downward, because this spring-pawl  $p^{17}$  cannot be moved to the right. This results in a lifting of the lever  $i^{22}$ , so that the pin  $y^3$  rests upon the outer periphery of the collar  $c^3$ . This action takes place only upon the completion of that amount of angular motion of the rod  $R'$  over to the left, as seen in Figs. 13 and 35, as shall stand for a movement of the bar  $b^6$  sufficient to advance the wheel  $d^7$  just one notch by means of the spring-pawl  $p^2$  engaging the ratchet-wheel  $t^2$ . At this time then the action of the lever  $i^{26}$  and the link  $i^{25}$  has forced the lever  $i^{22}$  upward, carrying with it the rod  $i^{24}$ , thus lifting all of the pawls  $p^{16}$   $p^{15}$   $p^{14}$   $p^{13}$  out of engagement, so that no one of such pawls, except the last one brought into engagement, can engage the tooth in its corresponding ratchet-wheel  $t^7$   $t^8$   $t^9$ , and the parts remain in this position until by the return of the rod  $R'$  to the neutral or starting point the pin  $y^3$  drops down through the opening  $i^{46}$  in the rear face of the collar  $c^3$ , at which time the parts again assume the position indicated in Figs. 13 and 35. Thus it will be seen that the angular motion of the rod  $R'$  over to the left and back again to its neutral position re-

sults in the operation of one and only one pair of register-wheels  $d^{13}$  and  $d^{12}$ ,  $d^{11}$  and  $d^{10}$ ,  $d^8$  and  $d^7$ , or  $d^7$  and  $d^6$  and that which pair is operated depends upon the amount of such angular motion of such rod  $R'$ . It will also be borne in mind that it is during the return of the rod  $R'$  to its starting-point the selected or desired pair of register-wheels is operated and that also during such return of the rod  $R'$  to its neutral position one and only one of such pair of register-wheels is operated, and that no matter to what extent the angular movement of the rod  $R'$  has been carried that fare only which stands for the maximum motion of such rod  $R'$  is registered and no one of the fares which would stand for a lesser motion of the rod  $R'$  can be registered.

It will of course be understood that suitable guides and supports for the racks  $r^6$ ,  $r^7$ , and  $r^8$ , as well as for the bars  $b^3$ ,  $b^4$ ,  $b^5$ , and  $b^6$ , are formed in the side of the register-case A. Where it is impracticable to show in detail the manner of supporting any part or member of the mechanism on account of confusion which would result from showing all of such supports, they are merely indicated diagrammatically.

It has thus far been explained, then, how that a motion of the rod  $R$  over to the right results in a registry of three, twenty-eight, fifty-three, or seventy-eight cents, and that if such motion of the rod  $R$  be over to the left the resulting registry will be of twenty-five, fifty, seventy-five, or one hundred cents, and that if the rod  $R'$  is moved over to the right it results in the registry of five, ten, fifteen, or twenty cents, according to the amount of motion of such rod, and that the combined rotation of the rod  $R$  over to the right or over to the left and the rotation of the rod  $R'$  over to the right results in the registry of three, twenty-eight, fifty-three, or seventy-eight cents and added thereto five, ten, fifteen, or twenty cents or in the registration of twenty-five, fifty, seventy-five, or one hundred cents and added thereto five, ten, fifteen, or twenty cents. The motion of the rod  $R'$  over to the left results in the registration of transfers by the register-wheels  $d^{12}$  and  $d^{13}$  and of tickets by the register-wheels  $d^{10}$  and  $d^{11}$  and of passes by the register-wheels  $d^8$  and  $d^9$  and of free rides by the register-wheels  $d^6$  and  $d^7$ .

Simultaneously with the registration of a cash fare the total fare collected is also indicated by the indicator-wheels  $d^{14}$ ,  $d^{15}$ , and  $d^{16}$ .

I will now explain how when a transfer, ticket, pass, or free ride is registered such registry is also indicated.

Refer to Figs. 1, 2, 3, 12, and 14. The rod  $R'$  carries, as already mentioned, gear  $g^{15}$ . This gear  $g^{15}$  engages rack  $r^{10}$ , which is connected by bar  $b^8$  with rack  $r^8$ , operating gear  $g^{13}$  on shaft  $s^{16}$ . A second gear  $g^{14}$  is also carried by this shaft  $s^{16}$ , which gear  $g^{14}$  engages rack  $r^9$ , rigidly connected to the indicator-tablet  $d^{17}$ , upon which the words "Transfer," "Ticket,"



"Pass," and "Free" are so arranged that, according to the height to which this tablet  $d^{17}$  is raised by rack  $r^9$  through the mechanism connected therewith, as already described, by the operation of gear  $g^{15}$ , one of such words will appear back of one of the corresponding openings  $a^4 a^3 a^2 a^1$  in the front of the register-case A. The gear  $g^{15}$  and the collar  $c^1$  are constructed in a manner similar to gear  $g^6$  and collar  $c^{10}$  (see in Figs. 4, 5, and 6) and for a similar purpose. Thus when rod  $R'$ , as seen in Fig. 2, is moved over to the right the gear  $g^{15}$  is not operated; but a motion of rod  $R'$  over to the left operates gear  $g^{15}$  and the mechanism connected therewith to indicate, as described, the fare registered by such movement of such rod  $R'$  over to the left. It only remains, then, now to explain how the desired rotary motion both in direction and degree is imparted to each of these rods  $R$  and  $R'$  to secure the above-mentioned results. For this purpose reference is made to Figs. 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, and 25, in which Fig. 15 is a view of the operating-tube  $R^2$  in its proper position relative to the rods  $R$  and  $R'$ , which are shown in sections. Fig. 16 is a plan view of the tube  $R^2$ , the rack  $r^{13}$ , and the connections between the same. Figs. 17 and 18 are side and top views, respectively, of that part of the stop-plate  $E$  which is below the dotted line  $z z'$  of Fig. 15. Figs. 19 and 20 are top and end views, respectively, of that part of the stop-plate  $E'$  which is below the dotted line  $z^2 z^3$  of Fig. 15. Fig. 21 shows the lower end of the operating-tube  $R^2$  with the handle  $H^2$  thereon, and Fig. 22 shows a plan view of such operating-tube  $R^2$  and the handle  $H^2$  thereon and also the handle  $H'$ . Fig. 23 is an enlarged sectional view of the lower end of the tube  $R^2$  and the handles  $H'$  and  $H^2$ , connected thereto. Figs. 24 and 25 are similar views of the tube  $R^2$  and the handle  $H'$ . Fig. 28, to which reference is also made, shows in perspective the lower end of the operating-tube  $R^2$  and the handles  $H'$  and  $H^2$  grasped by the hand of the operator in position to register a fare.

Referring to the several figures just mentioned, a vertically arranged and supported tube  $R^2$  is arranged to rotate freely in bearings  $j^{23}$ ,  $j^{24}$ , and  $j^{25}$ , formed on and extending to the left from the bracket  $H$ , as seen in Fig. 15, which bracket is arranged also to slide freely upon the operating-rods  $R$  and  $R'$  in such a way that such rods may also freely rotate in such bracket  $H$ . This tube  $R^2$  carries at its upper end a sliding and grooved collar  $c'$ , to which motion longitudinally upon this tube  $R^2$  and independently of longitudinal motion of such tube is communicated by means of the connecting-rod  $i^{38}$ , connected at its upper end to this collar  $c'$  by means of a pin extending through a slot in the side of this tube  $R^2$ , as seen more clearly in Figs. 23, 24, and 25. This connecting-rod  $i^{38}$  articulates at its lower end with a bell-crank lever

$i^{39}$ , supported from the tube  $H'$  by means of the projection  $j^{28}$ , and to the other arm of such bell-crank lever there is connected the link  $i^{40}$ . This link  $i^{40}$ , as indicated in Fig. 23, is connected to the lever  $i^{44}$ . Pivoted at  $j^{31}$  and arranged to operate this lever  $i^{44}$  are seen three buttons  $v'$ ,  $v^2$ , and  $v^3$ , with stems having varying lengths, whereby the depression of the buttons  $v'$ ,  $v^2$ , and  $v^3$  results in movements of the collar  $c'$  upon the rod  $R^2$  varying in amount exactly according with the lengths of the stems on such buttons. A spring  $f^{13}$  is arranged, as seen in Fig. 23, to hold the parts in the several positions indicated in such figure. Two collars  $c^{16}$  and  $c^{17}$  are secured upon this tube  $R^2$ , as indicated in Fig. 15, and between them there is supported a loose collar  $c^{21}$ , carrying a stud  $i^{28}$  upon which there is arranged to slide freely a tubular bolt  $i^{29}$ . This tubular bolt  $i^{29}$  is connected at one end to the bell-crank lever  $i^{27}$ , the other arm of which is arranged to engage the groove in the collar  $c'$ . This bell-crank lever  $i^{27}$  is pivoted upon the arm  $j^{22}$ , carried by the collar  $c^{21}$ . The tube  $R^2$  is arranged to rotate freely within this collar  $c^{21}$ . An upward or downward motion of this grooved collar  $c'$  upon the tube  $R^2$  results in a longitudinal movement of this bolt  $i^{29}$  varying in amount according to which of the buttons  $v'$ ,  $v^2$ , or  $v^3$  is depressed. This bolt  $i^{29}$  works in a vertical groove in the stop-plate  $E$  in such a way as to admit of a vertical movement being imparted to this tube  $R^2$  varying in amount according to the depth to which this tubular bolt extends within the slot in this stop-plate  $E$ . The groove in this stop-plate  $E$  is arranged in steps, as indicated in dotted lines, whereby when the tubular bolt  $i^{29}$  occupies the position shown in Fig. 15 a slight vertical movement either up or down is permissible for this tube  $R^2$ . The amount of such motion up or down is increased by depressing the button  $v'$ , and such motion may be still further increased by depressing the button  $v^2$  and again still further increased by depressing the button  $v^3$ . Hence we have four degrees of motion permissible in a vertical direction either up or down for this tube  $R^2$ , according as no button or as the button  $v'$  or  $v^2$  or  $v^3$  is depressed. Refer now again to Fig. 15. Secured upon this tube  $R^2$  is seen the grooved collar  $c^2$ . A rack  $r^{12}$  is arranged to slide vertically in suitable bearings in the bracket  $j^{23}$  and also in the bracket  $j^{26}$ , each of which brackets is formed upon the plate  $H$ . This rack  $r^{12}$  engages a spur-gear  $g^{17}$ , splined upon the rod  $R$ . This gear  $g^{17}$  works in a suitable opening therefor in this plate  $H$ , whereby the motion of this plate  $H$  longitudinally on the rods  $R$  and  $R'$  carries with it this gear  $g^{17}$ , which being splined upon the rod  $R$  is arranged to impart rotary motion to such rod at any and all points longitudinally of such rod. Extending to the left from this rack  $r^{12}$  is seen an arm  $i^{30}$ , arranged to engage the groove in the collar



$c^2$ , whereby a vertical movement of the tube  $R^2$  causes a rotary motion of the rod  $R$ . The amount of such rotary motion in either direction which may be imparted to the rod  $R$  depends, as will at once be understood, upon whether no button or the button  $v^1$  or the button  $v^2$  or the button  $v^3$  is depressed. Upon the rod  $R'$  there is splined a gear  $g^{18}$ , which is arranged to slide freely upon such rod  $R'$  longitudinally thereof and also to revolve in a suitable opening therefor in the lower end of this plate  $H$ . At the lower end of this plate  $H$  are seen bearings in the brackets  $j^{27}$  and  $j^{25}$ , through which a rack  $r^{13}$ , engaging this spur-gear  $g^{18}$ , is arranged to slide freely back and forth in a direction transverse to the rod  $R'$ . This rack  $r^{13}$  is arranged to be operated to the right or to the left by the rotation of the tube  $R^2$  by means of the combined collar and arm  $i^{34}$ , splined upon the tube  $R^2$  and articulating with a connecting-rod  $i^{33}$ , connected to such rack  $r^{13}$  by means of pin  $i^{32}$ , whereby a rotary motion of such tube  $R^2$  communicates a rotary motion to the rod  $R'$ , as seen more clearly in Fig. 16.

Refer now to Figs. 23, 24, and 25. A small shaft  $i^{35}$  is arranged to rotate in bearings  $j^{29}$  and  $j^{30}$  in the horizontally-disposed tubular handle-piece  $H'$  at the lower end of the tube  $R^2$ . Upon this shaft  $i^{35}$  are rigidly-secured arms  $i^{41}$ ,  $i^{42}$ , and  $i^{43}$ , against which the stems on the buttons  $v^4$ ,  $v^5$ , and  $v^6$ , respectively, are arranged to bear. These buttons  $v^4$ ,  $v^5$ , and  $v^6$  have stems of varying lengths, whereby the depression of the button  $v^4$  imparts a rotary motion to the small shaft  $i^{35}$  and the depression of the button  $v^5$  imparts a greater rotary motion to such shaft  $i^{35}$  and the depression of the button  $v^6$  imparts still greater motion to such shaft  $i^{35}$ . The end of this shaft  $i^{35}$  coming just under the vertically-disposed tube  $R^2$  carries an arm  $i^{36}$ , articulating with the lower end of the link  $i^{37}$ , the upper end of which, as seen in Fig. 24, is connected through a slot in this tube  $R^2$  with the collar  $c^{20}$ , whereby this collar  $c^{20}$  may be moved longitudinally on the tube  $R^2$  different amounts, according as the button  $v^4$ ,  $v^5$ , or  $v^6$  is pressed upon. A spring  $f^{12}$  is arranged, as seen in Fig. 25, to normally hold the parts operated by the buttons  $v^4$ ,  $v^5$ , and  $v^6$ , as well as such buttons in the position indicated in Figs. 15, 23, 24, and 25.

Rigidly secured upon the tube  $R^2$ , as seen in Fig. 15, are two collars  $c^{18}$  and  $c^{19}$ , between which are secured the stop-plate  $E'$ . Through the arms on this stop-plate  $E'$  the tube  $R^2$  is arranged to rotate freely. A suitable pin  $i^{31}$  is arranged to support this stop-plate  $E'$  against rotary movement, while permitting of a vertical movement of such stop-plate  $E'$  with the tube  $R^2$ . The interior cylindrical surface of this stop-plate  $E'$  is cut out in such a way, as indicated in Figs. 19 and 20, as to admit of a rotary movement being imparted to the stud  $i^{47}$  and the collar  $c^{20}$ , carrying such

stud and arranged to rotate with this tube  $R^2$ , varying in amount according to the vertical position of such stud  $i^{47}$  relatively to this stop-plate  $E'$ —that is, with no one of the buttons  $v^4$ ,  $v^5$ , or  $v^6$  depressed the rod  $R^2$  may be rotated slightly in either direction. With the button  $v^4$  depressed the amount of such rotary movement which may be imparted to the rod  $R^2$  is increased. Such possible rotary motion of such rod  $R^2$  is still further increased by the depression of the button  $v^5$  and still further again by the depression of the button  $v^6$ . It will be borne in mind that as the stop-plate  $E'$  is raised and lowered with the tube  $R^2$  the amount of rotary motion which may be imparted to this tube  $R^2$  varies; according as no one or which one of the buttons  $v^4$ ,  $v^5$ , or  $v^6$  is depressed, and that, too, regardless of at what point in its vertical movement such tube  $R^2$  may be.

I have then clearly described and explained means whereby any one of four different amounts of rotary motion in either direction for the tube  $R^2$  may be secured and similarly, also, means whereby any desired one of four amounts of vertical motion in either direction up or down for such tube  $R^2$  may be secured. The rotary movements of this tube  $R^2$  result in a rotary motion of the rod  $R'$ . The vertical movements of this tube  $R^2$  result in a rotary motion of the rod  $R$ . The several parts of my register are so proportioned relatively to each other that the several degrees of motion of the several kinds which may be imparted to this rod  $R^2$ , as already described, are such as to secure the operation of the several parts of my register, as already explained, resulting in the registry and indication of the several cash fares above indicated and of the transfers, tickets, passes, and free rides.

I will now describe the several operations of the handle necessary to secure the registry and of course the corresponding indication of the several fares which may be registered, as indicated in Figs. 21 and 22.

Simply pushing the handle up without pressing a button registers a three-cent fare. Similarly pushing the handle up and pressing the button  $v^1$ ,  $v^2$ , or  $v^3$  registers a twenty-eight, fifty-three, or seventy-eight cent fare. Thus pushing the handle up secures an operation of the register-wheels sufficient to register a three-cent fare, and the amount of such registry is increased by twenty-five or by fifty or by seventy-five cents, according as the button  $v^1$ ,  $v^2$ , or  $v^3$  is pressed upon. Rotating the handle over to the left without pressing any button registers a five-cent fare, and the amount of such fare is increased by five cents, ten cents, or fifteen cents, according as the button  $v^4$ ,  $v^5$ , or  $v^6$  is pressed upon. Hence the combination of the movements of different amounts to suit the different fares to be registered results in the registry of any one of the following fares: eight, thirteen, eighteen, twenty-three, thirty-three, thirty-eight,



forty - three, forty - eight, fifty - eight, sixty - three, sixty - eight, seventy - three, eighty - eight, ninety - three, or ninety - eight cents. Pulling the handle down registers twenty-five cents, and by pressing the button  $v'$ ,  $v^2$ , or  $v^3$  the amount of such registry may be increased by twenty-five, fifty, or seventy-five cents. The combination of the different movements of such handle downward with the rotation thereof over to the left results in the registry of any one of the following fares: thirty, thirty-five, forty, forty-five, fifty-five, sixty, sixty-five, seventy, eighty, ninety, ninety-five, one hundred and five, one hundred and ten, one hundred and fifteen, or one hundred and twenty cents. Hence by the rotation of such handle to the left and the movement of it up or down or by the combination of such movement to the left and either up or down we may register any one of the cash-fares indicated in Fig. 26. By rotating the handle to the right without depressing any one of the buttons  $v^4$ ,  $v^5$ , and  $v^6$  registry of a transfer is effected, while a ticket, pass, or a free ride may be registered by the rotation of such handle to the right and the depression of the button  $v^4$ ,  $v^5$ , or  $v^6$ , respectively.

Refer now to Fig. 27. Square 4 contains all of the fares which may be registered by my register using the arrangement herein described and all of the buttons  $v'$ ,  $v^2$ ,  $v^3$ ,  $v^4$ ,  $v^5$ , and  $v^6$ , while by the omission of buttons  $v^3$  and  $v^6$  only those fares can be registered which are contained within square 3. Similarly by the omission of buttons  $v^2$  and  $v^3$  and  $v^5$  and  $v^6$  only those fares can be registered which are contained in square 2, and by the omission of all of the buttons  $v'$ ,  $v^2$ ,  $v^3$ ,  $v^4$ ,  $v^5$ ,  $v^6$  only those fares contained within square 1 can be registered.

The fares which are to be registered will of course modify the arrangements and relations of the several parts of my register and its operating devices, and hence also modifications in the relations which the several fares bear to the different motions of the operating-handle and also of the rods R and R'.

In registering a fare by my register the operator or conductor grasps the handle in the manner indicated in Fig. 28 and presses on one or one or more of the buttons  $v'$ ,  $v^2$ ,  $v^3$ ,  $v^4$ ,  $v^5$ ,  $v^6$  and imparts to the handle a rotary motion or a vertical motion, either one alone or both together, such as is calculated to effect the registry of the desired fare in the manner already fully described, and clearly indicated, also, diagrammatically in Figs. 26 and 27.

Attention is called to the fact that in the registration of a fare by my register the operating-handle may be moved either in one direction alone or successively in two directions, or in a direction which is the resultant of two adjacent directions, and that when the handle is moved in a resultant direction the same fare is registered which would be

registered by the motion of such handle in each of such directions represented by such resultant successively and without the return of such handle to its neutral or central position between such motions.

What I claim is—

1. In a register, a tube or rod arranged to receive primary motions both longitudinal and rotary, and means whereby each of the different motions imparted such rod effects a different registry.

2. In a register, a tube or rod arranged to receive primary motions both longitudinal and rotary, means whereby each of the different motions imparted to such rod effects a different registry, and means whereby one of such motions of such rod in one direction followed by another motion of such rod in a different direction, not opposite to the direction of such first motion and without the return of such rod to its neutral position between such motions, effects a registry the value of which is the sum of the registries which would be effected by each of such primary motions taken singly.

3. In a register, a tube or rod arranged to receive primary motions both longitudinal and rotary, means whereby each of the different motions imparted to such rod effects a different registry, with the registry effected by the motion of such rod in one of such primary directions independent of and different in character from those effected by the motion of such rod in other directions.

4. In a register, a tube or rod arranged to receive primary motions both longitudinal and rotary, means whereby each of the different motions imparted to such rod effects a different registry, and means whereby a motion of such rod in one of such directions may be effected independently of any operation whatever upon the apparatus in the register arranged to be operated by a motion of such rod in other directions.

5. In a register, a tube or rod arranged to receive primary motions both longitudinal and rotary, means whereby each of the different motions imparted to such rod effects a different registry, and means whereby a motion of such rod which is the resultant of two of such primary motions not opposed to each other effects a registry the value which is the sum of those registries which would be effected by each of such primary motions of such rod represented by such resultant.

6. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, and two or more different amounts of one of such motions, and means whereby each of the different motions imparted to such handle effects a different registry.

7. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means whereby each of the different motions



imparted to such handle effects a different registry, and means whereby one of such motions of such handle in one direction followed by another motion of such handle in a different direction, not opposite to the direction of such first motion and without the return of such handle to its neutral position between such motions, effects a registry the value of which is the sum of the registries which would be effected by each of such primary motions taken singly.

8. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, and two or more different amounts of one of such motions, means whereby each of the different motions imparted to such handle effects a different registry, with the registry effected by the motion of such handle in one of such primary directions independent of and different in character from those effected by the motion of such handle in other directions.

9. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, and two or more different amounts of one of such motions, means whereby each of the different motions imparted to such handle effects a different registry, and means whereby a motion of such handle in one of such directions may be effected independently of any operation whatever upon the apparatus in the register arranged to be operated by a motion of such handle in other directions.

10. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means whereby each of the different motions imparted to such handle effects a different registry, and means whereby a motion of such handle which is the resultant of two of such primary motions not opposed to each other effects a registry the value of which is the sum of those registries which would be effected by each of such primary motions of such handle represented by such resultant.

11. In a register, a tube or rod arranged to receive primary motions both longitudinal and rotary, means for limiting one or more of such motions of such rod to two or more different amounts, and means whereby each different amount of one or more of such primary motions effects a different registry.

12. In a register, a tube or rod arranged to receive primary motions both longitudinal and rotary, means for limiting one or more of such motions of such rod to two or more different amounts, means whereby each different amount of one or more of such primary motions effects a different registry, and means whereby one of such motions of such rod in one direction followed by another one of such motions of such rod in a different direction, not opposite to the direction of such first motion and without the return of such rod to its neutral position between such motions, effects a registry the value of which is the sum

of the registries which would be effected by each of such primary movements taken singly.

13. In a register, a tube or rod arranged to receive primary motions both longitudinal and rotary and arranged also to receive one of such motions in opposite directions from its neutral or central position, means whereby each different amount of one or more of such primary motions effects a different registry, and means whereby one of the motions of such rod in one direction followed by a motion of such rod in an adjacent primary direction and without the return of such rod to its neutral position between such motions, effects a registry the value of which is the sum of the registries which would be effected by each of such primary movements taken singly.

14. In a register, a tube or rod arranged to receive primary motions both longitudinal and rotary, means for limiting one or more of such motions of such rod to two or more different amounts, means whereby each different amount of one or more of such primary motions effects a different registry, with one or more of the registries effected by the different motions of such rod in one of such primary directions independent of and different in character from those effected by the different motions of such rod in any other of such primary directions.

15. In a register, a tube or rod arranged to receive primary motions both longitudinal and rotary, means for limiting one or more of such motions of such rod to two or more different amounts, means whereby each different amount of one or more of such primary motions effects a different registry, with one or more of the registries effected by the different motions of such rod in one of such primary directions independent of and different in character from the other registries effected by the other different motions of such rod in the same direction.

16. In a register, a tube or rod arranged to receive primary motions both longitudinal and rotary, means for limiting one or more of such motions of such rod to two or more different amounts, means whereby each different amount of one or more of such primary motions effects a different registry, with one or more of the registries effected by such motions of such rod in one direction independent of and different in character from the other registries effected by such motions of such rod in any other directions or by any other one of such motions of such rod in the same direction.

17. In a register, a tube or rod arranged to receive primary motions both longitudinal and rotary, means for limiting one or more of such motions of such rod to two or more different amounts, and means whereby one or more of such motions of such rod in one of such directions may be effected independently of any operation whatever upon the apparatus in the register arranged to be oper-



ated by any of the other motions of such rod in either of such other directions.

18. In a register, a tube or rod arranged to receive primary motions both longitudinal  
5 and rotary, means for limiting one or more of such motions of such rod to two or more different amounts, and means whereby one or more of such motions of such rod in one of such directions may be effected independ-  
10 ently of any operation whatever upon the apparatus in the register arranged to be operated by any of the other motions of such rod in the same direction.

19. In a register, a tube or rod arranged to  
15 receive primary motions both longitudinal and rotary, means for limiting one or more of such motions of such rod to two or more different amounts, means whereby each different amount of one or more of such primary  
20 motion effects a different registry, and means whereby a motion of such rod which is the resultant of two of such primary motions of such rod, in directions not opposed to each other, effects a registry the value of which is  
25 the sum of those registries which would be effected by each of such primary motions of such rod represented by such resultant motion.

20. In a register, a tube or rod arranged to  
30 receive primary motions both longitudinal and rotary and arranged also to receive one of such motions in opposite directions from its neutral or central position, means whereby each different amount of one or more of  
35 such primary motions effects a different registry, means whereby a motion of such rod in a direction which is the resultant of two of such primary motions of such rod not opposed to each other effects a registry the value of  
40 which is the sum of those registries which would be effected by the primary motions of such rod represented by such resultant motion.

21. In a register, a tube or rod arranged to  
45 receive primary motions both longitudinal and rotary, means for imparting to such rod motion in one or more of such directions to two or more predetermined points, and means whereby each different amount of one or more  
50 of such primary motions effects a different registry.

22. In a register, a tube or rod arranged to receive primary motions both longitudinal and rotary, means for imparting to such rod  
55 motion in one or more of such directions to two or more predetermined points, means whereby each different amount of one or more of such primary motions effects a different registry, and means whereby one of such motions of such rod in one direction followed by another motion of such rod in a different direction, not opposite to the direction of such first motion and without the return of such rod to its neutral position between such motions effects a registry the value of which is  
65 the sum of the registries which would be ef-

fectured by each of such primary movements taken singly.

23. In a register, a tube or rod arranged to receive primary motions both longitudinal  
70 and rotary, means for imparting to such rod motion in one or more of such directions to two or more predetermined points, means whereby each different amount of one or more of such primary motions effects a different  
75 registry, with one or more of the registries effected by the different motions of such rod in one of such primary directions independent of and different in character from those effected by the different motions of such rod  
80 in any other of such primary directions.

24. In a register, a tube or rod arranged to receive primary motions both longitudinal and rotary, means for imparting to such rod motion in one or more of such directions to  
85 two or more predetermined points, means whereby each different amount of one or more of such primary motions effects a different registry, with one or more of the registries effected by the different motions of such rod  
90 in one of such primary directions independent of and different in character from the other registries effected by the different motions of such rod in the same direction.

25. In a register, a tube or rod arranged to  
95 receive primary motions both longitudinal and rotary, means for imparting to such rod motion in one or more of such directions to two or more predetermined points, means whereby each different amount of one or more  
100 of such primary motions effects a different registry, with one or more of the registries effected by such motions of such rod in one direction independent of and different in character from the other registries effected  
105 by such motions of such rod in any other directions or by any other one of such motions of such rod in the same direction.

26. In a register, a tube or rod arranged to receive primary motions both longitudinal  
110 and rotary, means for imparting to such rod motion in one or more of such directions to two or more predetermined points, and means whereby one or more of such motions of such rod in one of such directions may be effected  
115 independently of any operation whatever upon the apparatus in the register arranged to be operated by any of the other motions of such rod in either of such other directions.

27. In a register, a tube or rod arranged to  
120 receive primary motions both longitudinal and rotary, means for imparting to such rod motion in one or more of such directions to two or more predetermined points, and means whereby one or more of such motions of such  
125 rod in one of such directions may be effected independently of any operation whatever upon the apparatus in the register arranged to be operated by any of the other motions of such rod in the same direction.

28. In a register, a tube or rod arranged to receive primary motions both longitudinal  
130



and rotary, means for imparting to such rod motion in one or more of such directions to two or more predetermined points, means whereby each different amount of one or more of such primary motions effects a different registry, and means whereby a motion of such rod which is the resultant of two of such primary motions of such rod, in directions not opposed to each other, effects a registry the value of which is the sum of those registries which would be effected by each of such primary motions of such rod represented by such resultant motion.

29. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means for giving two or more limitations to the movements of such handle in one or more of such directions, and means whereby each different amount of one or more of such primary motions effects a different registry.

30. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means for giving two or more limitations to the movements of such handle in one or more of such directions, means whereby each different amount of one or more of such primary motions effects a different registry, and means whereby one of such movements of such handle in one direction followed by another one of such movements of such handle in a different direction not opposite to the direction of such first motion, and without the return of such handle to its neutral position between such motions, effects a registry the value of which is the sum of the registries which would be effected by each of such primary movements of such handle taken singly.

31. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, and arranged also to receive such motions in opposite directions from its neutral or central position, means whereby each different amount of one or more of such primary motions effects a different registry, and means whereby one of the motions of such handle in one direction followed by a motion of such handle in an adjacent primary direction effects a registry the value of which is the sum of the registries which would be effected by each of such primary motions of such handle taken singly.

32. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means for giving two or more limitations to the movements of such handle in one or more of such directions, means whereby each different amount of one or more of such primary motions effects a different registry, with one or more of the registries effected by the different motions of such handle in one of such primary directions independent of and different in character from those effected by the different motions of such handle in any other of such primary directions.

33. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means for giving two or more limitations to the movements of such handle in one or more of such directions, means whereby each different amount of one or more of such primary motions effects a different registry, with one or more of the registries effected by the different motions of such handle in one of such primary directions independent of and differing in kind from the other registries effected by the different motions of such handle in the same direction.

34. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means for giving two or more limitations to the movements of such handle in one or more of such directions, means whereby each different amount of one or more of such primary motions effects a different registry, with one or more of the registries effected by such motions of such handle in one direction independent of and different in character from the registries effected by such motions of such handle in any other direction or by any other motions of such handle in the same direction.

35. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means for giving two or more limitations to the movements of such handle in one or more of such directions, and means whereby one or more of such motions of such handle in one of such directions may be effected independently of any operation whatever upon the apparatus in the register arranged to be operated by any of the other motions of such handle in either of such other directions.

36. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means for giving two or more limitations to the movements of such handle in one or more of such directions, and means whereby one or more of such motions of such handle in one of such directions may be effected independently of any operation whatever upon the apparatus in the register arranged to be operated by any of the other motions of such handle in the same direction.

37. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means for giving two or more limitations to the movements of such handle in one or more of such directions, means whereby each different amount of one or more of such primary motions effects a different registry, and means whereby a motion of such handle which is the resultant of two of such movements of such handle in two different directions not opposed to each other effects a registry the value of which is the sum of those registries which would be effected by each of such primary



movements of such handle represented by such resultant motion.

38. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds and arranged also to receive such motions in opposite directions from its neutral or central position, means whereby each different amount of one or more of such primary motions effects a different registry, and means whereby a motion of such handle in a direction which is the resultant of two of such primary motions of such handle not opposed to each other effects a registry the value of which is the sum of those registries which would be effected by the motions of such handle in each of such adjacent directions represented by such resultant.

39. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means for indicating a motion of such handle in one or more of such directions to two or more predetermined points, and means whereby each different amount of one or more of such primary motions effects a different registry.

40. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means for indicating a motion of such handle in one or more of such directions to two or more predetermined points, means whereby each different amount of one or more of such primary motions effects a different registry, and means whereby one of such movements of such handle in one direction followed by another one of such movements of such handle in a different direction not opposite to the direction of such first motion, and without the return of such handle to its neutral position between such motions, effects a registry the value of which is the sum of the registries which would be effected by each of such primary movements of such handle taken singly.

41. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means for indicating a motion of such handle in one or more of such directions to two or more predetermined points, means whereby each different amount of one or more of such primary motions effects a different registry, with one or more of the registries effected by the different motions of such handle in one of such primary directions independent of and different in character from those effected by the different motions of such handle in any other of such primary directions.

42. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means for indicating a motion of such handle in one or more of such directions to two or more predetermined points, and means whereby each different amount of one or more of such primary motions effects a different registry, with one or more of the registries effected by the

different motions of such handle in one of such primary directions independent of and differing in kind from the other registries effected by different motions of such handle in the same direction.

43. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means for indicating a motion of such handle in one or more of such directions to two or more predetermined points, means whereby each different amount of one or more of such primary motions effects a different registry, with one or more of the registries effected by such motions of such handle in one direction independent of and different in character from the registries effected by such motions of such handle in any other directions or by any other motions of such handle in the same direction.

44. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means for indicating a motion of such handle in one or more of such directions to two or more predetermined points, and means whereby one or more of such motions of such handle in one of such directions may be effected independently of any operation whatever upon the apparatus in the register arranged to be operated by any of the other motions of such handle in either of such other directions.

45. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means for indicating a motion of such handle in one or more of such directions to two or more predetermined points, and means whereby one or more of such motions of such handle in one of such directions may be effected independently of any operation whatever upon the apparatus in the register arranged to be operated by any of the other motions of such handle in the same direction.

46. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means for indicating a motion of such handle in one or more of such directions to two or more predetermined points, means whereby each different amount of one or more of such primary motions effects a different registry, and means whereby a motion of such handle which is the resultant of two of such movements of such handle in two different directions not opposed to each other effects a registry the value of which is the sum of those registries which would be effected by each of such primary movements of such handle represented by such resultant motion.

47. Two or more registering mechanisms, an operating device and connections between such operating device and each of such registering mechanisms whereby each one individually of such registering mechanisms is operated by a motion of such device different in amount from, but of the same kind or in the same direction as, that required to operate



any other of such registering mechanisms, and means whereby, for each predetermined different amount of motion of such device, only that registering mechanism corresponding to such predetermined amount of such motion is operated.

48. Two or more registering mechanisms, an operating device, means whereby each of the motions, in the same direction or of the same kind, of such operating device, to any one of two or more predetermined points, establishes an operative relation between mechanism under the control of such operating device and a corresponding one of such registering mechanisms, and means whereby the return of such operating device to its neutral position actuates the selected registering mechanism.

49. Two or more registering mechanisms, an operating device and connections between such operating device and each of such registering mechanisms, whereby each one individually of such registering mechanisms may be operated by a movement of such operating device and the return thereof to its neutral position different in amount from, but of the same kind or in the same direction as, that required to operate any other one of such registering mechanisms, and means whereby, for each predetermined different amount of motion of such operating device, only that registering mechanism corresponding to such predetermined amount of such motion is operated.

50. In a register, two operating-rods each arranged to actuate the mechanism of such register, and means whereby two or more different amounts of motion imparted to one of such rods effect correspondingly different registries.

51. In a register, two operating-rods each arranged to actuate the mechanism of such register, means whereby two or more different amounts of motion imparted to one of such rods effect correspondingly different registries, and means whereby a motion imparted to one of such rods and, before the return thereof to its neutral position, a motion imparted to the other one of such rods, effects a registry whose value is the sum of those registries which would be effected by the same motions of such rods taken singly.

52. In a register, two operating-rods each arranged to actuate the mechanism of such register, and means whereby two or more different amounts of motion imparted to each of such rods effect correspondingly different registries.

53. In a register, two operating-rods each arranged to actuate the mechanism of such register, means whereby two or more different amounts of motion imparted to each of such rods effect correspondingly different registries, and means whereby a motion imparted to one of such rods and, before the return thereof to its neutral position, a motion imparted to the other one of such rods, effects a

registry whose value is the sum of those registries which would be effected by the same motions of such rods taken singly.

54. In a register, a tube or rod arranged to receive primary motions both longitudinal and rotary, and means whereby each of the different motions imparted to such rod effects a different indication.

55. In a register, a tube or rod arranged to receive primary motions both longitudinal and rotary, means whereby each of the different motions imparted to such rod effects a different indication, and means whereby one of such motions of such rod in one direction followed by another motion of such rod in a different direction, not opposite to the direction of such first motion and without the return of such rod to its neutral position between such motions, effects an indication the value of which is the sum of the indications which would be effected by each of such primary motions taken singly.

56. In a register, a tube or rod arranged to receive primary motions both longitudinal and rotary, means whereby each of the different motions imparted to such rod effects a different indication, with the indication effected by the motion of such rod in one of such primary directions independent of and different in character from those effected by the motion of such rod in other directions.

57. In a register, a tube or rod arranged to receive primary motions both longitudinal and rotary, means whereby each of the different motions imparted to such rod effects a different indication, and means whereby a motion of such rod which is the resultant of two of such primary motions not opposed to each other effects an indication the value of which is the sum of those indications which would be effected by each of such primary motions of such rod represented by such resultant.

58. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, and two or more different amounts of one of such motions, and means whereby each of the different motions imparted to such handle effects a different indication.

59. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means whereby each of the different motions imparted to such handle effects a different indication, and means whereby one of such motions of such handle in one direction followed by another motion of such handle in a different direction, not opposite to the direction of such first motion and without the return of such handle to its neutral position between such motions, effects an indication the value of which is the sum of the indications which would be effected by each of such primary motions taken singly.

60. In a register, an operating-handle arranged to receive primary motions in two or



more directions or of two or more kinds, means whereby each of the different motions imparted to such handle effects a different indication, with the indication effected by the motion of such handle in one of such primary directions independent of and different in character from those effected by the motion of such handle in other directions.

61. In a register, an operating-handle arranged to receive primary motions in two or more directions or of two or more kinds, means whereby each of the different motions imparted to such handle effects a different indication, and means whereby a motion of such handle which is the resultant of two of such primary motions not opposed to each other effects an indication the value of which is the sum of those indications which would be effected by each of such primary motions of such handle represented by such resultant.

62. In a register, two operating-rods each arranged to actuate the mechanism of such register, and means whereby two or more different amounts of motion imparted to one of such rods effect correspondingly different indications.

63. In a register, two operating-rods each arranged to actuate the mechanism of such register, means whereby two or more different amounts of motion imparted to one of such rods effect correspondingly different indications, and means whereby a motion imparted to one of such rods and, before the return thereof to its neutral position, a motion imparted to the other one of such rods, effects an indication whose value is the sum of those indications which would be effected by the motions of such rods taken singly.

64. In a register, two operating-rods each arranged to actuate the mechanism of such register, and means whereby two or more different amounts of motion imparted to each of such rods effect correspondingly different indications.

65. In a register, two operating-rods each arranged to actuate the mechanism of such register, means whereby two or more different amounts of motion imparted to each of such rods effect correspondingly different indications, and means whereby a motion imparted to one of such rods and, before the return thereof to its neutral position, a motion imparted to the other one of such rods, effects an indication whose value is the sum of those indications which would be effected by the same motions of such rods taken singly.

66. In a register, one or more indicator-wheels, an actuating-handle, and means whereby the movement of such handle to either one of two or more predetermined points, in either one of two or more different directions, effects an indication of a different value for each of such predetermined points in each direction.

67. In a register, one or more indicator-wheels, and means for returning the same to zero between each indication and the next suc-

ceeding one, an actuating-handle, and means whereby the movement of such handle in either one of two or more different directions, effects an indication of a different value.

68. In a register, one or more indicator-wheels and means for returning the same to zero between each indication and the next succeeding one, an actuating-handle, and means whereby the movement of such handle to either one of two or more predetermined points, in either one of two or more different directions, effects an indication of a different value for each of such predetermined points in each direction.

69. In a register, one or more indicator-wheels, an actuating-handle, means whereby the movement of such handle in either one of two or more directions effects an indication of a different value for each of such directions, and means whereby the movement of such handle to any one predetermined point in one direction and, before the return of such handle to its neutral position, the movement thereof to another predetermined point in an adjacent primary direction, effects an indication the value of which is the sum of those indications which would be effected by each of such adjacent motions of such handle taken singly.

70. In a register, one or more indicator-wheels, an actuating-handle, means whereby the movement of such handle in either one of two or more directions effects an indication of a different value for each of such directions, and means whereby a motion of such handle, which is the resultant of the motion thereof to each of two predetermined points in adjacent directions, effects an indication the value of which is the sum of those indications which would be effected by the motion of such handle to each of such two predetermined points in such adjacent directions represented by such resultant.

71. In a register, one or more indicator-wheels, an actuating-handle, means for retaining the indicator-wheels in any position to which they may be carried by such operating-handle, in indicating any one value, until the commencement of the next succeeding registry, and means for preventing the indication and registry of any value until the return of such indicator-wheels to their neutral position or nearly so.

72. In a register, one or more indicator-wheels, a tube or rod arranged to receive primary motions both longitudinal and rotary, and means whereby each one of the different motions imparted to such rod effects a different indication.

73. In a register, one or more indicator-wheels, and means for returning the same to zero between each indication and the next succeeding one, a tube or rod arranged to receive primary motions both longitudinal and rotary, and means whereby each of the different motions imparted to such rod effects a different indication.



74. In a register, one or more indicator-wheels and means for returning the same to zero between each indication and the next succeeding one, a tube or rod arranged to receive primary motions both longitudinal and rotary, and two or more different amounts of one of such motions, and means whereby each different amount of each one of such primary motions of such rod effects a different indication.

75. In a register, one or more indicator-wheels, a tube or rod arranged to receive primary motions both longitudinal and rotary, means whereby the different motions of such tube or rod effect different indications, and means whereby one of the movements of such rod and, before the return thereof to its neutral position, a second movement thereof in another direction not opposed to the direction of such first motion, effects an indication the value of which is the sum of those indications which would be effected by each of such movements of such rod taken singly.

76. In a register, one or more indicator-wheels, a tube or rod arranged to receive primary motions both longitudinal and rotary, means whereby each different movement of such rod effects a different indication, and means whereby a movement of such rod which is the resultant of the movements thereof in each of two directions, not opposed to each other, effects an indication the value of which is the sum of those indications which would be effected by each of the movements of such rod represented by such resultant.

77. In a register, one or more indicator-wheels, two operating-rods each arranged to actuate such indicator-wheels, and means whereby two or more different amounts of motion imparted to one of such rods effect correspondingly different indications.

78. In a register, one or more indicator-wheels, two operating-rods each arranged to actuate such indicator-wheels, means whereby two or more different amounts of motion imparted to one of such rods effect correspondingly different indications, and means whereby a motion imparted to one of such rods and, before the return thereof to its neutral position, a motion imparted to the other one of such rods, effects an indication whose value is the sum of those indications which would be effected by the same motions of such rods taken singly.

79. In a register, one or more indicator-wheels, two operating-rods each arranged to actuate such indicator-wheels, and means whereby two or more different amounts of motion imparted to either of such rods effect correspondingly different indications for each motion of such rod.

80. In a register, one or more indicator-wheels, two operating-rods each arranged to actuate such indicator-wheels, means whereby two or more different amounts of motion imparted to either of such rods effect correspondingly different indications, and means

whereby a motion imparted to one of such rods and, before the return thereof to its neutral position, a motion imparted to the other one of such rods, effects an indication whose value is the sum of those indications which would be effected by the same motions of such rods taken singly.

81. In a register, a total-register, a handle arranged to move in two or more directions, means whereby each motion of such handle actuates such total-register, means also whereby the motion of such handle in one direction, and before the return thereof to its neutral position, the motion of such handle in another direction, not opposed to the direction of such first motion, effects one and only one operation of such total-register.

82. In a register, a total-register, a handle arranged to move in two or more primary directions, means whereby each motion of such handle actuates such total-register, and means whereby a motion of such handle which is the resultant of two of such primary movements effects one and only one operation of such total-register.

83. In a register, a tube or rod arranged to receive primary movements both longitudinal and rotary, a total-register, means whereby each of such motions of such rod actuates such total-register, and means whereby one of such motions of such rod, and, before the return thereof to its neutral position, another one of such motions of such rod in a direction not opposed to the direction of such first motion, effects one and only one operation of such total-register.

84. In a register, a tube or rod arranged to receive primary movements both longitudinal and rotary, a total-register, means whereby each of such motions of such rod actuates such total-register, and means whereby the combination of two of such movements of such rod in directions not opposed to each other effects one and only one operation of such total-register.

85. In a register, two operating-rods each arranged to actuate the mechanism of such register, a total-register, means whereby the motion of either one of such rods actuates such total-register, and means whereby the motion of one of such rods, and before the return thereof to its neutral position, a motion of the other one of such rods, effects one and only one operation of such total-register.

86. In a register, two operating-rods each arranged to actuate the mechanism of such register, a total-register, means whereby the motion of either one of such rods actuates such total-register, and means whereby the simultaneous movement of both such rods effects one and only one operation of such total-register.

WM. H. COOLEY.

Witnesses:

ALBERT C. BELL,  
ETHA M. SMITH.