

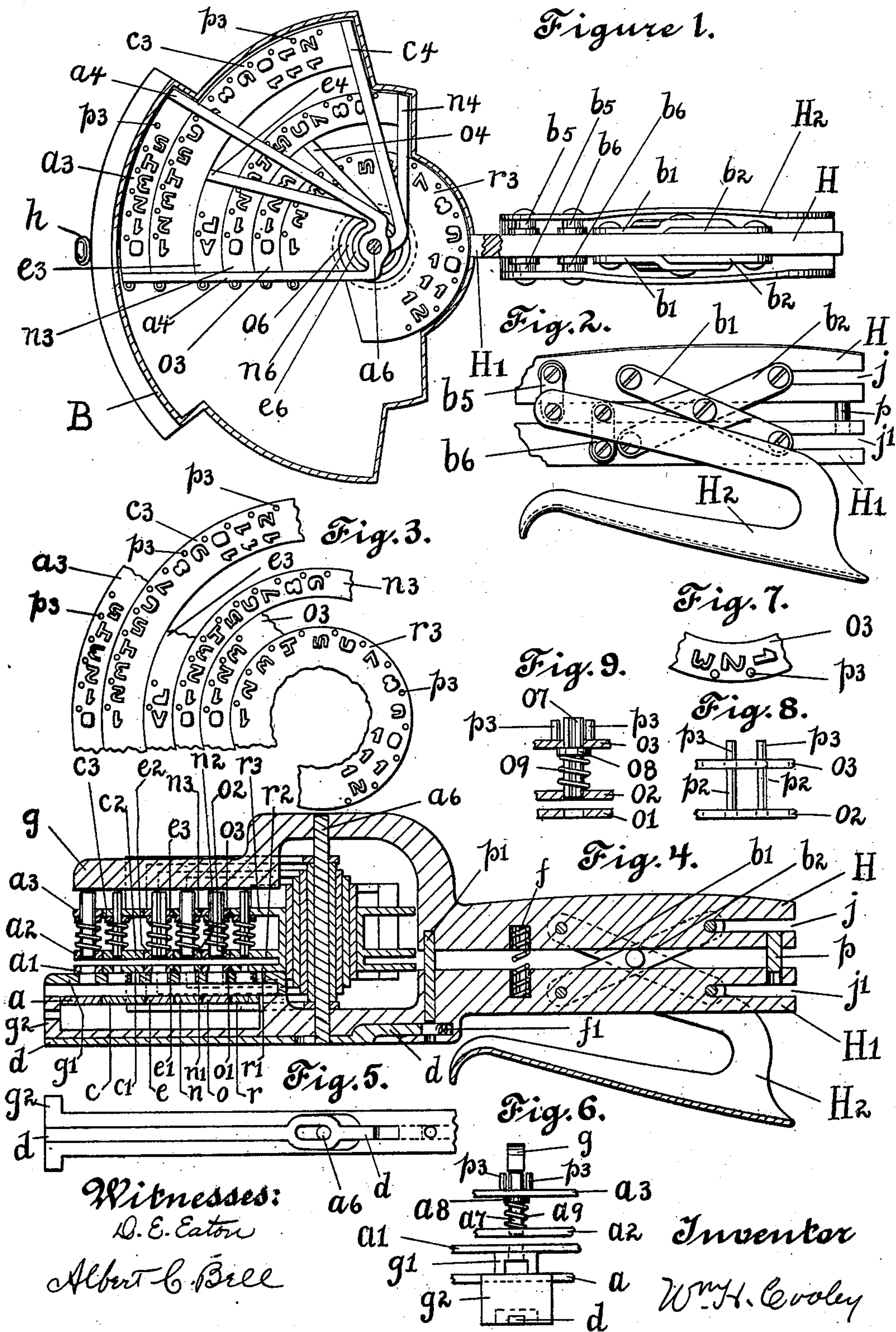
W. H. COOLEY.

MEANS FOR LIMITING TRANSFER PRIVILEGES.

(Application filed May 23, 1900.)

(No Model.)

5 Sheets—Sheet 1.



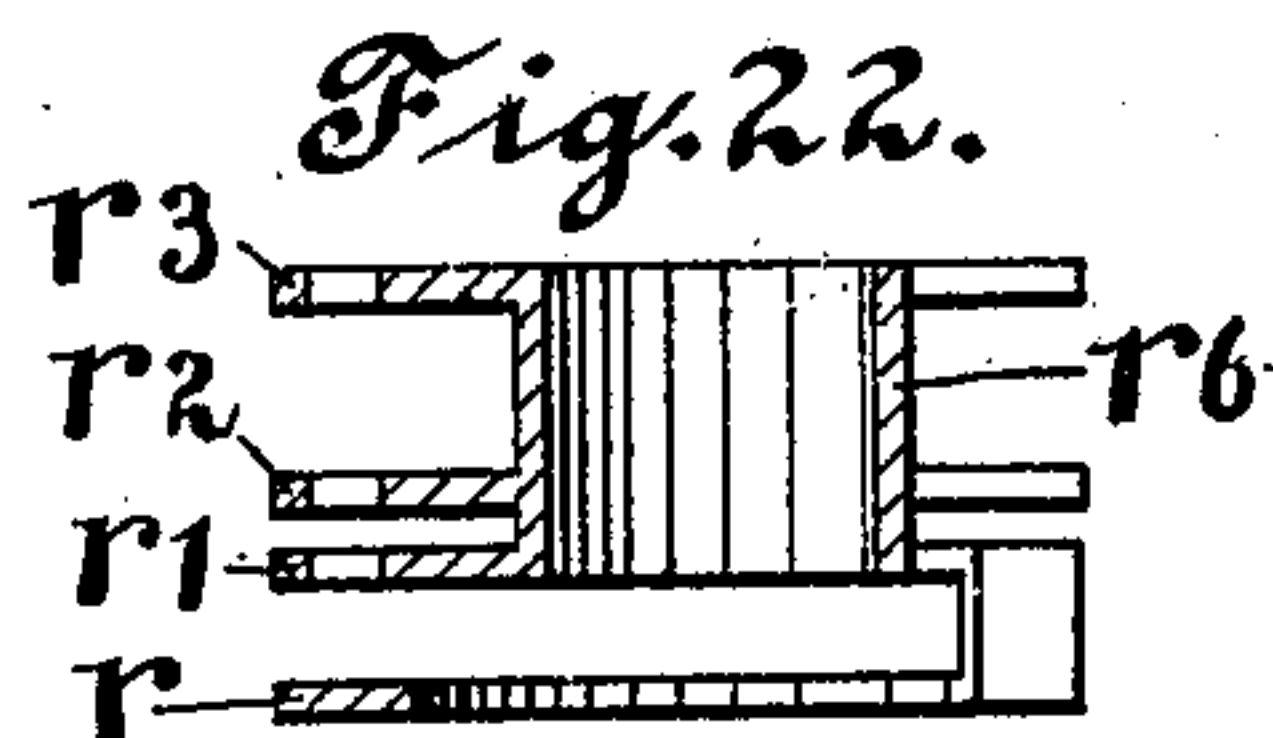
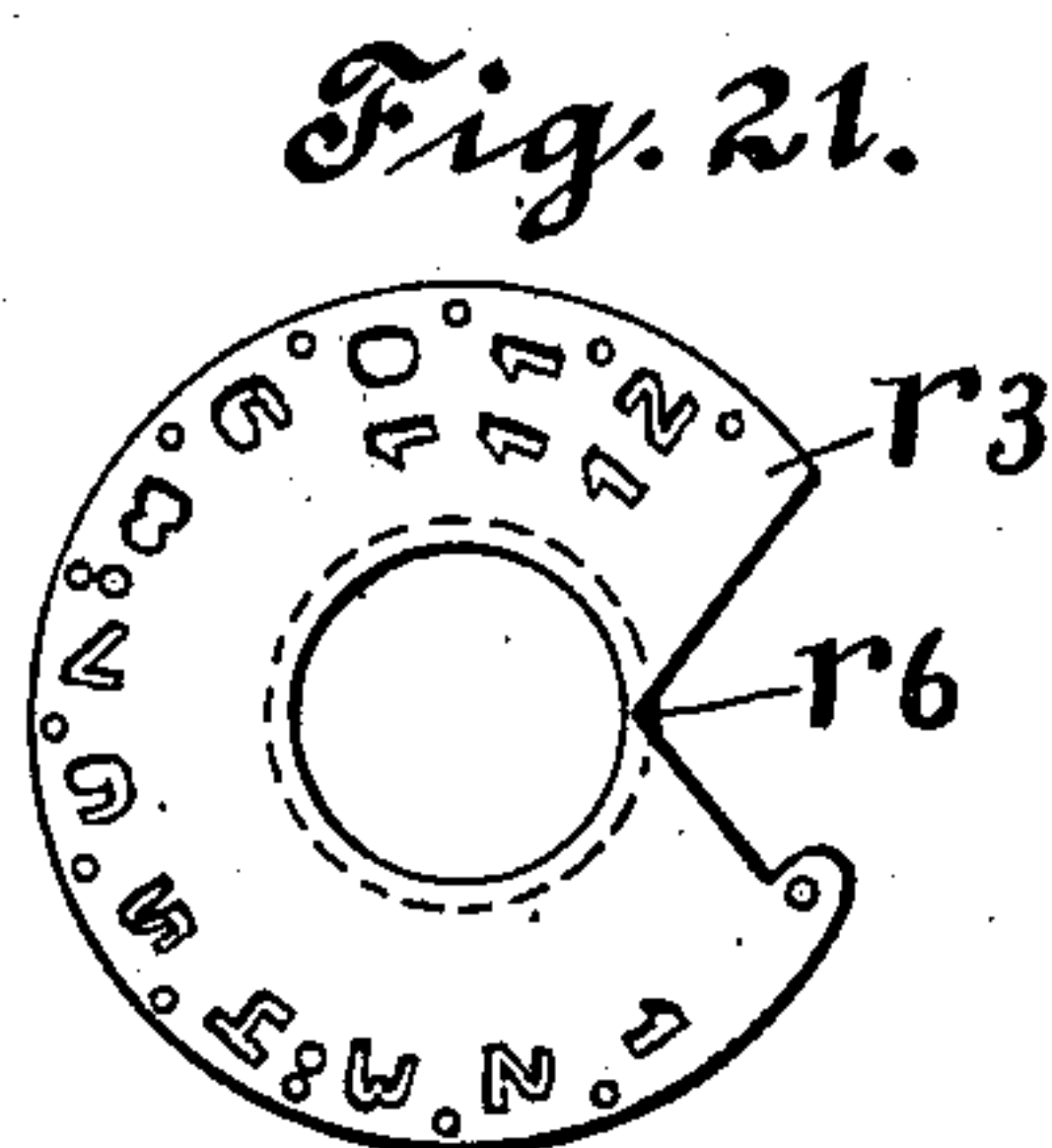
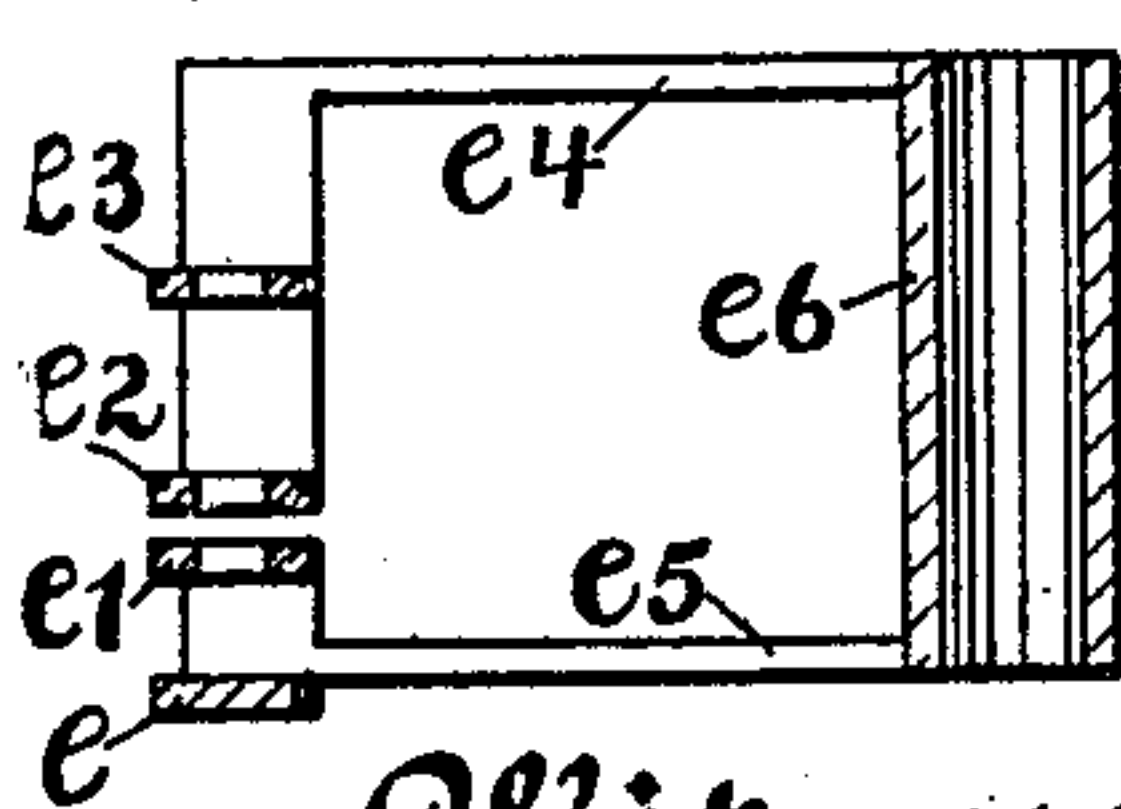
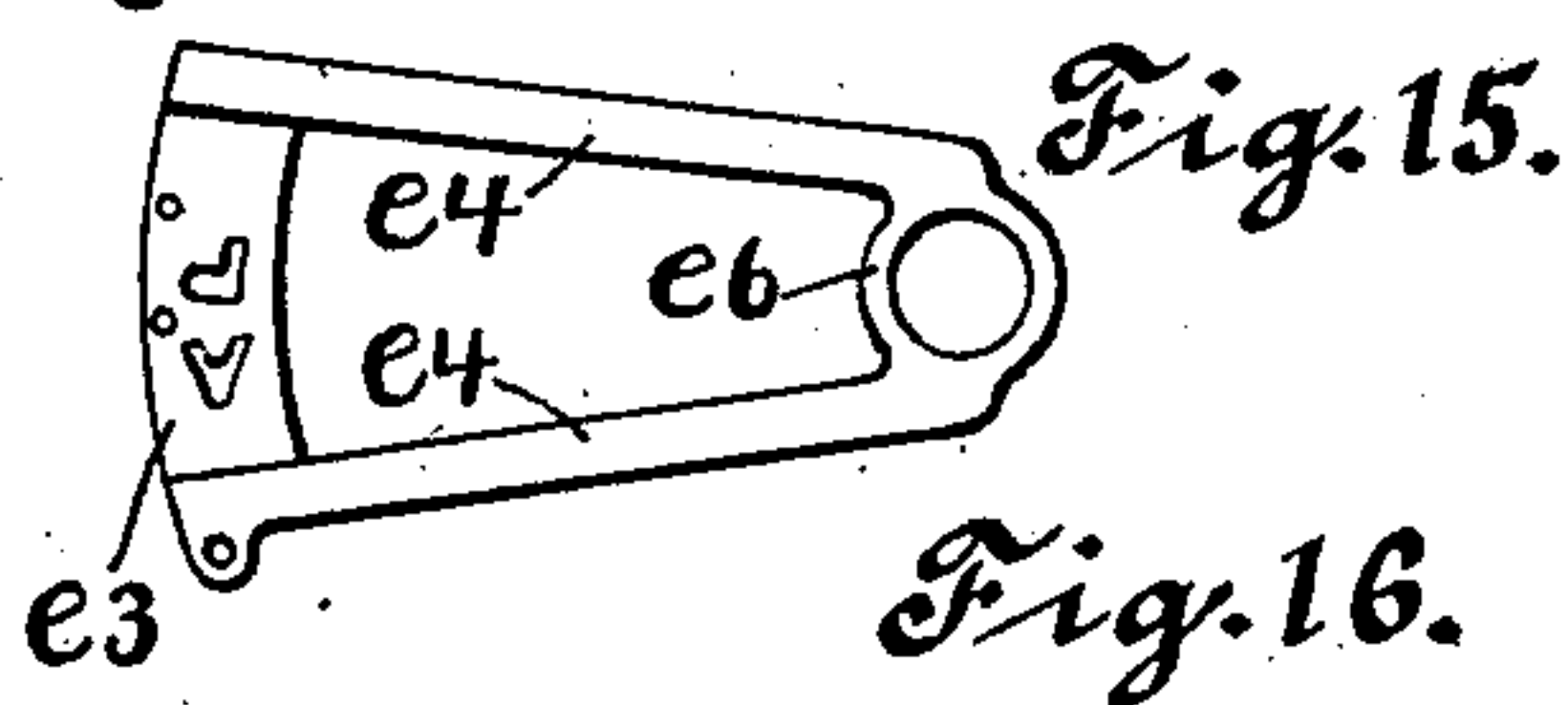
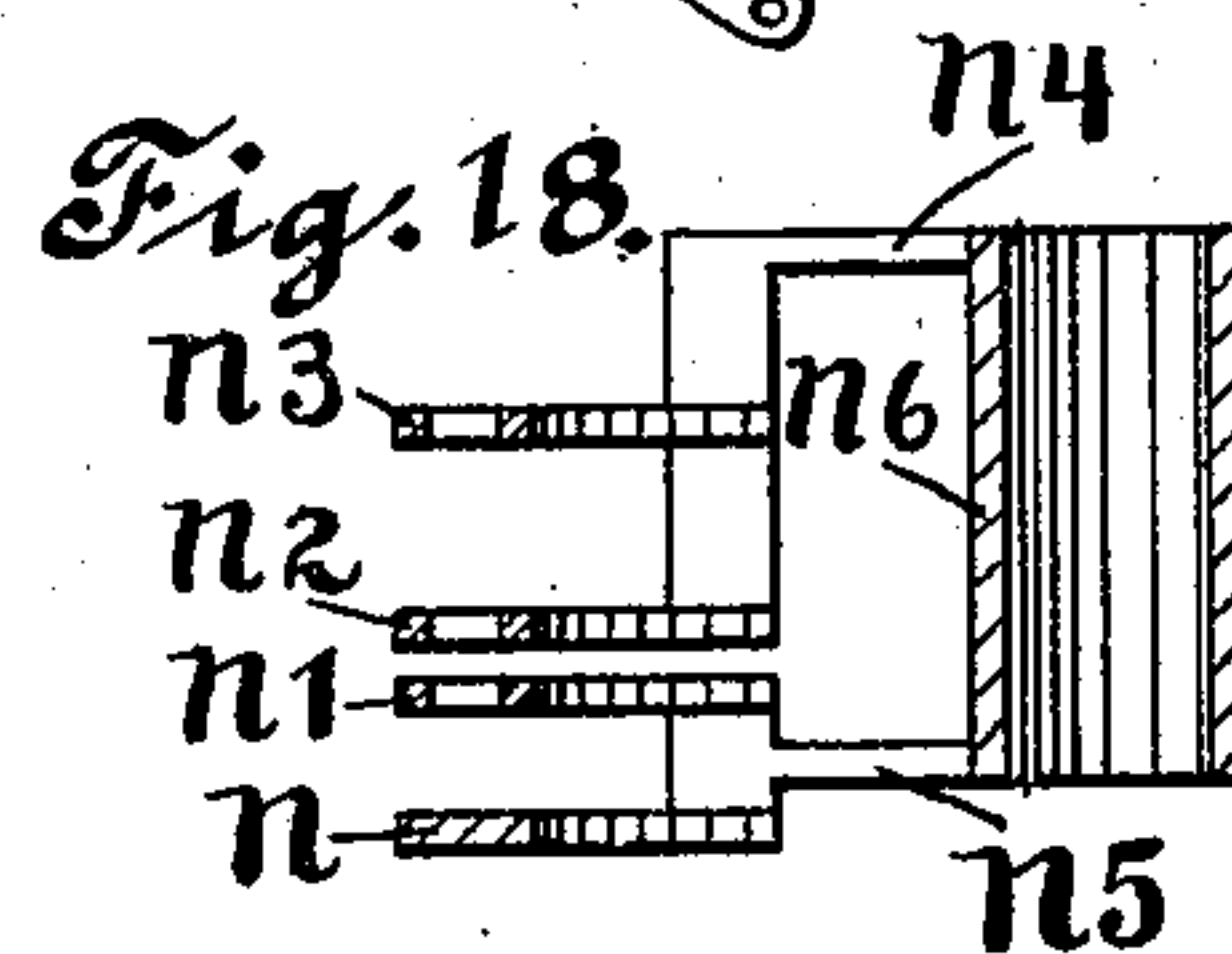
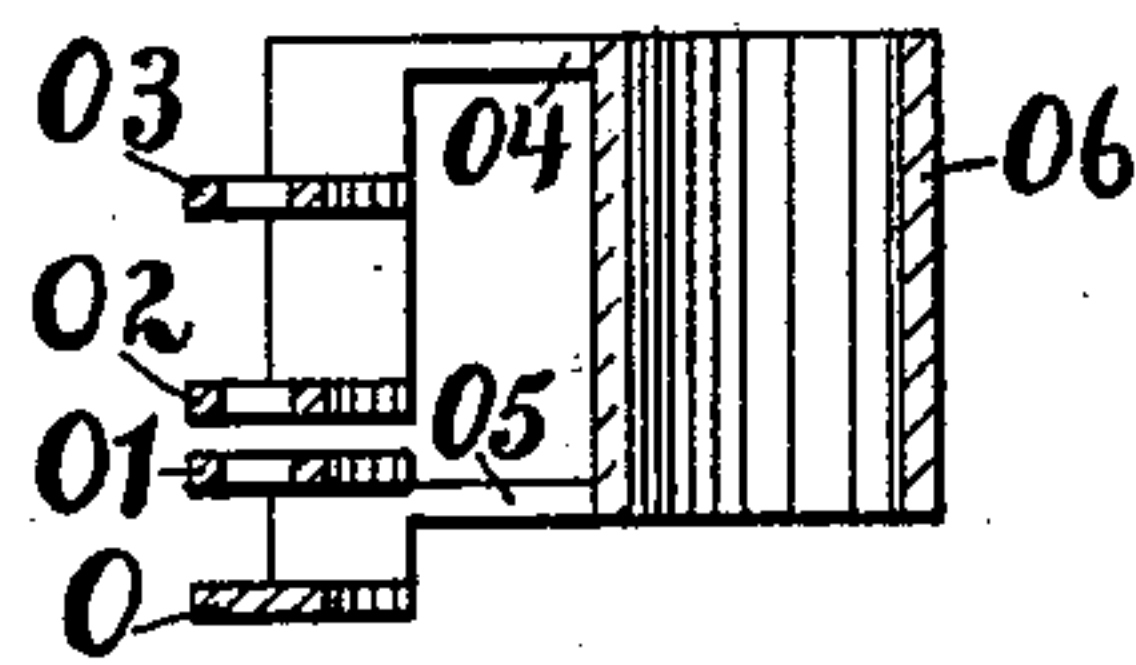
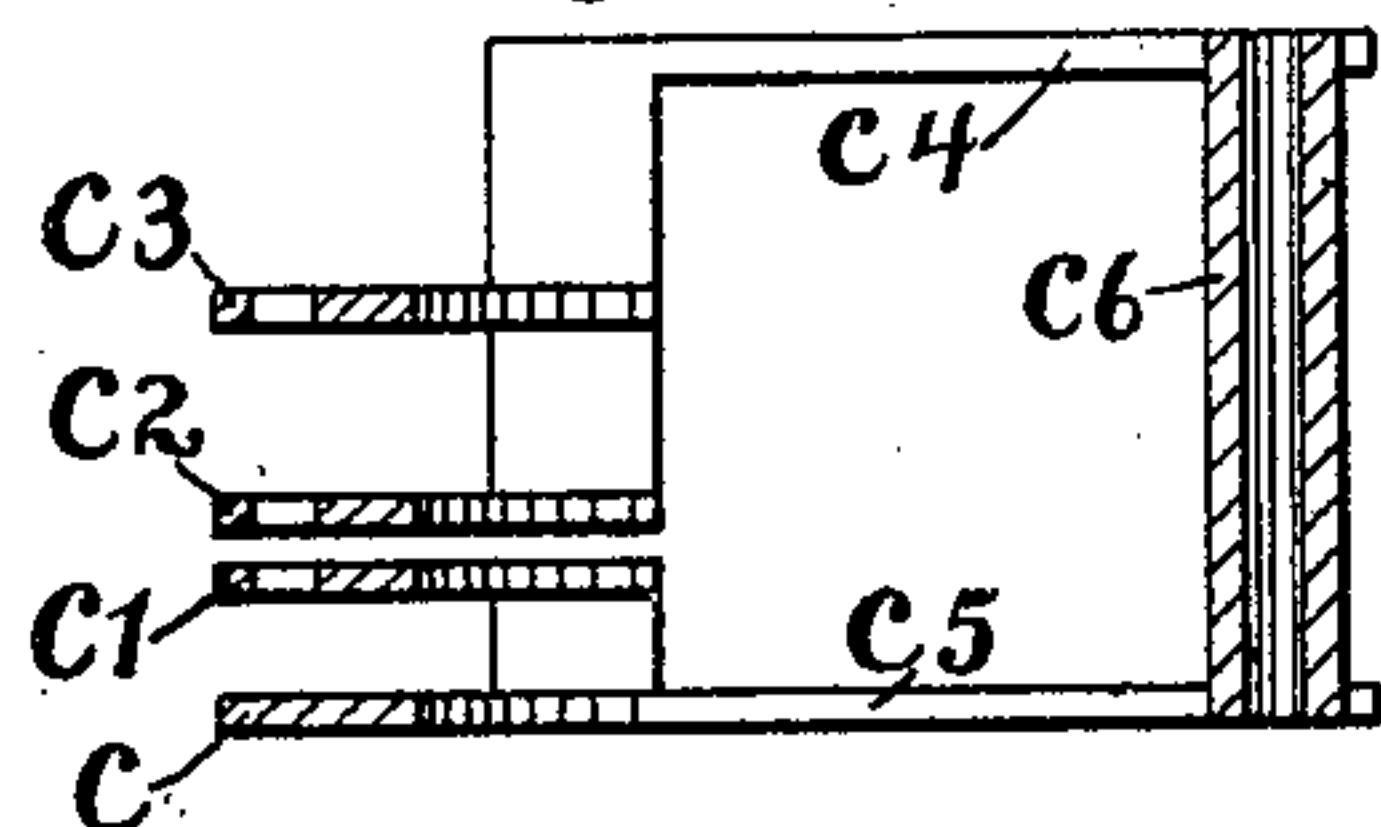
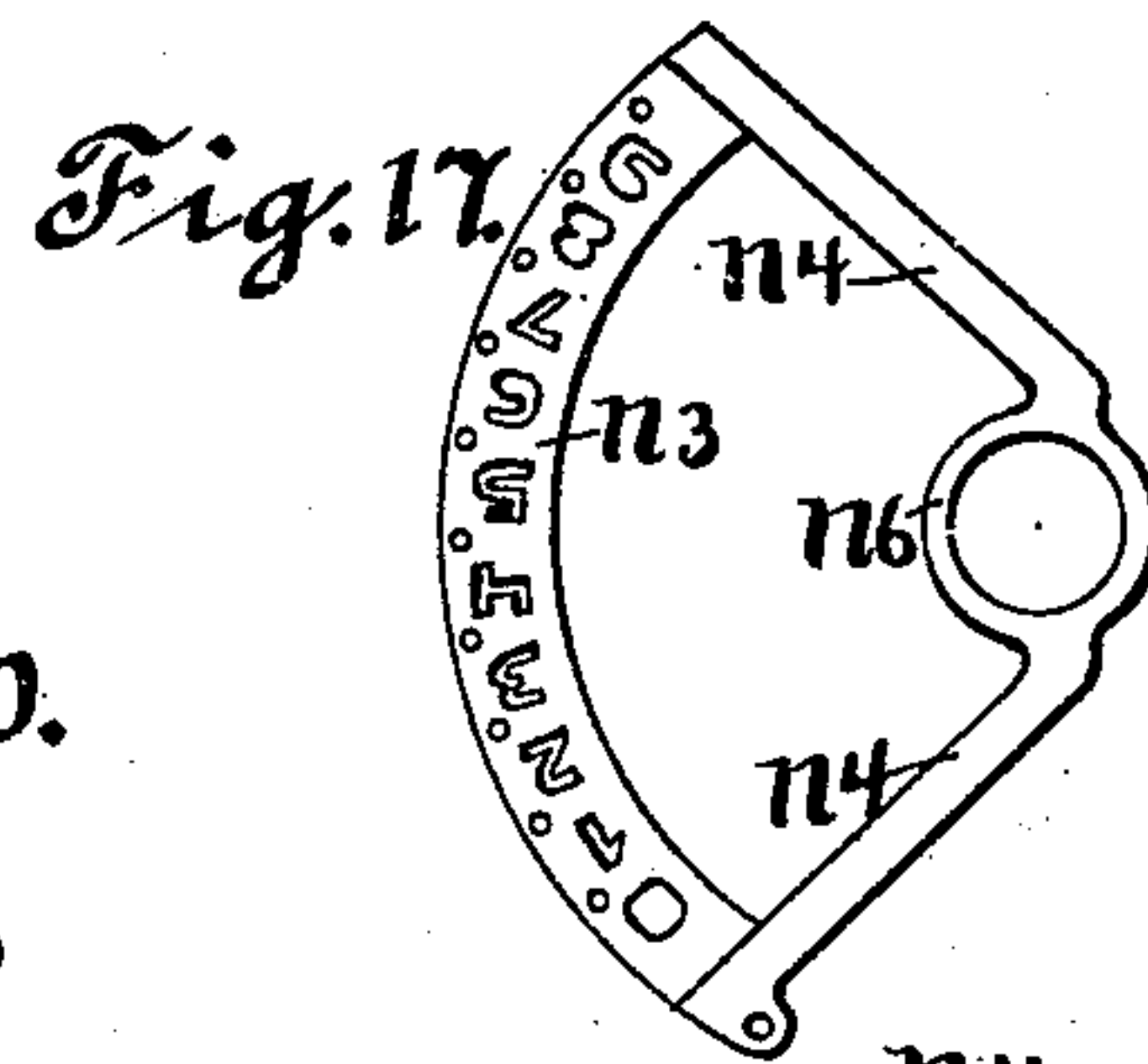
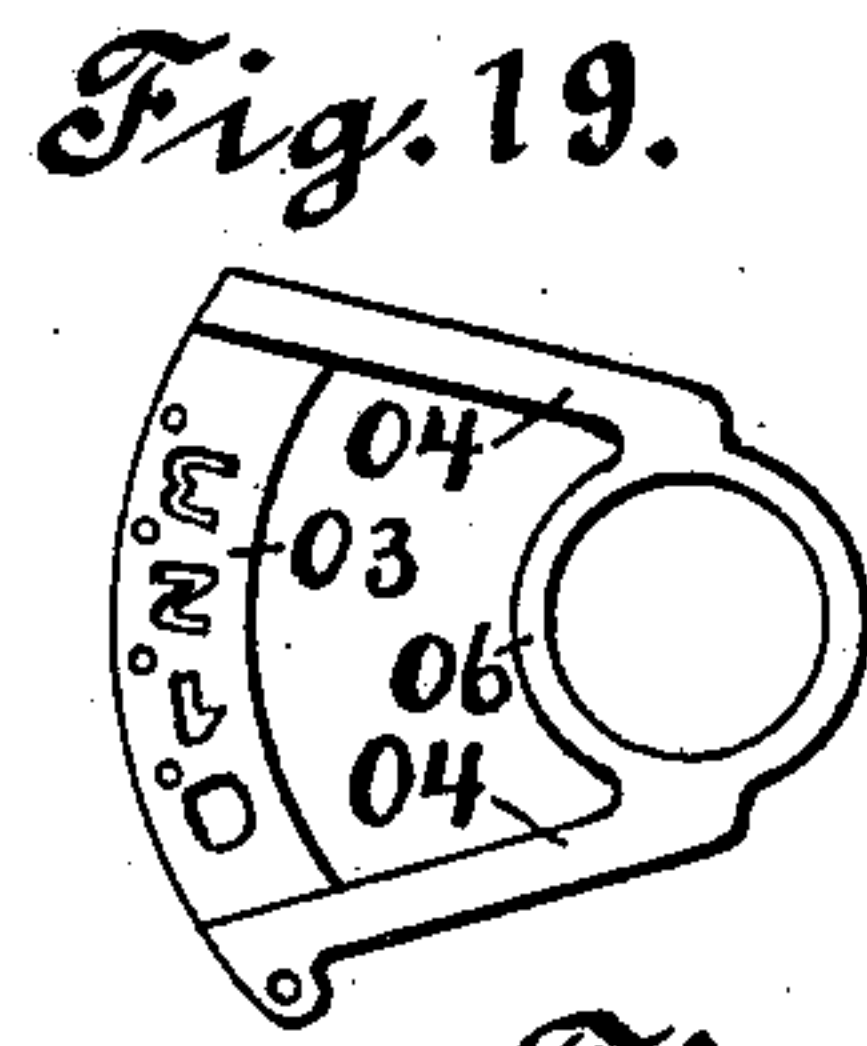
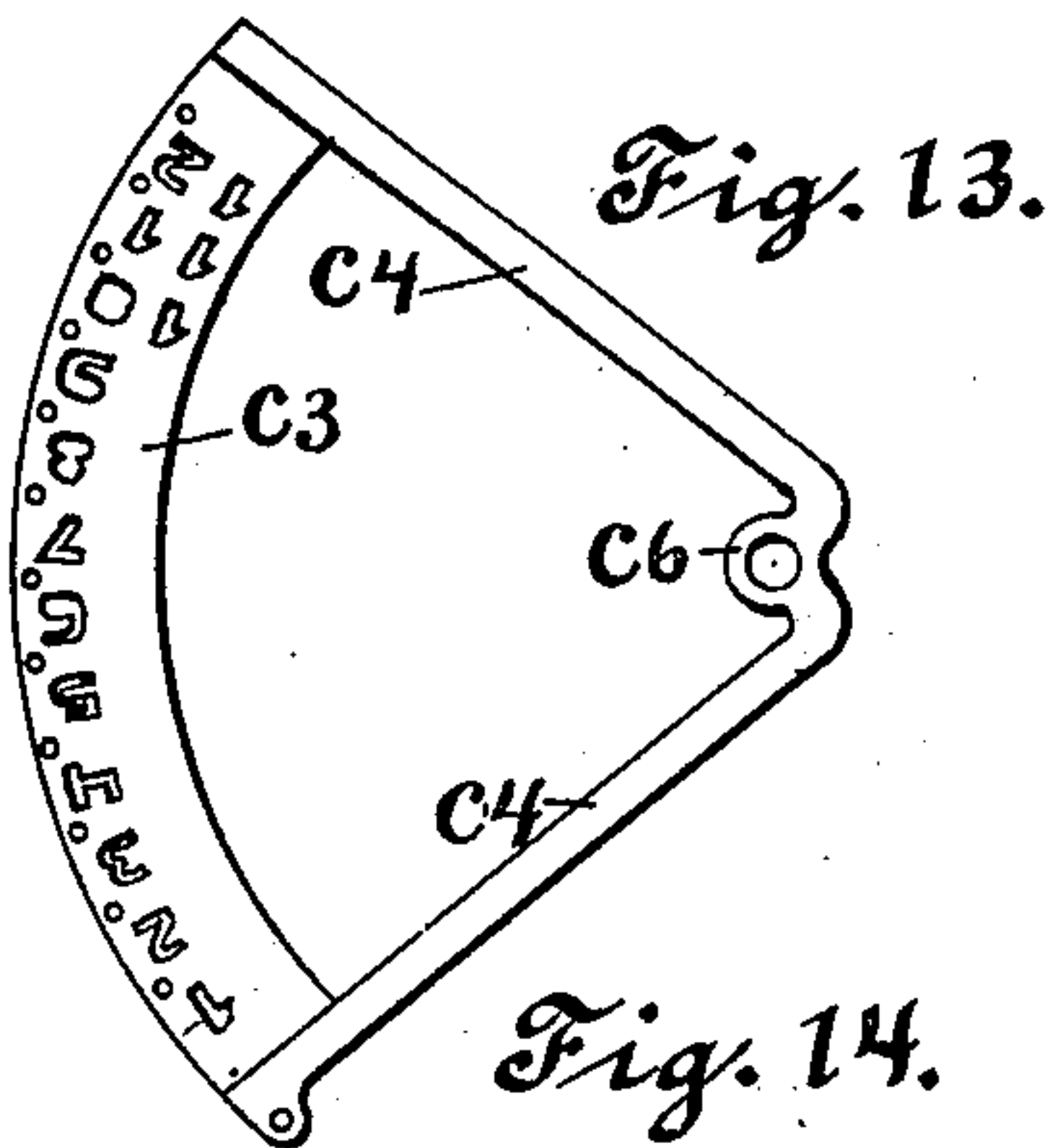
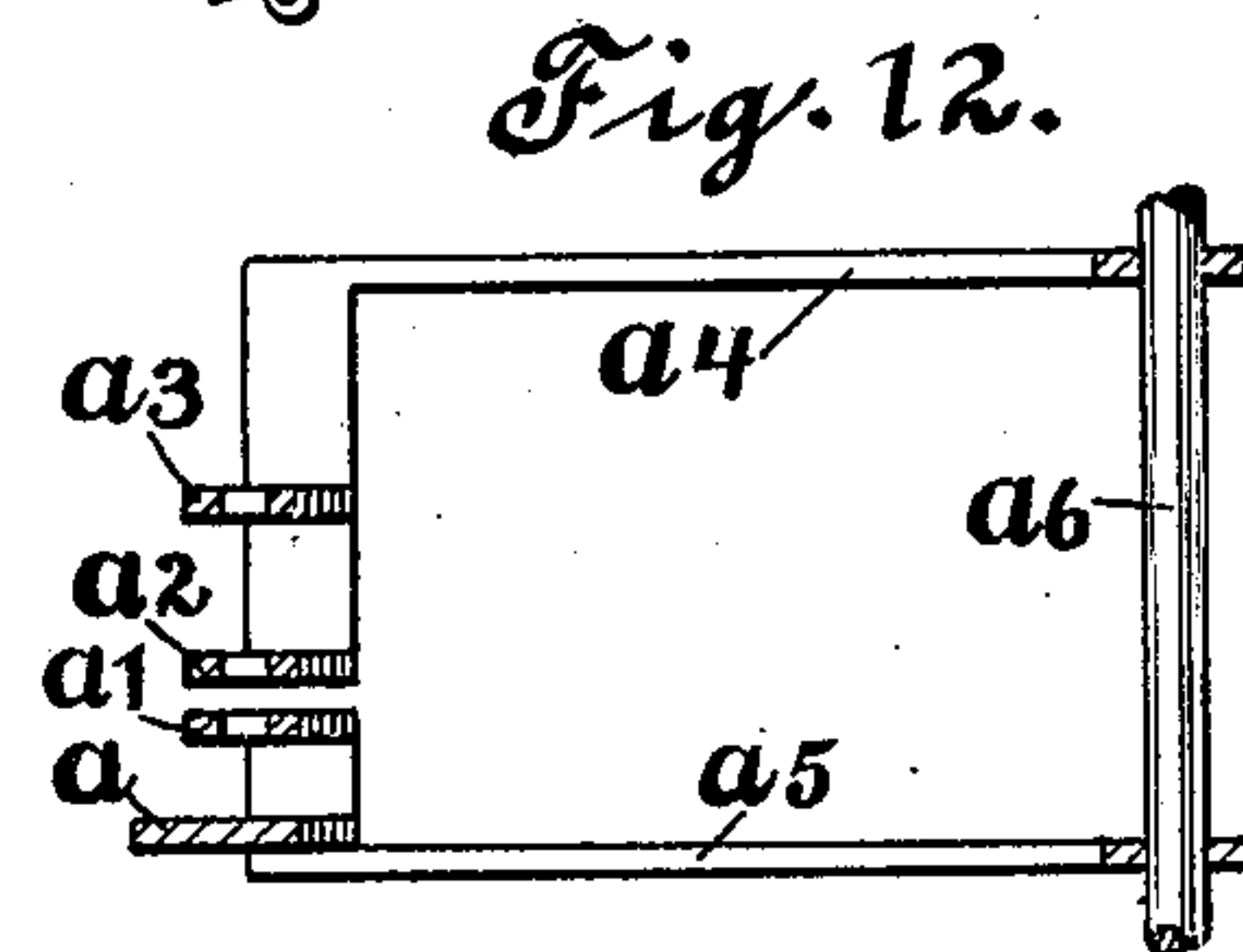
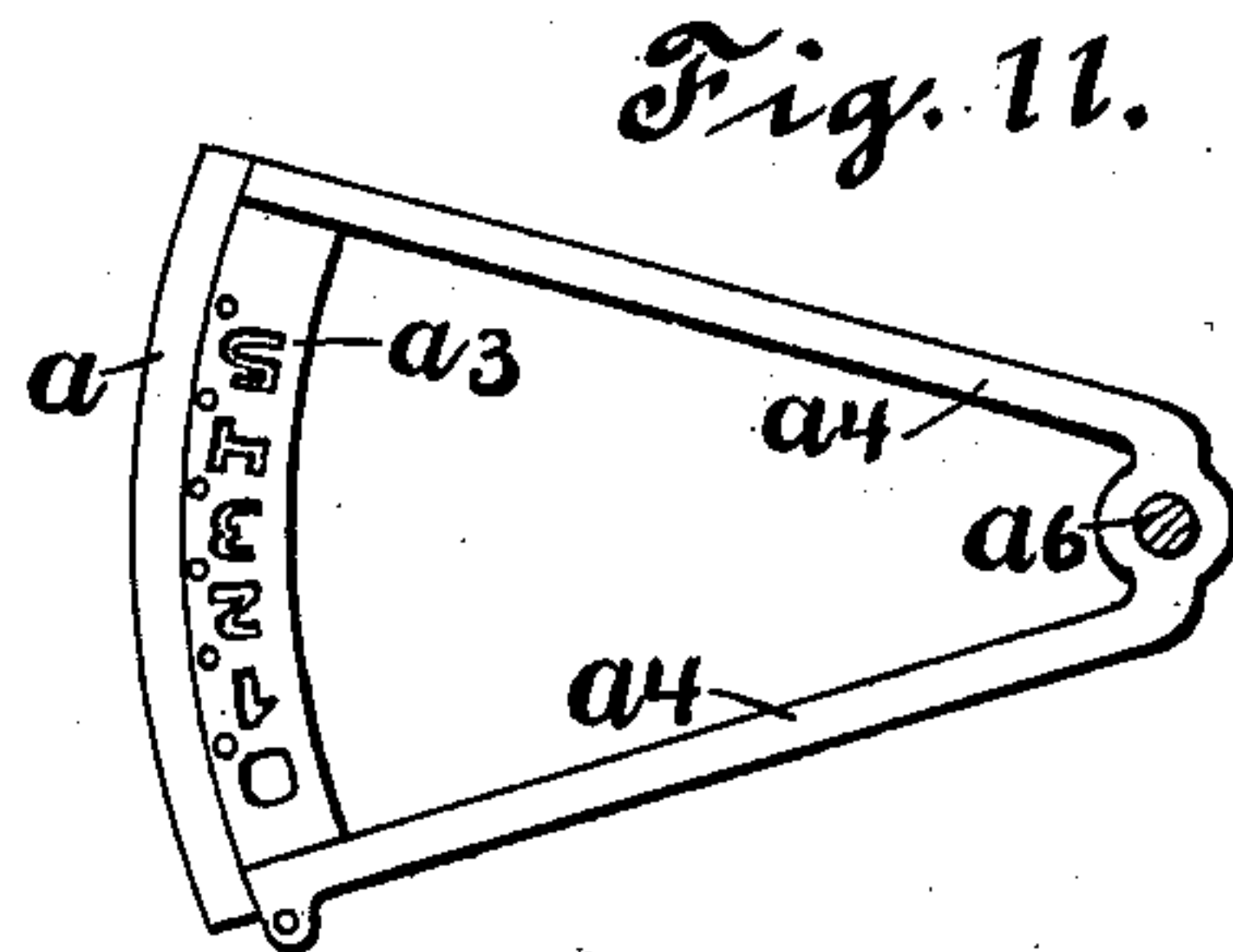
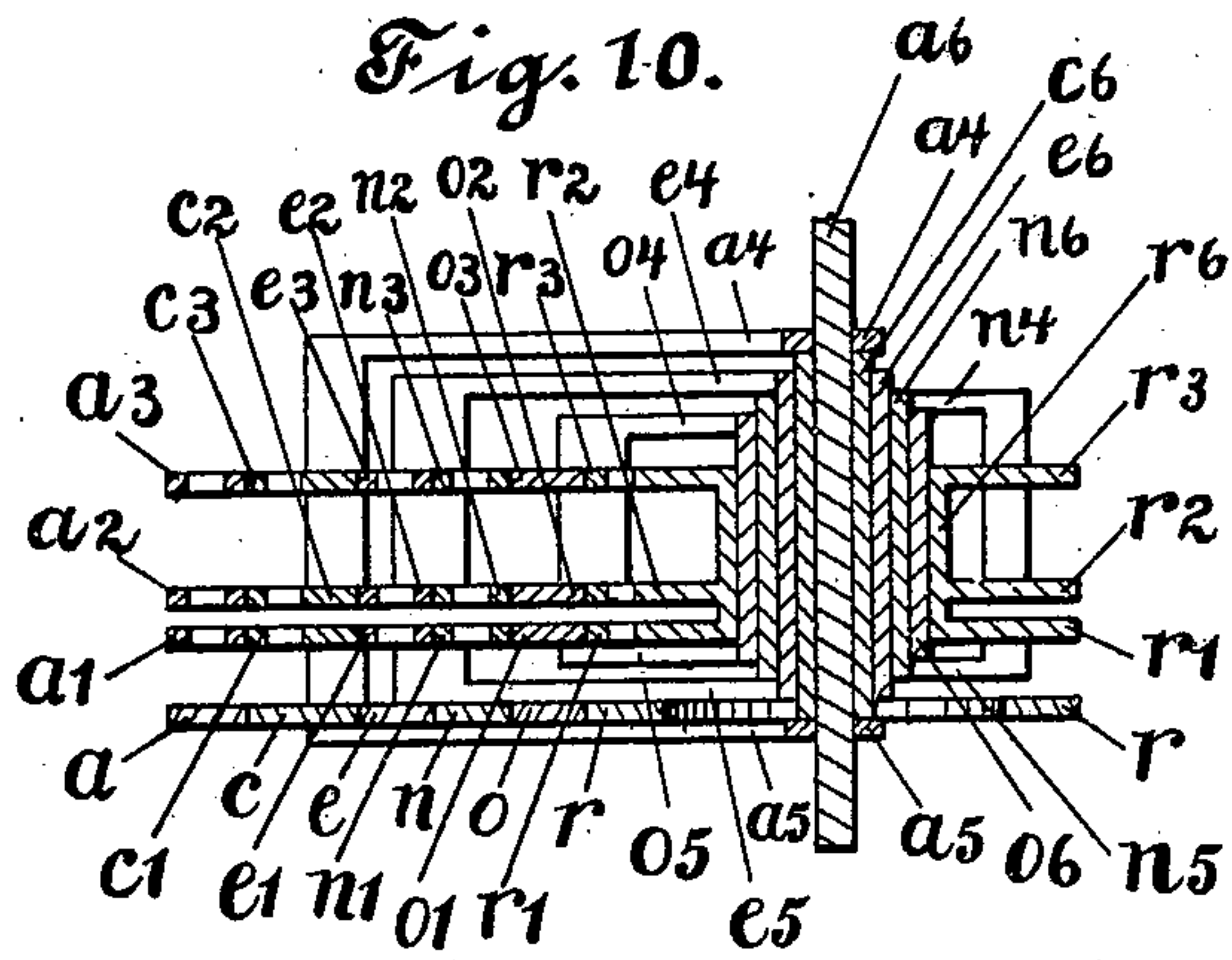
W. H. COOLEY.

MEANS FOR LIMITING TRANSFER PRIVILEGES.

(Application filed May 23, 1900.)

(No Model.)

5 Sheets—Sheet 2.



Witnesses:

D. E. Eaton
Albert C. Bell

Inventor
W. H. Cooley.

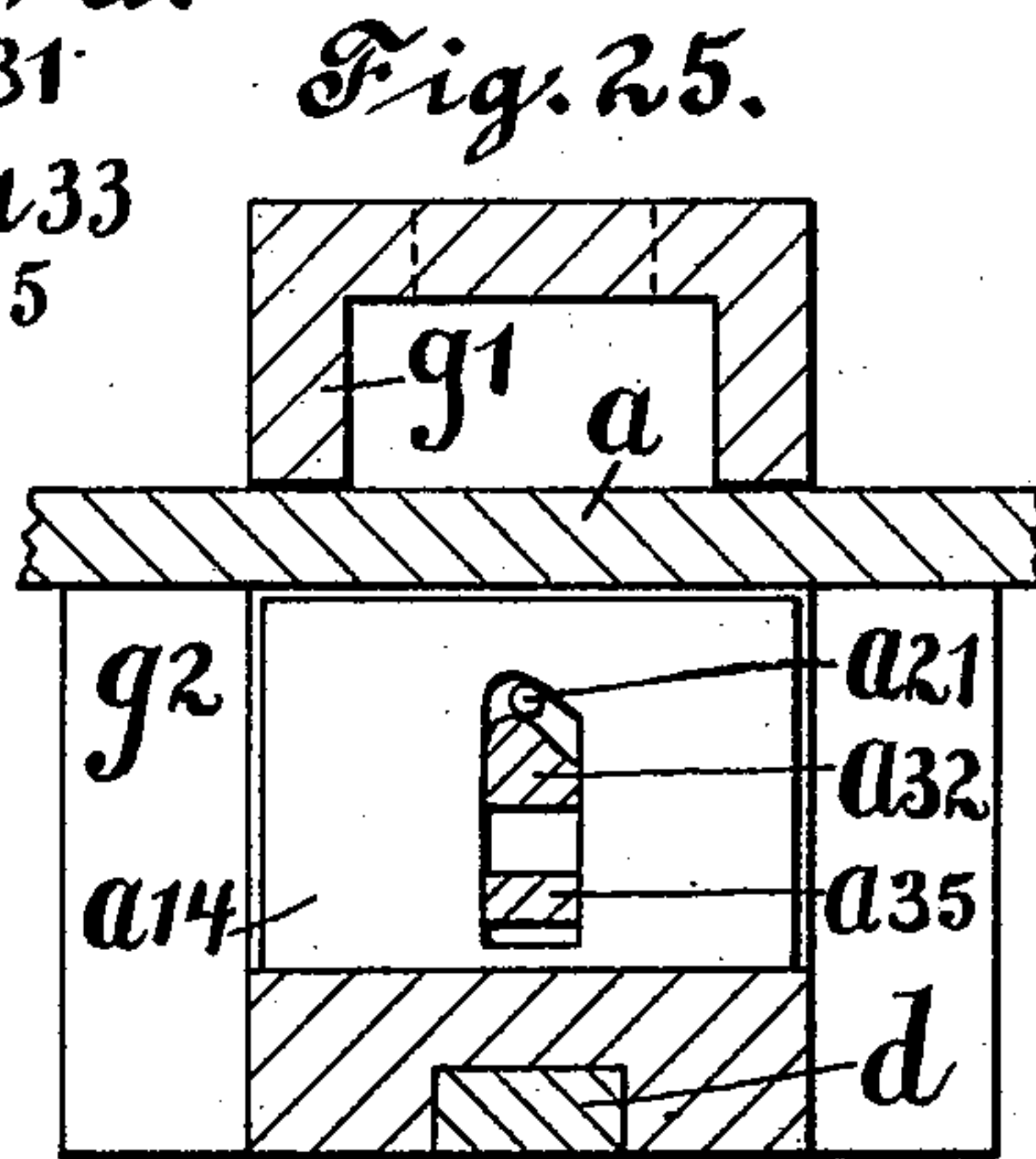
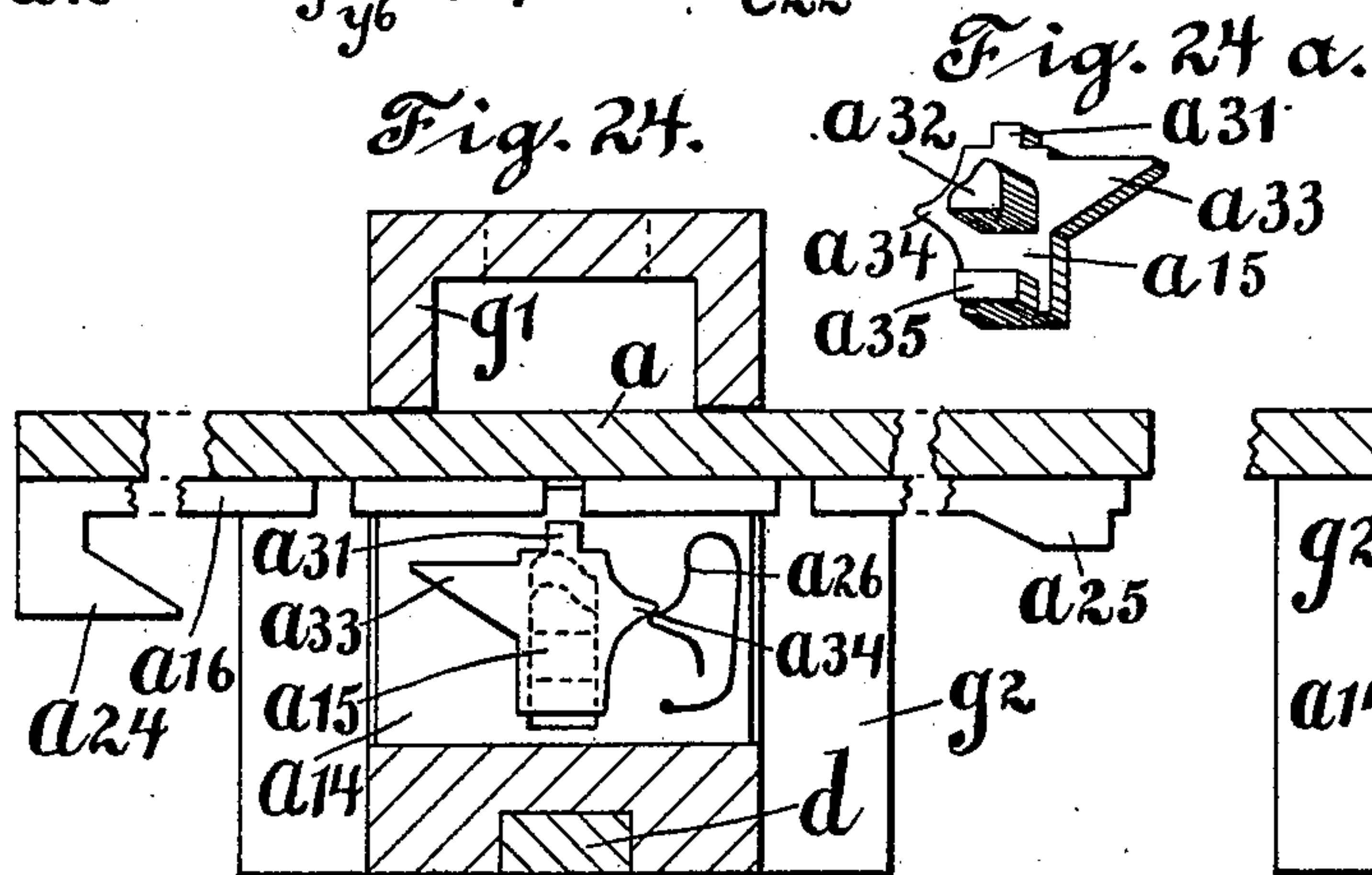
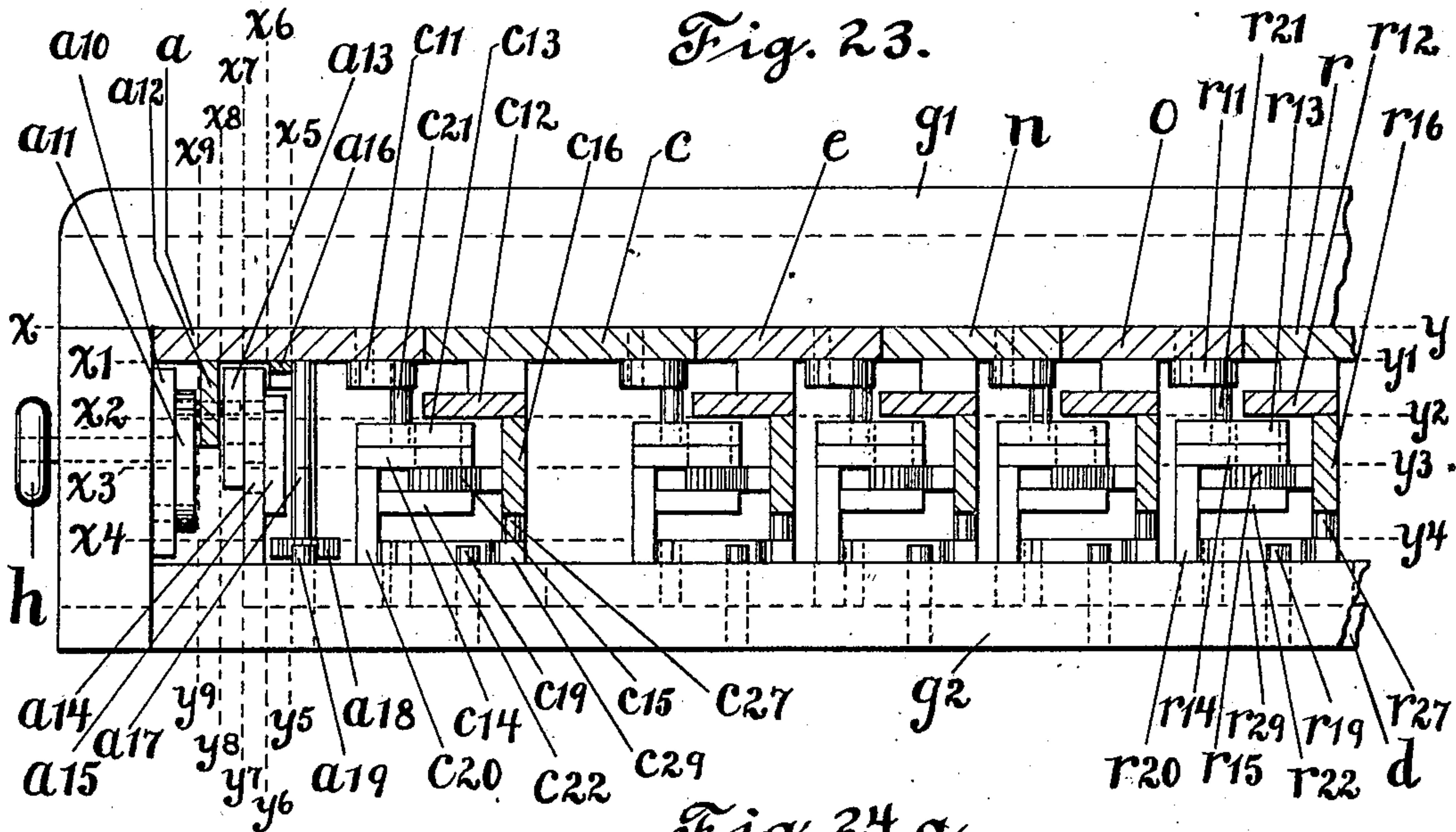
W. H. COOLEY.

MEANS FOR LIMITING TRANSFER PRIVILEGES.

(Application filed May 23, 1900.)

(No Model.)

5 Sheets—Sheet 3.



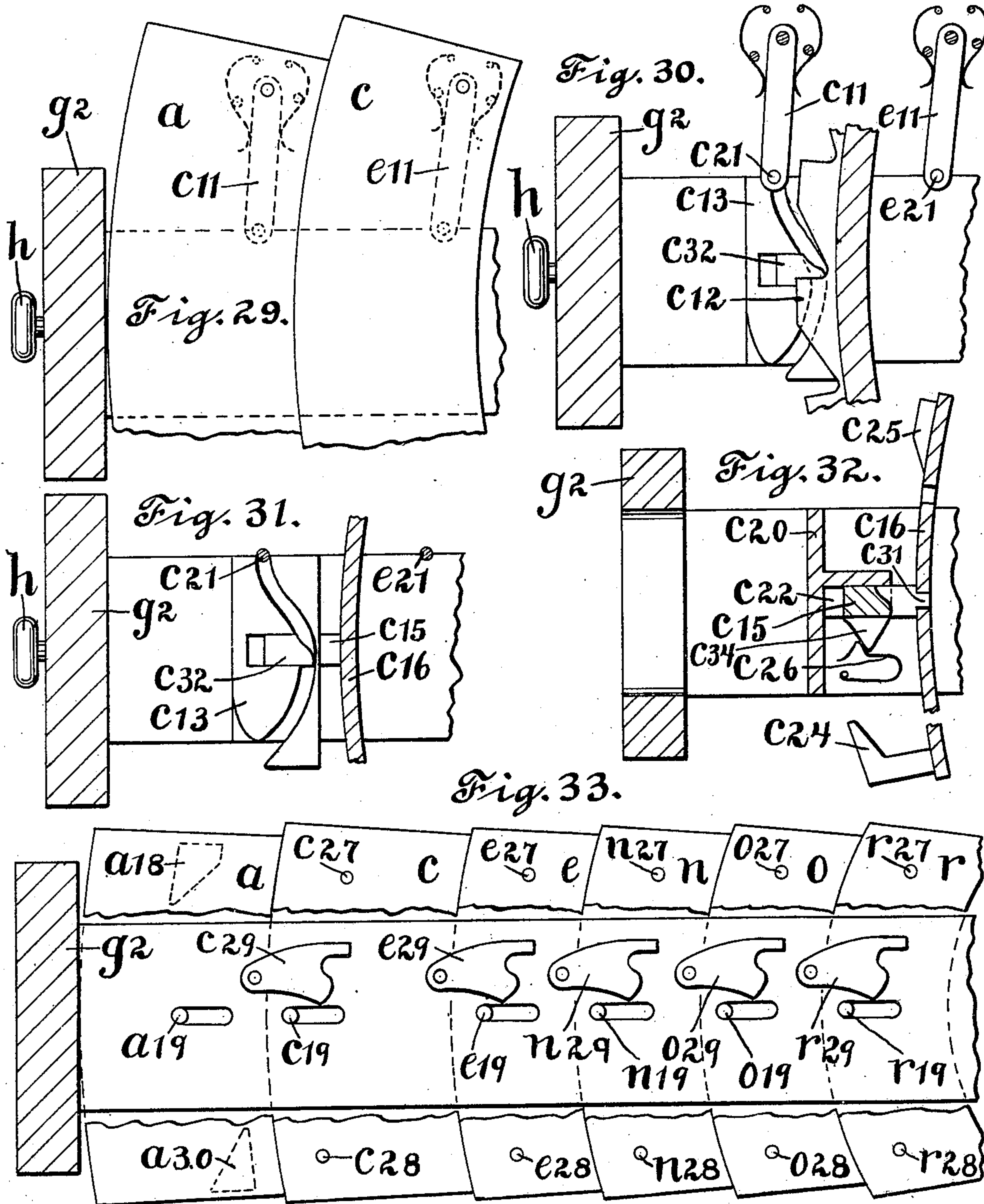
W. H. COOLEY.

MEANS FOR LIMITING TRANSFER PRIVILEGES.

(Application filed May 23, 1900.)

(No Model.)

5 Sheets—Sheet 4.



Witnesses:

B. E. Eaton

Albert C. Bell

Inventor

W. H. Cooley.

No. 680,646.

Patented Aug. 13, 1901.

W. H. COOLEY.

MEANS FOR LIMITING TRANSFER PRIVILEGES.

(Application filed May 23, 1900.)

(No Model.)

5 Sheets—Sheet 5.

Fig. 34.

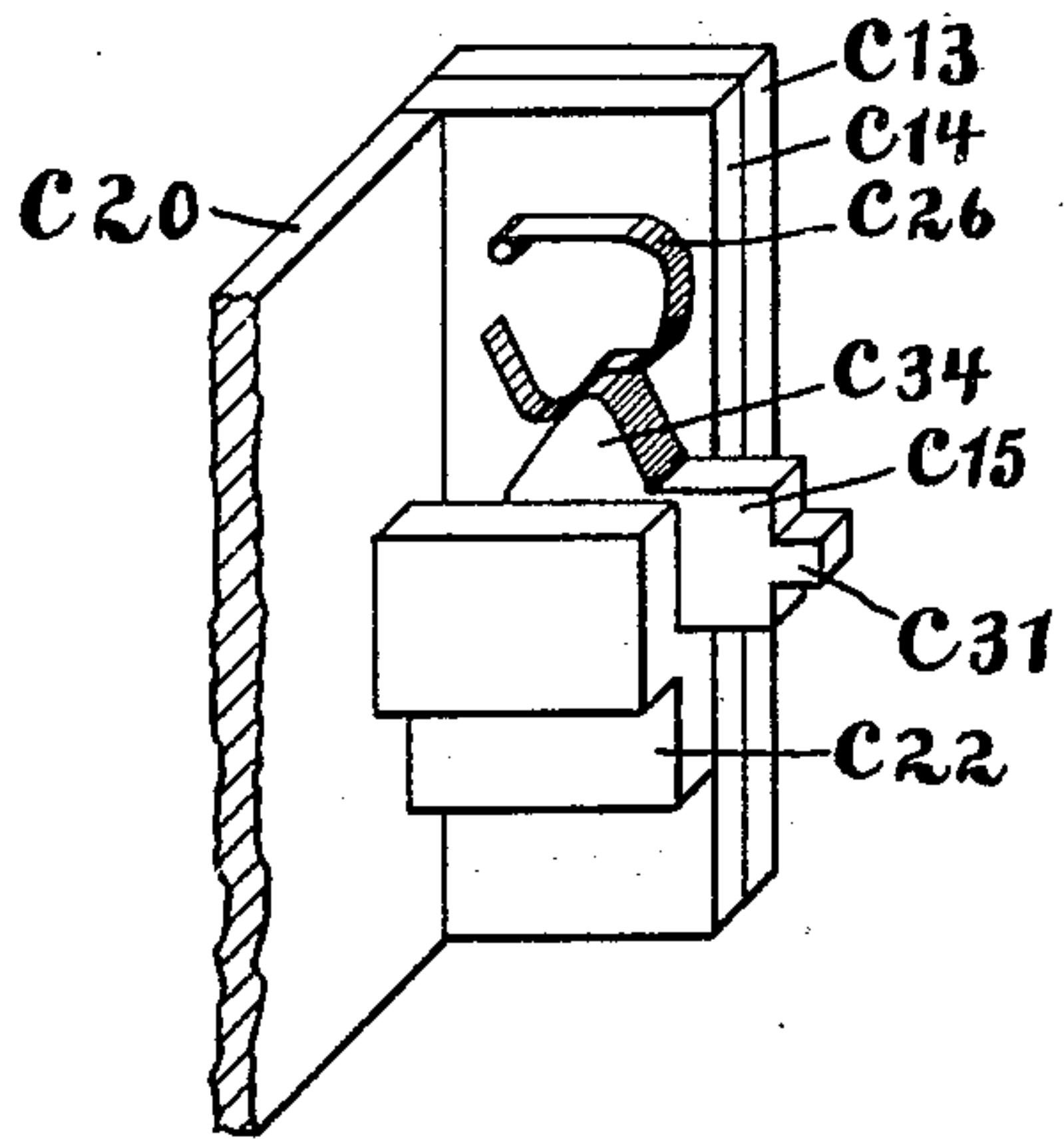


Fig. 35.

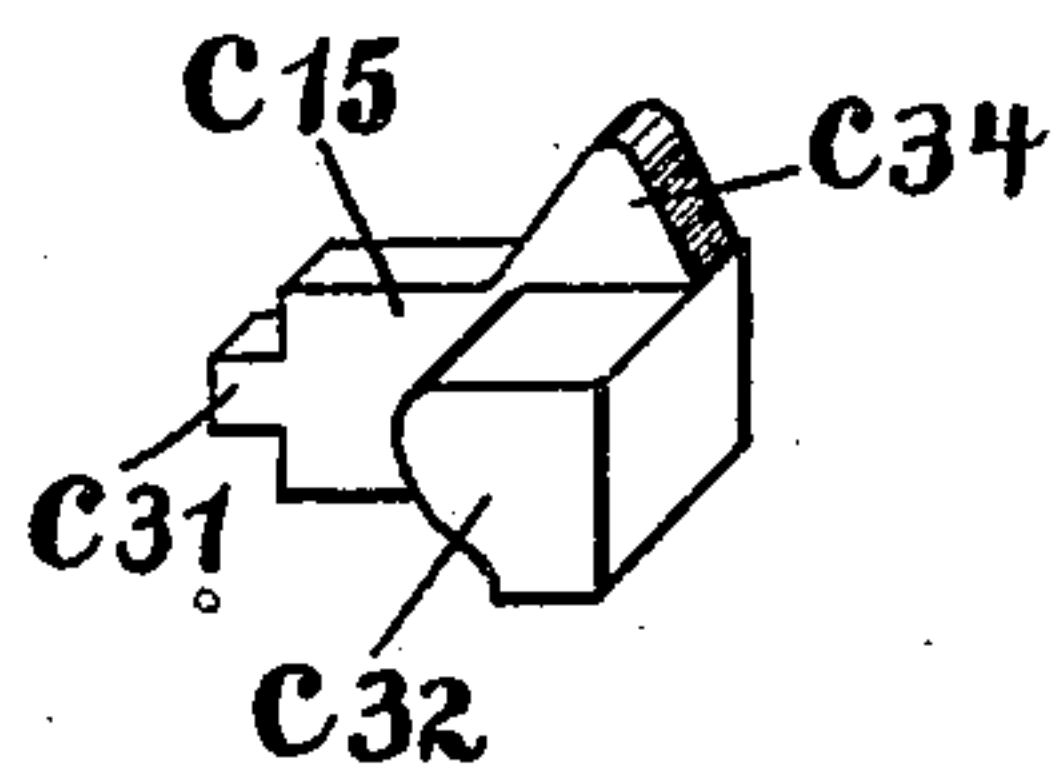


Fig. 39.



Fig. 38.

MONTH	DAY	A.M. OR P.M.	HOURL	FRACTION	LINES	
					SOUTH AVE.	
					LAKE "	
					UNIVERSITY "	
9	17	P	2	4	LYELL "	
					NORTH "	
					WEST "	
					HUDSON "	
					EXCHANGE	
					N. ST. PAUL	
					SOPHIA	
					ALLEN	
					ST. JOSEPH	
					E. MAIN	
					PARK AVE.	
					RECEIVING PUNCH	9 17 P 2 5

Fig. 36.

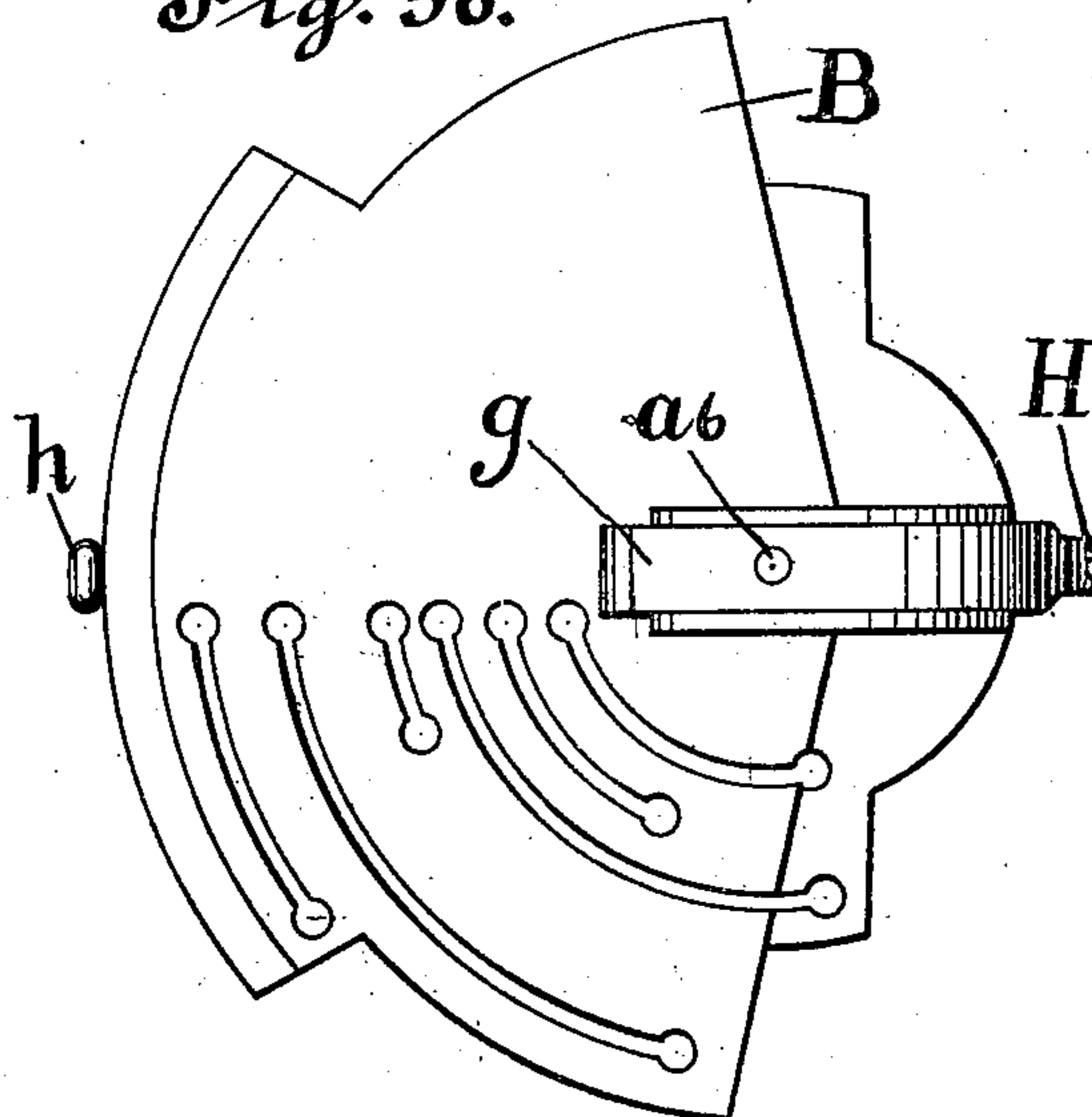
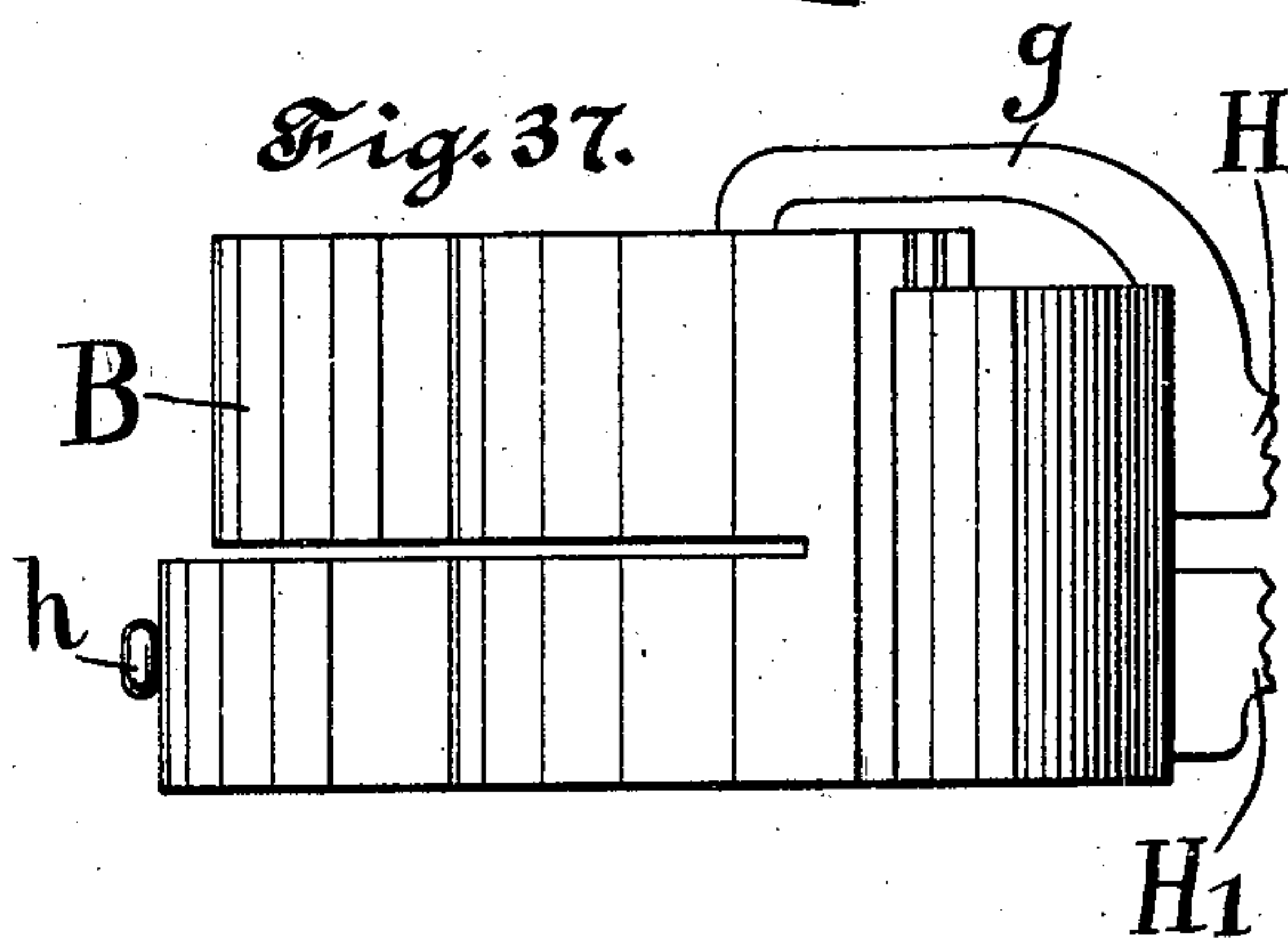


Fig. 37.



Witnesses:

B. E. Eaton

Albert C. Bell

Inventor

W. H. Cooley.

UNITED STATES PATENT OFFICE.

WILLIAM H. COOLEY, OF BROCKPORT, NEW YORK.

MEANS FOR LIMITING TRANSFER PRIVILEGES.

SPECIFICATION forming part of Letters Patent No. 680,646, dated August 13, 1901.

Application filed May 23, 1900. Serial No. 17,735. (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 Means for Limiting Transfer Privileges, of which the following is a specification.

One of the principal objects of my invention is to provide means for indicating the time limitations on a transfer or ticket of such a character that it shall be impossible for the conductor to give to a passenger a transfer good over more than the prescribed period of time without detection—that is, the conductor cannot give to any one passenger a transfer good until any particular point of time and then deliver to another passenger a transfer with a time limitation expiring earlier than that on the preceding transfer.

Another object of my invention is to provide a means for preventing the receipt and use of transfers by a conductor after the time limitation thereon has expired.

In carrying out my invention I prefer to make use of a transfer-ticket upon which there are printed in any suitable order the different divisions of the road or system of roads upon which transfers may be used or, if preferred, the points at which a transfer may be made from one road to any other road passing that particular point. In connection with such a ticket I make use of several series of time-indicating punches—a first series arranged to indicate the fractions of the hour, as “0, 1, 2, 3, 4, 5,” indicating the six even divisions of an hour of ten minutes each, or “0, 1, 2, 3,” indicating the four even divisions of an hour of fifteen minutes each. A second series of such punches is devoted to the hours of the day. A third series is devoted to the indications “A” or “P,” indicating time in the forenoon or afternoon. The next series is used to indicate the days of the month. This may be a single series for the units of days and another series for the tens of days, coöperating together to indicate the days of the month, and a sixth series is used to indicate the months of the year. These several series of punches coöperate together in such a way that the completion of a cycle in each series advances the

next series of higher denomination one step in its cycle.

I have shown each series of punches as carried by two guide-plates, in rigid connection with which there is a die-plate supported with the openings therein in proper registry with the corresponding punches. I have so arranged the punches in each system of guide-plates that the desired one of such punches may be operated upon by suitable mechanism to punch out from the ticket or transfer the desired characters standing for the intended limitations which are to be given to the ticket. One series of such punches is arranged to indicate the fractions of the hour, and when the cycle of the punches standing for the fractions of the hour has been completed then an impulse is given to the next series of punches standing for the hours of the day, which in turn at the completion of each cycle of twelve hours serves to advance the next series of punches standing for “A. M.” or “P. M.” one step. At the completion of the cycle standing for “A. M.” and “P. M.,” which really stands for twenty-four hours, the series of punches representing the units of the days of the month is advanced one step. At the completion of a cycle standing for the units of the days of the month the series of punches standing for the tens of the days of the month is advanced one step. In this way also at the completion of the cycle standing for the tens of the days of the month the series of punches standing for the months of the year is advanced one step. These coöperating series of punches and dies are arranged to be advanced by mechanism under the control of the conductor in such a way that any motion imparted thereto must be progressive, so that no one series of dies and punches can be worked backward to indicate a point of time prior to the time of punching any one transfer. The result of this is that the conductor cannot give to any passenger a transfer with an extended time limitation thereon without being compelled to give to the next transfer which he issues the same limitation. As an additional check upon the use of such transfer, each conductor upon receiving a transfer may be required to punch out of such transfer (and preferably in

a space devoted to this purpose) with his punch characters indicating the time at which he receives it. Thus we have provided a double check against the abuse of the transfer privilege, the first consisting in means for preventing the issue of a transfer with an improper time limitation and the second check consisting in an indication of the time at which the transfer is received by the conductor on the car to which the passenger is transferred.

In carrying out my invention I also provide means whereby the conductor may periodically advance the coöperating punch and die plates, so as to properly indicate the time of issuing the transfers, and as a conductor upon receiving a transfer from another line or division is required to indicate upon such transfer the time of receiving the same we have a check upon the use of the transfer which requires only an examination of the transfers handed in by each conductor independently of any consecutive numbering of conductor's numbering in order to determine if such transfers have been abused.

The accompanying drawings, illustrating my invention, are as follows:

Figure 1 is a top view of my punch with the top of the case B and also the upper jaw *g* removed. Fig. 2 is a side view of the handles and the mechanism for operating the punch, so as to bring the jaws of the punch together. Fig. 3 is a top or plan view of the upper punch-carrying plates $a^3 c^3 e^3 n^3 o^3 r^3$ with the series of punches located in each one. In this figure the arrangement of the punches in the several series is also seen. Fig. 4 is a vertical longitudinal section taken through the center of the punch with all of the parts in the position in which they are seen in Fig. 1. Fig. 5 is a view from the under side of a portion of the locking mechanism, as will be explained. Fig. 6 is an end view of the punch, as seen from the left hand or front end, with the ends of the sectors $a^3 a^2 a'$ and a removed and also the case B. Figs. 7, 8, and 9 show details in the construction and connection of the punch-carrying plates and also of the punches, as will be explained, Fig. 7 being a plan view, Fig. 8 a side view, and Fig. 9 a vertical sectional view of the parts. Fig. 10 is a vertical section through the various sectors and their supporting arms and tubes assembled, as seen in Fig. 4. Figs. 11, 13, 15, 17, 19, and 21 are top views of the several systems of punch-carrying plates, as seen when removed from the punch, while Figs. 12, 14, 16, 18, 20, and 22 show vertical longitudinal sections of parts seen in Figs. 11, 13, 15, 17, 19, and 21, respectively. Fig. 23 is an enlarged longitudinal section taken just below the lower arm a^4 , as seen in Fig. 1, and shows the operating mechanism by means of which motion is communicated to the outer series of punches, and also the mechanism by means of which each series of punches when it has completed its cycle op-

erates to advance the next series of punches to the right one step in its cycle. Figs. 24, 25, 26, 27, and 28 show vertical transverse sections of the parts seen in Fig. 23, as viewed from the right or rear end of the punch, taken along the dotted lines $x^5 y^5$, $x^6 y^6$, $x^7 y^7$, $x^8 y^8$, and $x^9 y^9$, respectively. Fig. 24^a is a perspective view, as seen from near the rear of the punch, of the cam-latch a^{15} . Figs. 29, 30, 31, and 32 show horizontal sections of only those parts seen in Fig. 23 which relate to the two outer series of punches, as seen from above and taken along the dotted lines $x y$, $x' y'$, $x^2 y^2$, and $x^3 y^3$, respectively, in Fig. 23, while Fig. 33 is a horizontal sectional view, as seen from above, of the parts shown in Fig. 23 and taken along the dotted line $x^4 y^4$. Fig. 34 shows in perspective from below and near the rear the method of supporting the cam-latch c^{15} from the plate c^{20} . Fig. 35 shows in perspective from above and near the front of the punch the cam-latch c^{15} . Fig. 36 shows in top view the punch with the case in place, but the handles H and H² and the body-piece H' and the operating mechanism connected therewith removed. Fig. 37 is a side view of the parts shown in Fig. 36. Fig. 38 is a view of one of the transfers that may be used in connection with my punch. Fig. 39 shows the pin by means of which any system of punch-plates may be returned from its extreme forward position to its starting-point.

Referring to the drawings, my punch consists in a pair of coöperating and parallel moving parts H and H', connected together by means of links b' and b^2 , articulating at their forward or left-hand ends on pins passing through the parts H and H', respectively, and connected together at their rear ends also by means of pins working in slots j' and j at the rear or right-hand ends of the body-pieces H' and H, respectively. Articulating upon screws, as indicated in Figs. 1 and 2, screwed into the upper body-piece H, are seen the links b^5 . Similar links b^6 are seen articulating upon screws in the lower body-piece H'. The handle-piece H² has members extending each side of the body-pieces H and H' and articulating upon pins with these links b^5 and b^6 in such a way, as seen, as to afford a greatly-increased leverage for the operation of the punch when the handle H² is operated in connection with the body-piece H, which taken together serve as the handles of my punch. The construction as thus far outlined consists, substantially, in the usual arrangement of parallel moving parts such as seen in pliers and punches, with the exception, perhaps, of the mechanism for operating these parts consisting in the handle H² and the links b^5 and b^6 . The body-piece H is curved upward and around the punch-carrying plates and terminates at its left-hand end in a horizontal jaw *g*, as indicated in Figs. 4, 36, and 37, arranged to press upon and force downward those punches in each series which, according to the several positions of the

punch-carrying plates, happen to lie in a straight line passing through the longitudinal axis of the punch.

At the rear end of the body-pieces H and H' in Figs. 2 and 4 is seen a pin p , serving to maintain lateral alinement between such body-pieces. A spring f , suitably supported in holes therefor in the body-pieces H and H', serves to force them apart after each act of punching.

A suitable stud a^6 , revolubly secured in the lower body-piece H' of my punch, works freely in a hole therefor in the upper body-piece H, so as to admit of the reciprocating motion of the parts H and H'. Upon this pin a^6 , as seen in Fig. 10, are assembled the several systems of punch-carrying plates in the manner to be explained. As seen in Figs. 1, 4, 10, 11, and 12, the outer system of punch-carrying plates consists in four segmental plates a a' a^2 a^3 , similar in conformation, and with the lower plates a and a' secured together at each end by a vertical member, and by means of which they are connected also at each end to a radial arm a^5 . The upper segmental plates a^2 and a^3 are similarly secured together at each end by a vertically-disposed member, and by means of which they also are connected at each end to a radially-disposed arm a^4 . The upper radially-disposed arms a^4 and also the lower arms a^5 are connected together at their inner ends and are rigidly secured at their junction upon the pin a^6 , as indicated in Figs. 1, 4, 10, 11, and 12. As seen in Figs. 1, 4, 10, 13, and 14, a similar system of segmental plates, c , c' , c^2 , and c^3 are similarly arranged, supported and carried by upper radially-disposed arms c^4 and lower radially-disposed arms c^5 , these upper and lower radially-disposed arms c^4 and c^5 being connected together by the tube c^6 , which fits between the arms a^4 and a^5 upon the pin a^6 and is revoluble upon such pin a^6 . As seen in Figs. 1, 4, 10, 15, and 16, a similar system of segmental plates e e' e^2 e^3 are carried by means of upper radial arms e^4 and lower radial arms e^5 , united at their junction by a tube e^6 , which fits between the arms c^4 and c^5 upon the tube c^6 and is revoluble in turn upon such tube c^6 . Again, as seen in Figs. 1, 4, 10, 17, and 18, a similar system of segmental plates n n' n^2 n^3 is supported and carried by means of upper radial arms n^4 and lower radial arms n^5 , united at their inner ends by a tube n^6 , which fits between the arms e^4 and e^5 upon the tube e^6 and is revoluble upon such tube e^6 . As seen in Figs. 1, 4, 10, 19, and 20, a similar system of segmental plates o o' o^2 o^3 is supported by means of upper radially-disposed arms o^4 and lower radially-disposed arms o^5 , united at their inner ends by means of a tube o^6 , which fits between the arms n^4 and n^5 upon the tube n^6 and is revoluble in turn upon such tube n^6 . Again, as seen in Figs. 1, 4, 10, 21, and 22, a similar system of segmental plates r r' r^2 r^3 are supported in

this case, however, directly from a tube r^6 , which fits and is revoluble in turn upon the tube o^6 , the plate r being supported from and beneath the plate r' .

Refer now to Figs. 1, 3, 4, and 6. In the two upper segmental plates a^2 and a^3 are punched out a series of openings, as indicated in Fig. 3, such that rods having cross-sectional conformations which would punch out characters as follows—"0, 1, 2, 3, 4, 5"—may freely work therein. There are also punched out in the plate a' a similar series of openings so arranged as to exactly register with those openings just described and seen in the plates a^2 and a^3 . The openings in these plates a^2 and a^3 serve as guides for vertically operating punches so formed throughout their entire length that they shall be capable of vertical movement through the series of plates a' , a^2 , and a^3 . Located in the plates a^2 and a^3 are seen six of these punches, arranged when forced downward so as to pass into and through the corresponding openings in the plate a' , with which they register, to punch out characters as follows—"0, 1, 2, 3, 4, 5"—reading from the bottom in Fig. 3 upward and to the right. Each of these punches, as a^7 , Fig. 6, is held in the position indicated in Figs. 4 and 6 by means of a small coil-spring a^9 , operating against a suitable washer a^8 , secured upon such punch at such a point in its height as to allow this punch to be raised so that its lower end shall lie a little above the lower surface of the plate a^2 . This construction is more fully indicated in detail in Fig. 9 for the series of plates o , o' , o^2 , and o^3 , o' being the die-plate and between which and the plate o^2 the punching is effected. The punch o^7 is held upward by means of the coil-spring o^9 , working against the washer o^8 , secured upon this punch o^7 at such a point, as indicated, that the operation of the spring thereon will hold the punch o^7 with its lower end a little above the lower surface of the plate o^2 . All of the punches are supported in exactly this same way, and to avoid confusion letters of reference to many of these individual punches and also to the washers and the springs is entirely omitted from the other figures. The upper and lower guide-plates o^3 and o^2 , as well as all of the punch-carrying plates, are held at suitable distances apart by means of studs p^2 , riveted into these plates o^2 and o^3 and located between the holes in such plates through which the several punches are arranged to move, as indicated in Fig. 8. In Fig. 4 to avoid confusion only one punch is shown in each system of plates, and such ones as are so shown are the ones seen in operative position in Fig. 1.

Referring to Figs. 1, 3, and 4, in the plates a^3 and a^2 is arranged a series of punches coöperating with the openings in the die-plate a' to punch out from the ticket or transfer openings which shall stand for the following characters: "0," "1," "2," "3," "4," or "5." Similarly the punches carried by the

plates c^3 and c^2 cooperate with the corresponding openings in the die-plate c' to punch out from the ticket or transfer "1," "2," "3," "4," "5," "6," "7," "8," "9," "10," "11," or "12." The punches carried by the plates e^3 and e^2 cooperate with the corresponding opening in the die-plate e' to punch out either the character "A" or "P," while the punches carried by the plates n^3 and n^2 cooperate with the corresponding openings in the die-plate n' to punch out characters as follows: "0," "1," "2," "3," "4," "5," "6," "7," "8," or "9." Similarly the punches carried by the plates o^3 and o^2 cooperate with the corresponding openings in the die-plate o' to punch out characters as follows: "0," "1," "2," or "3," while the punches carried by the plates r^3 and r^2 cooperate with the corresponding holes in the die-plate r' to punch out characters as follows: "1," "2," "3," "4," "5," "6," "7," "8," "9," "10," "11," or "12." In constructing my punch the lower radially-disposed arms a^5 are first rigidly secured upon the rod a^6 . The lower radially-disposed arms c^5 are rigidly secured upon the tube c^6 , and so on for each of the other systems of plates, excepting r , r' , r^2 , and r^3 . The upper radially-disposed arms a^4 , c^4 , &c., are not yet secured to the rod a^6 , tube c^6 , &c. Then the tubes c^6 , e^6 , n^6 , o^6 , and r^6 are placed one on the other on the rod a^6 in the order named. The plates r , r' , r^2 , and r^3 are all rigidly secured in proper registry to the tube r^6 before assembling. Then the upper radially-disposed arms o^4 are forced upon the upper end of the tube o^6 and rigidly secured thereto, care being taken to have the punch-openings in the plates o^2 and o^3 register properly with the corresponding openings in the plate o' . Then the radially-disposed arms n^4 , e^4 , c^4 , and a^4 are similarly forced upon the upper ends of the tubes n^6 , e^6 , c^6 , and the rod a^6 , respectively and in the order named.

Referring to Figs. 4 and 22, through the opening in the lower segmental plate r there is formed a union between the channeled jaw g' and the extension g^2 , formed on the body-piece H' and lying underneath the plates a c e n o r . The upper surface of this channeled jaw g' extends under and supports each one of the plates a' c' e' n' o' r' , and in this jaw g' there are located preferably round clearance-holes, arranged to register with the holes in these plates a' c' e' n' o' r' when such plates are in their operative positions for the punching of the ticket. The portions of the ticket that are punched out drop into the channel formed on the under surface of this jaw g' , and upon the turning of the left-hand end of the punch downward these punchings fall out of the opening at the left-hand end of this channeled jaw g' .

Referring now to Figs. 23, 24, 24^a, 25, 26, 27, and 28, at the left-hand end of the lower section of the punch a handle h is located, which is connected through a suitable slot in the case B with the plate a^{10} , and by means

of which such plate a^{10} is reciprocated horizontally, so as to impart motion to the plates a a' a^2 a^3 in the manner following: The plate a^{10} carries a spring-pawl a^{11} , pivoted thereto, and from the free or upper end of which there projects to the right, as seen in Fig. 23, and toward the observer from the plane of the drawings, as seen in Figs. 27 and 28, a pin a^{21} , arranged to engage at the proper time the teeth in the ratchet a^{12} , projecting downward from the under surface of the plate a . To the right of this ratchet a^{12} , as seen in Fig. 23, is a cam-plate a^{13} , in the slot in which this projecting pin a^{21} is always retained. This cam-plate a^{13} in turn is supported from the plate a^{14} , rigidly secured to the extension g^2 of the body-piece H' . In this plate a^{13} there is formed a slot, in which there is arranged to slide vertically the cam-latch a^{15} . This cam-latch a^{15} has a projection a^{34} , which is so engaged by a spring a^{26} as to hold up this cam-latch a^{15} with the latch a^{31} thereon in one of the notches in the rack a^{16} . A cam a^{32} , formed on this cam-latch a^{15} , is arranged to close the groove in the cam-plate a^{13} when this cam-latch a^{15} occupies its upper position, locking the plate a from motion either to the right or to the left. The spring a^{26} cooperates with the projection a^{34} on the cam-latch a^{15} , against which it bears, in such a way that when the cam-latch a^{15} is up the spring a^{26} tends to keep it in that position. It also tends to restore the cam-latch a^{15} to such position when it has been pressed down only far enough to clear the rack a^{16} , as shown in Fig. 24; but the conformation of the parts is such, as will at once be understood, that when the cam-latch a^{15} is pressed clear down by the cam a^{25} on the extreme right-hand end of the plate a , then this spring a^{26} tends to hold such cam-latch a^{15} in its extreme downward position until by the return of this plate a to its extreme right-hand position the cam a^{24} on the left-hand end of this plate a engages the projection a^{33} formed on the left-hand side of the cam-latch a^{15} and raises it to its upper position. The forward movement of the plate a is downward and to the left, as seen in Figs. 1 and 3. As seen in Fig. 23, it is toward the observer, and as seen in Figs. 24, 25, 26, 27, and 28 it is from the right toward the left, until each one of the punches arranged to punch out the characters "0" "1" "2" "3" "4" "5" in regular order have been brought under the jaw g , formed on the body-piece H , and by means of which such punches may be forced downward and through the corresponding openings in the plate a' . At the completion of the cycle of the plates a^3 , a^2 , a' , and a the cam-latch a^{15} is forced downward and held there by the spring a^{26} , so that, referring to Figs. 24, 25, 26, 27, and 28, such plates a a' a^2 a^3 may be returned to their extreme right-hand position, which is the starting position for the next cycle of such plates. The pin a^{21} on the upper free end of the spring-pawl a^{11} works constantly

in the groove formed in the cam-plate a^{13} , and the reciprocation of the plate a^{10} laterally, by means of the handle h , serves to advance the plate a one step to the left for each complete motion to the left of such plate a^{10} . This plate a^{10} is suitably supported by means of its connection with the handle h to admit of such reciprocating motion being imparted thereto. The pawl a^{11} is arranged to be operated upon by two springs near the pivotal point thereof in such a way that the pin a^{21} , projecting from the upper end thereof, shall never stop at the neutral point at either end of the elliptical groove formed in the plate a^{13} . The cam-latch a^{15} is seen in perspective view in Fig. 24^a. Attention is called to the fact that each sector is advanced in uniform steps during the range of its operative positions, and then, lastly, each sector, except the sector r , is advanced over a greater distance in order that it may communicate to the next succeeding sector the necessary angular motion to constitute one step in the cycle of such next succeeding sector. Thus it will be seen that all of the teeth on the ratchet a^{12} except the last must have one and the same conformation, while the last tooth on the ratchet a^{12} must have a different conformation as to its length and as to its operative face. The teeth are shown only diagrammatically in the drawings, and there is not given to them the conformation in the above-referred-to details necessary to secure these different angular advances. The conformations for securing this result are so clearly shown, described, and claimed in another pending application of mine, serially numbered 16,200, filed May 10, 1900, that no detailed illustration or description is herein given. These same remarks apply to the ratchets yet to be described for operating the sectors c , e , n , o , and r , except that in the case of the sector r , as no other sector is advanced thereby, the additional step is omitted and of course the teeth upon the ratchet r^{12} for actuating the sector r are all of the same conformation.

Pivotaly secured to the under surface of the plate a and near the inner edge thereof, and also near the upper right-hand corner thereof, as indicated in dotted lines in Fig. 29, is seen a spring-pawl c^{11} , whose function, construction, and arrangement are very similar to the spring-pawl a^{11} , already described, except that its motion is in a horizontal rather than in a vertical plane, as is the case with the spring-pawl a^{11} . A pin c^{21} , extending downward from the free end of this pawl c^{11} , is arranged to work in a groove formed in the cam-plate c^{13} , as indicated in Fig. 30, whereby as the plate a is advanced one step after the last punch in the series carried by the plates a^3 and a^2 has been brought into operative position and under the jaw g , formed on the body-piece H , then this pin c^{21} , projecting downward from the spring-pawl c^{11} and working in the groove in this cam-plate c^{13} , is

forced to the right, as seen in Fig. 30, and engages one of the teeth on the ratchet c^{12} , rigidly supported from and a little below the under surface of the plate c . The further movement of the plate a to its extreme downward position, as indicated in Figs. 1, 3, 29, and 33, or to its extreme left-hand position, as seen in Figs. 24, 25, 26, 27, and 28, then serves to advance the plate c one step, carrying with it also the plates c' , c^2 , and c^3 and the series of punches carried by such plates and operating therein. The extreme movement of the plate a , just above described, results in the pin c^{21} being forced to the left in passing downward, so as to be free from the cam-plate c^{13} . Then under the influence of the springs operating at the upper end of the pawl c^{11} such pawl is forced to the left, so that the pin c^{21} upon the return movement of the plate a passes to the left of the cam-plate c^{13} , so that the plate a may be returned to its starting position. The cam-latch c^{15} , as seen in Figs. 23, 30, 31, and 32, serves, by means of the latch c^{31} thereon, when in its extreme right-hand position to lock the plate c by engaging the notches in the rack c^{16} , supported from the ratchet c^{12} , as indicated in Figs. 23 and 32. A cam c^{32} on this cam-latch c^{15} passes through the cam-plate c^{13} in such a way as to be engaged by the pin c^{21} upon the spring-pawl c^{11} , so as to release the latch c^{31} of the cam-latch c^{15} from the rack c^{16} just prior to the engagement of the ratchet c^{12} by means of this pin c^{21} . Thus the plate c is released from the cam-latch c^{15} just before such plate is advanced by the pin c^{21} engaging one of the teeth in the ratchet c^{12} by the forward movement of the plate a , by which such pawl c^{11} is carried, as indicated in Fig. 29 and already described.

Referring to Fig. 32, a projection c^{25} , formed on the left-hand side of the rack c^{16} and at its upper end, is arranged to so engage the latch c^{31} on the cam-latch c^{15} as to force it to its extreme left-hand position, where it is held by the spring c^{26} , cooperating with the projection c^{34} on the under side of this cam-latch c^{15} in a manner similar to the cooperation already described between the cam-latch a^{15} and spring a^{26} , so that when the plate c has completed its cycle the latch c^{31} is held out of engagement with the rack c^{16} by the spring c^{26} , so as to permit of the free return of the plate c to its starting-point, when the projection c^{24} , formed on the left-hand side of the rack c^{16} and at its front end, engages the projection c^{34} on the cam-latch c^{15} , so as to force it to its extreme right-hand position, causing the latch c^{31} to engage the first notch in the rack c^{16} , carried by the plate c . As the cooperation between the plate c and the plate e is exactly similar to that already described between the plate a and the plate c , no further description of the cooperation between such plates or between the plates e and n , or n and o , or o and r is called for in this connection, the operation being such that

each one of such plates when it is advanced a short distance after the completion of its operative cycle (which is that portion of its movement during which some of the punches 5 carried by the upper plates of corresponding number are in a position to be engaged by the jaw *g*) it in turn advances the next plate to the right or toward the center of the punch one step in its cycle. Each one of such plates 10 at the completion of its operative cycle and the extra movement needed to impart an impulse to the next succeeding plate serves to release the latch by which it is held, such latch remaining out of engagement with its 15 corresponding rack until such plate is returned to its starting position, when such latch is again forced into engagement with the first notch in its corresponding rack, whereby each of such plates is held in proper 20 position for each advance thereof by its corresponding latch. In Figs. 24, 25, 26, 27, and 28 no holes are shown through the upper surface of this channel-piece *g'*, their location laterally being indicated by dotted lines.

Fig. 33, to which reference is now made, is a horizontal section of the parts seen in Fig. 23, taken along the dotted line x^4y^4 , with the parts above such line removed. In this view, Fig. 33, only the extreme ends of the plates *a c e n o r* 30 are shown in diagram and with the portions thereof between such extreme ends broken away. The plate *a* carries on its under surface and at its rear or upper end a cam projection a^{18} and also on its under surface and at its lower or front end a cam projection a^{30} . 35 These cam projections are arranged to so engage a pin a^{19} , projecting upward through a suitable slot therefor in the lower side of the arm g^2 and from the slide *d*, as seen in Fig. 23, that as the plate *a* completes its extreme forward motion the pin a^{19} is moved to the right, as indicated in Fig. 33, carrying with it this slide *d*, the function of which will be explained later. The return of this plate *a* 45 to its starting position again forces this slide *d* to the left by the engagement of the cam projection a^{30} with the pin a^{19} . From this slide *d* there extends upward through suitable slots therefor in the lower part of the arm g^2 also the pins $c^{19} e^{19} n^{19} o^{19} r^{19}$, arranged, 50 when such pins are moved to the right, so that they may be engaged and held in their extreme right-hand positions by means of latches $c^{29} e^{29} n^{29} o^{29} r^{29}$, suitably pivoted upon 55 the upper surface of this member g^2 .

Referring again to Fig. 33, as the plate *c* is moved to its extreme downward position a pin c^{27} serves to force the latch c^{29} into engagement with the pin c^{19} , where it remains 60 until by the return of this plate *c* to its starting position the pin c^{28} , also carried by this plate *c*, forces the latch c^{29} out of engagement with the pin c^{19} . From the arrangement seen in Fig. 33 it will be understood that an ex- 65 actly similar operation takes place at the completion of the forward motion of each one of the plates *e n o r*, and at the return of

such plates to their starting positions their corresponding latches are released from en- 70 gagement with the corresponding pins. It will of course be understood that no one of the plates *c e n o r* is ever advanced to its extreme downward position, as seen in Fig. 33, except by the motion of the plate *a* to its extreme downward position. The movement 75 of this plate *a* to its extreme downward position results by means of the coöperation between the projection a^{18} and the pin a^{19} in forcing the slide *d* to the right. At this same time, however, it will further be understood 80 that either the plate *c* alone or with it the plate *e* or with them both the plate *n* or with all three of the plates just mentioned the plate *o*, or all of the plates *c e n o r*, may be moved to their extreme downward positions 85 simultaneously with the plate *a*. Such ones, however, of such plates *c e n o r* as are advanced to their extreme forward or downward positions carry with them their corresponding latches $c^{29} e^{29} n^{29} o^{29} r^{29}$, causing 90 such latches to engage the corresponding pins $c^{19} e^{19} n^{19} o^{19} r^{19}$ immediately after such pins have been moved to the right by the operation of the plate *a* in a manner already described, and thus holding this slide *d* in 95 its extreme right-hand position until all of such plates *c e n o r* as have been thus moved to their extreme forward or downward positions are returned to their starting positions, it being necessary that each one of such 100 plates shall be returned to its starting position in order that all of the latches $c^{29} e^{29} n^{29} o^{29} r^{29}$ shall be released from their corresponding pins, so that the slide *d* may be returned to its left-hand position, as seen in Figs. 4 105 and 5. Attention is called to the fact that no one of the latches $c^{29} e^{29} n^{29} o^{29} r^{29}$ can be brought into engagement with its corresponding pin except when this slide *d* is forced to the right, which can occur only when the 110 plate *a* is moved to its extreme forward position, causing the slide *d* to be forced to the right by means of the projection a^{18} on the under side of this plate *a*. The pin *p'*, secured in the body-piece H, projects downward through a hole in registry therewith in the body-piece H' in such a way that when the punch is operated this pin may pass to the right-hand end of the slide *d* only when 115 this slide *d* occupies its extreme left-hand position, as indicated in Figs. 4 and 5. The result of this, it will at once be understood, is that the punch cannot be operated after either the first one, or two, or three, or four, or five, or all of such plates *a* 125 *c e n o r* have been moved to their extreme forward or downward position until they have been returned, all of them that have reached their extreme forward or downward position, to their starting positions. The con- 130 formation of these latches $c^{29} e^{29} n^{29} o^{29} r^{29}$ is such, it will at once be seen, that they are held in engagement with their corresponding pins projecting upward from the slide *d* by

means of the spring f' , operating to force this slide d a little to the left only when in its extreme right-hand position. The latches c^{29} , e^{29} , n^{29} , o^{29} , and r^{29} may be held at either extreme position by means of any suitable springs, (not shown,) but similar in conformation and operation to the springs a^{20} . The slide d works in a suitable groove therefor in the under side of the arm g^2 and may be held therein by the bottom of the case B. In this slide d there is formed a suitable slot for the lower end of the pin a^6 . In this case B there is a suitable slot for the connection between the handle h and plate a^{10} . An opening is also provided in the case B opposite the channel in the jaw g' , through which the punchings may drop out.

For returning each series of punches to its starting position after it has been advanced to its extreme forward position I use a pin, such as seen in Fig. 39, which is inserted through the circular opening at the forward end of the corresponding one of the slots seen in the top of the case in Fig. 36, and when any one of the series of punches has been advanced to its extreme forward position the lower end of this pin enters a corresponding hole therefor in the forward one of the radially-disposed arms connecting the punch-carrying plates, and then by moving such pin the proper system of punch-plates and punches carried thereby may be returned to its starting position, when the pin may be removed through the circular opening provided therefor at the rear end of each of such slots.

To provide for the extreme motion of the plates r r' r^2 r^3 , three holes in the upper plate r^3 are provided for the insertion of this pin, so that the motion of this pin which is permitted in the corresponding slot is sufficient to provide for the return in three operations or in three successive steps of such system of plates to its starting-point.

The operation of my punch may be divided into three parts, as follows: First, the operation of the punches by means of the handles H and H²; second, the operation of the system of sectors carrying the punches standing for the fractions of an hour for the purpose of advancing the time indication the desired fractional part of an hour; third, the operation of the system of sectors carrying the punches standing for hours of the day by suitable mechanism from the system of sectors carrying the punches standing for fractions of an hour. A clear understanding of these operations is all that is necessary, as the operation of any one of the systems of sectors from the next one of lower time value is precisely the same as that to be described in the third operation.

First operation: Refer to Figs. 1, 2, 4, 37, and 38. The means by which it is possible to adjust the systems of sectors so that the punches will punch out any desired time indication will be readily understood by reference to the second and third operations de-

scribed below. The transfer, as shown in Fig. 38, is inserted through the opening in the case B, Fig. 37, between the plates a^2 , c^2 , e^2 , n^2 , o^2 , and r^2 and the die-plates a' , c' , e' , n' , o' , and r' , Fig. 4, in such a way that the line to which the transfer is issued shall come opposite to the jaws g and g' , Fig. 4, of the punch, and then the handles H and H², Fig. 2, are forced together. As a result of this, through the operation of the links b^5 and b^6 , Figs. 1 and 2, the body-pieces H and H' are forced together and carry with them the jaws g and g' . As the jaw g approaches the jaw g' the punches lying in the plane passing longitudinally through the handles and jaws and the center of the rod a^6 , Fig. 4, are pressed by this jaw g through the transfer into the corresponding die-plates against the action of the spring f and also the springs on such punches, Fig. 4. When the pressure on the handles is relieved, the spring f , Fig. 4, forces the body-pieces H and H' apart, and with them the jaws g and g' . As the jaws recede from each other the springs on the operated punches draw such punches out of the die-plates and back through the punch-plates, which latter serve as strippers to remove the transfer from such punches. The transfer is then withdrawn and has punched out of it the desired time indication.

Second operation: Refer to Figs. 1, 3, 4, 5, 6, 7, 8, 9, 11, 12, 23, 24, 24^a, 25, 26, 27, 28, 33, 36, 37, and 39. When it is necessary to advance the sectors a , a' , a^2 , and a^3 , Figs. 1, 3, 4, 6, 11, and 12, carrying the punches standing for the fractions of an hour, the handle h , Figs. 1, 23, 36, and 37, is moved first away from and then toward the observer, as seen in Fig. 23, each time as far as it will go, which results in moving the plate a^{10} , Figs. 27 and 28, to its extreme right-hand position and then to its extreme left-hand position, as seen in Figs. 27 and 28. From the pawl a^{11} , Figs. 27 and 28, which is pivoted to this plate a^{10} , a pin a^{21} , Figs. 23, 27, and 28, extends into the cam-slot in the cam-plate a^{13} , Figs. 23 and 26, and the motion of the plate a^{10} , as just described, causes this pin a^{21} to travel in such cam-slot always over to the left, as seen in Fig. 26—that is, to the left in the upper portion and to the right in the lower portion of such cam-slot—as a result of the operation of the springs seen in Figs. 27 and 28 upon such pawl a^{11} . The upper spring throws the pawl down at the left-hand end, while the lower spring throws the pawl up at the right-hand end of such cam-slot, as the right-hand end of this cam-slot is lower than the left-hand end. Thus when the plate a^{10} is moved to the right, as seen in Figs. 27 and 28, the pin a^{21} is moved through the lower part of the cam-slot in the cam-plate a^{13} , Fig. 26, and does not engage the ratchet a^{12} , Fig. 27. Then when moved to the left, as seen in Figs. 27 and 28, the pin a^{21} is caused by the lower spring of the pawl a^{11} to pass into the upper part of the cam-slot in the cam-plate a^{13} . When it has

almost reached the middle of such slot, it engages the cam a^{32} , Fig. 26, and forces it downward, and the latch a^{31} , Fig. 24, connected therewith, is also forced downward out of engagement with the rack a^{16} , against the action of the spring a^{26} , but not far enough downward to reverse the action of such spring. This frees the sector a from the lower member g^2 of the punch, and at the same time that the latch a^{31} is withdrawn from the rack a^{16} the pin a^{21} engages the rear surface of one of the teeth of the ratchet a^{12} and moves the sector a in the direction to bring the next time indication into operative position, and the continued motion to the left of the plate a^{10} first releases the cam-latch a^{15} , Figs. 24 and 24^a, which is forced upward by spring a^{26} to engage the rack a^{16} as soon as the next notch of such rack comes opposite to the latch a^{31} . After once engaging the rear face of one of the teeth of the ratchet a^{12} the motion of the plate a^{10} to the left causes the pin a^{21} to carry the ratchet a^{12} , and hence the sector a , along with it until the cam-slot in the cam-plate a^{13} draws the pin a^{21} downward away from the ratchet a^{12} , and at just the time when the pin a^{21} is released from the ratchet a^{12} the rack a^{16} has been sufficiently advanced to be again engaged by the latch a^{31} . It will of course be understood that the pitch of the teeth on the ratchet a^{12} and the pitch of the notches on the rack a^{16} , as well as the distance moved by the sector a for each complete motion of the handle h , as just described, corresponds angularly exactly with the pitch of the punches carried by the sectors a^2 and a^3 —that is, the distance from the center of one to the center of the next punch carried by such sectors. The pins p^3 (seen in Figs. 1, 3, 6, 7, 8, and 9) are provided on all of the sectors a^3 , c^3 , e^3 , n^3 , o^3 , and r^3 in order that the racks carried by all of the sectors a c e n o r must be engaged by their corresponding cam-latches to permit the jaws g and g' to be brought together; otherwise the jaw g would strike against some of the pins p^3 , and such pin or pins would prevent the operation of the punch at all until the sectors were properly adjusted, Figs. 6 and 9. When the punches indicating the fractions of the hour have been advanced until (in this case) the indication "5" is brought into operative position, since the motion must necessarily be ahead and cannot be backward when the punch-jaws are operative, in order to return the sectors to the position to bring the first of this series of punches, or 0, into operative position it is first necessary to advance these sectors one step beyond the "5." This first brings the cam a^{18} , carried by the sector a , Figs. 23 and 33, against a pin a^{19} , Figs. 23 and 33, carried by the sliding bar d , Figs. 4, 5, 6, 23, 24, 25, 26, 27, and 28, and this forces the bar d back toward the handles of the punch. Immediately after this operation the cam a^{25} , carried by the sector a , forces the cam-latch a^{15} down so far that the action of the spring a^{26} is reversed and the sectors a ,

a' , a^2 , and a^3 are free from the member g^2 ; but by the operation of the cam a^{18} the bar d was moved to the right, as seen in Fig. 4, so that its right-hand end is beneath the pin p' , which is fixed in the upper body-piece H. This prevents operating the punch, as the bar d is right in the path of the pin p' . In order to again make the punch operative, the sectors a , a' , a^2 , and a^3 must be returned to their zero position, at which time the cam a^{30} , carried by the sector a , Fig. 33, engages the pin a^{19} from the opposite side and forces the bar d back out of the path of the pin p' , at which time also the cam a^{24} , Fig. 24, engages the projection a^{33} on the cam-latch a^{15} , Fig. 24, and forces the same upward until the action of the spring a^{26} is again reversed, and it causes the latch a^{31} on such cam-latch a^{15} to engage the first notch in the rack a^{16} . The sectors a , a' , a^2 , and a^3 are returned to their starting position by means of the pin shown in Fig. 39, which is inserted through the outside circular slot, (shown in Fig. 36,) into the hole in the arm a^4 , Fig. 11. By moving the pin, which is inserted through the lower end of the slot, as seen in Fig. 36, up to the upper end these sectors and the punches carried by them are returned to their starting position.

Third operation: Refer to Figs. 1, 3, 4, 13, 14, 23, 29, 30, 31, 32, 33, 35, 36, and 39. At the same time that the sector a is advanced from its last operative position in order to free it from the cam-latch a^{15} , as already described, the pin c^{21} , carried by the pawl c^{11} , Figs. 23, 29, and 30, is moved through the cam-slot in the cam-plate c^{13} , Figs. 30 and 31. The pin c^{21} first engages the cam c^{32} and withdraws the latch c^{31} from the rack c^{16} , but does not reverse the action of the spring c^{26} , Figs. 30, 31, 32, and 35. At the same time that the rack c^{16} is released the pin c^{21} engages the rear or radial face of one of the teeth of the ratchet c^{12} , Fig. 30, and as the motion of the sector a is continued the pawl c^{11} and pin c^{21} move the ratchet c^{12} , and hence also the sector c , along with the sector a , which motion is continued until the sector c has been sufficiently advanced to bring the next punch carried by the sectors c , c' , c^2 , and c^3 , Figs. 1, 3, 4, 13, and 14, into operative position between the jaws g and g' , at which time the cam-slot in the cam-plate c^{13} has drawn the pin c^{21} away from the operating-face of the tooth of the ratchet c^{12} , with which it was in contact. At this time, also, the rack c^{16} has advanced sufficiently so that the cam-latch c^{31} engages another notch in such rack c^{16} , Fig. 32. When the sector a is returned to its starting position as a result of the conformation of the cam-slot in the cam-plate c^{13} and the action of the springs on the pawl c^{11} , the pin c^{21} passes to the left of the cam-plate c^{13} , Figs. 30 and 31. When the sector c has been advanced until the last punches in its series, or "12," have been brought into operative position, the sector c must be advanced another

step in order to release such sector *c* and permit its return to the starting position, which is accomplished in the manner just described, and this results in forcing the latch *c*³¹ so far out from the rack *c*¹⁶ by means of the cam *c*²⁵, carried by such rack, Fig. 32, that the action of the spring *c*²⁶ is reversed and the sector *c* is free to be returned to the starting position. This is done by means of the pin shown in Fig. 39, which is inserted through the lower end of the second circular slot from the outside in the case B, Fig. 36, into the hole in the arm *c*⁴, Fig. 13. The pin is moved upward in this slot, as seen in Fig. 36, and when it reaches the upper end of such slot the sector *c* has been returned to its starting position. At this time also the cam *c*²⁴ on the rack *c*¹⁶ has engaged the projection *c*³⁴ on the cam-latch *c*¹⁵ and forced the latch *c*³¹ into the first notch of such rack *c*¹⁶ and at the same time again reversed the action of the spring *c*²⁶. In order to necessitate the return of the sector *c* to its starting position after it has completed its cycle, the sector *c* is advanced from its last operative position to the position to release the rack *c*¹⁶ from the latch *c*³¹, at which time the pin *c*²⁷, carried by such sector *c*, Fig. 33, engages the latch *c*²⁹ and pushes it downward, as seen in Fig. 33; but just before this occurs the cam *a*¹⁸ has pushed the sliding bar *d* to the right by engaging the pin *a*¹⁹, as already described, and this results in moving the pin *c*¹⁹, secured in the sliding bar *d*, just to the right of the latch *c*²⁹; but the cam-surface on the end of this latch *c*²⁹ forces the pin *c*¹⁹, and hence the bar *d*, still farther to the right as the pin *c*²⁷ pushes the latch *c*²⁹ into engagement with the pin *c*¹⁹. This extra motion to the right of the bar *d* is opposed by the spring *f*¹, Fig. 4, which as a result of the conformation of the cam on the end of the latch *c*²⁹ serves to lock the latch when the sector *c* is moved back until such latch *c*²⁹ is forcibly disengaged from such pin *c*¹⁹ by means of the pin *c*²³, at which time the sector *c* is in its starting position. Each sector *e*, *n*, *o*, or *r* is operated from the sector *c*, *e*, *n*, or *o* preceding it in precisely the same manner as the sector *c* is operated from the sector *a*, and a similar locking mechanism to that operated by the sector *c* is operated by each of the sectors *e*, *n*, *o*, and *r*, as indicated in Fig. 33.

In using my punch the conductor inserts the ticket through the slot seen in the front side of the case and forces the body-piece *H*, which is the upper handle-piece, and the handle-piece *H*² together in the usual way, thus causing those punches in each series which are arranged in a line with the longitudinal axis of the punch to operate upon the ticket and punch therefrom the desired characters. Each of the several systems of punches is advanced in the manner already described from time to time by the operation of the handle *h* in such a way that the punchings given to the transfers or tickets shall bear the desired time indications. The conductor may

be required to advance the punches at intervals of time corresponding with any predetermined arrangement in the points of time at which he passes any particular points in his route or at predetermined points of time indicated by a clock upon the car. The issuing conductor will punch the transfer opposite the line to which the passenger is to be transferred, as indicated in Fig. 38. The receiving conductor will also punch the transfer in a space provided for that purpose in such a way as to indicate thereon the time at which he receives the transfer. It will at once be understood that it is not possible for a conductor to give to a transfer which he receives a time indication differing from that which he gives at the same time to the transfers which he issues.

By the use of transfers substantially as indicated in connection with my punch in the manner described it is necessary only to examine the transfers handed in by each conductor independently of any consecutive numbering or conductor's numbering to determine if the transfer privilege has been abused and, if so, by whom.

What I claim is—

1. Two or more series of punches with their corresponding dies, means for supporting the dies of each series in rigid and permanent alinement with their corresponding punches, such punches and dies arranged to give indications of progressive values in one or more cycles in each series, a complete cycle in each one of such series except the last standing for a step in a cycle of the next series of higher denomination, means whereby the coöperating punches and dies in each one of such series may be moved only progressively or forward so as to bring the coöperating punches and dies in such series into operative position only in regular progressive order throughout each cycle in such series, means whereby one or more of such series, except the first, can be advanced one step only in a cycle of the coöperating punches and dies therein, and only after all the punches and dies in a complete cycle, in the next series of lower denomination, have been brought into operative position, and means whereby the movement of one or more of such series, except the last, from a last step to a first step in a cycle of the coöperating punches and dies therein advances the next series of higher denomination one step in a cycle of its coöperating punches and dies.

2. Two or more series of punches with their corresponding dies, means for supporting the dies of each series in rigid and permanent alinement with their corresponding punches, such punches and dies arranged to give indications of progressive values in one or more cycles in each series, a complete cycle in each one of such series except the last standing for a step in a cycle of the next series of higher denomination, means whereby the coöperating punches and dies in each one of such

series may be moved only progressively or forward so as to bring the cooperating punches and dies in such series into operative position only in regular progressive order throughout
 5 each cycle in such series, means whereby one or more of such series, except the first, can be advanced one step only in a cycle of the cooperating punches and dies therein, and only after all the punches and dies in a
 10 complete cycle, in the next series of lower denomination, have been brought into operative position, means whereby the movement of one or more of such series, except the last, from a last step to a first step in a cycle of
 15 the cooperating punches and dies therein advances the next series of higher denomination one step in a cycle of its cooperating punches and dies, and means whereby all of the punches and dies standing for each different
 20 relation between the several steps in the cycles of the punches and dies in such different series may be operated simultaneously, or nearly so, to indicate the step to which each series has been advanced.

25 3. Two or more series of punches with their corresponding dies, means for supporting the dies of each series in rigid and permanent alinement with their corresponding punches, such punches and dies arranged to give indi-
 30 cations of progressive values in one or more cycles in each series, a complete cycle in each one of such series except the last standing for a step in a cycle of the next series of higher denomination, means whereby the cooperating
 35 punches and dies in each one of such series may be moved only progressively or forward so as to bring the cooperating punches and dies in such series into operative position only in regular progressive order throughout
 40 each cycle in such series, means whereby one or more of such series, except the first, can be advanced one step only in a cycle of the cooperating punches and dies therein, and only after all the punches and dies in a
 45 complete cycle, in the next series of lower denomination, have been brought into operative position, means whereby the movement of one or more of such series, except the last, from a last step to a first step in a cycle of
 50 the cooperating punches and dies therein advances the next series of higher denomination one step in a cycle of its cooperating punches and dies, means whereby all of the punches and dies standing for each different
 55 relation between the several steps in the cycles of the punches and dies in such different series may be operated simultaneously, or nearly so, to indicate the step to which each series has been advanced, and means
 60 whereby the mechanism for actuating such punches and dies is inoperative except when the punches and dies in each series occupy an operative position standing for some one relation between the several steps in the cy-
 65 cles of such punches and dies.

4. Two or more series of punches with their corresponding dies, means for supporting the

dies of each series in rigid and permanent alinement with their corresponding punches, such punches and dies arranged to give indi- 70
 cations of progressive values in one or more cycles in each series, a complete cycle in each one of such series except the last standing for a step in a cycle of the next series of higher
 75 denomination, means whereby the cooperating punches and dies in each one of such series may be moved only progressively or forward so as to bring the cooperating punches and dies in such series into operative position
 80 only in regular progressive order throughout each cycle in such series, means whereby one or more of such series, except the first, can be advanced one step only in a cycle of the cooperating punches and dies therein, and
 85 only after all the punches and dies in a complete cycle, in the next series of lower denomination, have been brought into operative position, means whereby the movement of one or more of such series, except the last, from a
 90 last step to a first step in a cycle of the cooperating punches and dies therein advances the next series of higher denomination one step in a cycle of its cooperating punches and dies, and means whereby the mechanism for
 95 actuating such punches and dies is inoperative except when the punches and dies in each series occupy an operative position standing for some one relation between the several steps in the cycles of such punches
 100 and dies.

5. Two or more series of punches with their corresponding dies, means for supporting the dies of each series in rigid and permanent alinement with their corresponding punches, such punches and dies arranged to give indi- 105
 cations of progressive values in one or more cycles in each series, a complete cycle in each one of such series except the last standing for a step in a cycle of the next series of higher
 110 denomination, means whereby the cooperating punches and dies in each one of such series may be moved only progressively or forward so as to bring the cooperative punches and dies in such series into operative position
 115 only in regular progressive order throughout each cycle in such series, means whereby one or more of such series, except the first, can be advanced one step only in a cycle of the cooperating punches and dies therein, and
 120 only after all the punches and dies in a complete cycle, in the next series of lower denomination, have been brought into operative position, and means for preventing the movement of one or more of such series, except
 125 the last, from a last step to a first step in a cycle of the cooperating punches and dies therein until the next series of higher denomination has been advanced one step in a cycle of its cooperating punches and dies.

6. Two or more series of punches with their 130
 corresponding dies, means for supporting the dies of each series in rigid and permanent alinement with their corresponding punches, such punches and dies arranged to give indi-

cations of progressive values in one or more cycles in each series, a complete cycle in each one of such series except the last standing for a step in a cycle of the next series of higher denomination, means whereby the cooperating punches and dies in each one of such series may be moved only progressively or forward so as to bring the cooperating punches and dies in such series into operative position only in regular progressive order throughout each cycle in such series, means whereby one or more of such series, except the first, can be advanced one step only in a cycle of the cooperating punches and dies therein, and only after all the punches and dies in a complete cycle, in the next series of lower denomination, have been brought into operative position, means for preventing the movement of one or more of such series, except the last, from a last step to a first step in a cycle of the cooperating punches and dies therein until the next series of higher denomination has been advanced one step in a cycle of its cooperating punches and dies, and means whereby all of the punches and dies standing for each different relation between the several steps in the cycles of the punches and dies in such different series may be operated simultaneously, or nearly so, to indicate the step to which each series has been advanced.

7. Two or more series of punches with their corresponding dies, means for supporting the dies of each series in rigid and permanent alinement with their corresponding punches, such punches and dies arranged to give indications of progressive values in one or more cycles in each series, a complete cycle in each one of such series except the last standing for a step in a cycle of the next series of higher denomination, means whereby the cooperating punches and dies in each one of such series may be moved only progressively or forward so as to bring the cooperating punches and dies in such series into operative position only in regular progressive order throughout each cycle in such series, means whereby one or more of such series, except the first, can be advanced one step only in a cycle of the cooperating punches and dies therein, and only after all the punches and dies in a complete cycle, in the next series of lower denomination, have been brought into operative position, means for preventing the movement of one or more of such series, except the last, from a last step to a first step in a cycle of the cooperating punches and dies therein until the next series of higher denomination has been advanced one step in a cycle of its cooperating punches and dies, means whereby all of the punches and dies standing for each different relation between the several steps in the cycles of the punches and dies in such different series may be operated simultaneously, or nearly so, to indicate the step to which each series has been advanced, and means whereby the mechanism for actuating such punches and dies is inoperative except

when the punches and dies in each series occupy an operative position standing for some one relation between the several steps in the cycles of such punches and dies.

8. Two or more series of punches with their corresponding dies, means for supporting the dies of each series in rigid and permanent alinement with their corresponding punches, such punches and dies arranged to give indications of progressive values in one or more cycles in each series, a complete cycle in each one of such series except the last standing for a step in a cycle of the next series of higher denomination, means whereby the cooperating punches and dies in each one of such series may be moved only progressively or forward so as to bring the cooperating punches and dies in such series into operative position only in regular progressive order throughout each cycle in such series, means whereby one or more of such series, except the first, can be advanced one step only in a cycle of the cooperating punches and dies therein, and only after all the punches and dies in a complete cycle, in the next series of lower denomination, have been brought into operative position, means for preventing the movement of one or more of such series, except the last, from a last step to a first step in a cycle of the cooperating punches and dies therein until the next series of higher denomination has been advanced one step in a cycle of its cooperating punches and dies, and means whereby the mechanism for actuating such punches and dies is inoperative except when the punches and dies in each series occupy an operative position standing for some one relation between the several steps in the cycle of such punches and dies.

9. Two or more series of punches with their corresponding dies, means for supporting the dies of each series in rigid and permanent alinement with their corresponding punches, such punches and dies arranged to give indications of progressive values in one or more cycles in each series, a complete cycle in each one of such series except the last standing for a step in a cycle of the next series of higher denomination, means whereby an operative relation may be established between the cooperating punches and dies standing for each step in each cycle in each one of such series and a suitable actuating mechanism only in regular progressive order throughout each cycle in such series, and by advances of one step at a time only in one or more of such series except the first, and only after an operative relation has been established between all the cooperating punches and dies and the actuating mechanism therefor standing for a complete cycle in the next series of lower denomination, and means whereby each reestablishment of an operative relation between the cooperating punches and dies and the actuating mechanism therefor standing for a first step in a cycle of one or more of such series except the last establishes an operative

relation between the cooperating punches and dies and the actuating mechanism therefor standing for the next succeeding step in a cycle of the next series of higher denomination.

10. Two or more series of punches with their corresponding dies, means for supporting the dies of each series in rigid and permanent alinement with their corresponding punches, such punches and dies arranged to give indications of progressive values in one or more cycles in each series, a complete cycle in each one of such series except the last standing for a step in a cycle of the next series of higher denomination, means whereby an operative relation may be established between the cooperating punches and dies standing for each step in each cycle in each one of such series and a suitable actuating mechanism only in regular progressive order throughout each cycle in such series, and by advances of one step at a time only in one or more of such series except the first, and only after an operative relation has been established between all the cooperating punches and dies and the actuating mechanism therefor standing for a complete cycle in the next series of lower denomination, means whereby each reestablishment of an operative relation between the cooperating punches and dies and the actuating mechanism therefor standing for a first step in a cycle of one or more of such series except the last establishes an operative relation between the cooperating punches and dies and the actuating mechanism therefor standing for the next succeeding step in a cycle of the next series of higher denomination, and means whereby all of the punches and dies that are in operative relation with their actuating mechanism standing for each different relation between the several steps in the cycles of the punches and dies in such different series may be actuated simultaneously, or nearly so.

11. Two or more series of punches with their corresponding dies, means for supporting the dies of each series in rigid and permanent alinement with their corresponding punches, such punches and dies arranged to give indications of progressive values in one or more cycles in each series, a complete cycle in each one of such series except the last standing for a step in a cycle of the next series of higher denomination, means whereby an operative relation may be established between the cooperating punches and dies standing for each step in each cycle in each one of such series and a suitable actuating mechanism only in regular progressive order throughout each cycle in such series, and by advances of one step at a time only in one or more of such series except the first, and only after an operative relation has been established between all the cooperating punches and dies and the actuating mechanism therefor standing for a complete cycle in the next series of lower denomination, means whereby each reestablishment

of an operative relation between the cooperating punches and dies and the actuating mechanism therefor standing for a first step in a cycle of one or more of such series except the last establishes an operative relation between the cooperating punches and dies and the actuating mechanism therefor standing for the next succeeding step in a cycle of the next series of higher denomination, means whereby all the punches and dies that are in operative relation with their actuating mechanism standing for each different relation between the several steps in the cycles of the punches and dies in such different series may be actuated simultaneously, or nearly so, and means whereby the mechanism for actuating such punches and dies is inoperative except when a punch or its corresponding die in each series, standing for some one relation between the several steps in the cycles of the punches and dies in such different series, is in operative relation to its actuating mechanism.

12. Two or more series of punches with their corresponding dies, means for supporting the dies of each series in rigid and permanent alinement with their corresponding punches, such punches and dies arranged to give indications of progressive values in one or more cycles in each series, a complete cycle in each one of such series except the last standing for a step in a cycle of the next series of higher denomination, means whereby an operative relation may be established between the cooperating punches and dies standing for each step in each cycle in each one of such series and a suitable actuating mechanism only in regular progressive order throughout each cycle in such series, and by advances of one step at a time only in one or more of such series except the first, and only after an operative relation has been established between all the cooperating punches and dies and the actuating mechanism therefor standing for a complete cycle in the next series of lower denomination, means whereby each reestablishment of an operative relation between the cooperating punches and dies and the actuating mechanism therefor standing for a first step in a cycle of one or more of such series except the last establishes an operative relation between the cooperating punches and dies and the actuating mechanism therefor standing for the next succeeding step in a cycle of the next series of higher denomination, and means whereby the mechanism for actuating such punches and dies is inoperative except when a punch or its corresponding die in each series, standing for some one relation between the several steps in the cycles of the punches and dies in such different series, is in operative relation to its actuating mechanism.

13. Two or more series of punches with their corresponding dies, means for supporting the dies of each series in rigid and permanent alinement with their corresponding punches, such punches and dies arranged to give indications of progressive values in one or more

cycles in each series, a complete cycle in each one of such series except the last standing for a step in a cycle of the next series of higher denomination, means whereby an operative relation may be established between the co-operating punches and dies standing for each step in each cycle in each one of such series and a suitable actuating mechanism only in regular progressive order throughout each cycle in such series, and by advances of one step at a time only in one or more of such series except the first, and only after an operative relation has been established between all the coöperating punches and dies and the actuating mechanism therefor standing for a complete cycle in the next series of lower denomination, and means for preventing a reestablishment of an operative relation between the coöperating punches and dies and the actuating mechanism therefor standing for a first step in a cycle of one or more of such series except the last until an operative relation has been established between the coöperating punches and dies and the actuating mechanism therefor standing for the next succeeding step in a cycle of the next series of higher denomination.

14. Two or more series of punches with their corresponding dies, means for supporting the dies of each series in rigid and permanent alinement with their corresponding punches, such punches and dies arranged to give indications of progressive values in one or more cycles in each series, a complete cycle in each one of such series except the last standing for a step in a cycle of the next series of higher denomination, means whereby an operative relation may be established between the coöperating punches and dies standing for each step in each cycle in each one of such series and a suitable actuating mechanism only in regular progressive order throughout each cycle in such series, and by advances of one step at a time only in one or more of such series except the first, and only after an operative relation has been established between all the coöperating punches and dies and the actuating mechanism therefor standing for a complete cycle in the next series of lower denomination, means for preventing a reestablishment of an operative relation between the coöperating punches and dies and the actuating mechanism therefor standing for a first step in a cycle of one or more of such series except the last until an operative relation has been established between the coöperating punches and dies and the actuating mechanism therefor standing for the next succeeding step in a cycle of the next series of higher denomination, and means whereby all the punches and dies that are in operative relation with their actuating mechanism standing for each different relation between the several steps in the cycles of the punches and dies in such different series may be actuated simultaneously, or nearly so.

15. Two or more series of punches with their

corresponding dies, means for supporting the dies of each series in rigid and permanent alinement with their corresponding punches, such punches and dies arranged to give indications of progressive values in one or more cycles in each series, a complete cycle in each one of such series except the last standing for a step in a cycle of the next series of higher denomination, means whereby an operative relation may be established between the coöperating punches and dies standing for each step in each cycle in each one of such series and a suitable actuating mechanism only in regular progressive order throughout each cycle in such series, and by advances of one step at a time only in one or more of such series except the first, and only after an operative relation has been established between all the coöperating punches and dies and the actuating mechanism therefor standing for a complete cycle in the next series of lower denomination, means for preventing a reestablishment of an operative relation between the coöperating punches and dies and the actuating mechanism therefor standing for a first step in a cycle of one or more of such series except the last until an operative relation has been established between the coöperating punches and dies and the actuating mechanism therefor standing for the next succeeding step in a cycle of the next series of higher denomination, means whereby all the punches and dies that are in operative relation with their actuating mechanism standing for each different relation between the several steps in the cycles of the punches and dies in such different series may be actuated simultaneously, or nearly so, and means whereby the mechanism for actuating such punches and dies is inoperative except when a punch or its corresponding die in each series, standing for some one relation between the several steps in the cycles of the punches and dies in such different series, is in operative relation to its actuating mechanism.

16. Two or more series of punches with their corresponding dies means for supporting the dies of each series in rigid and permanent alinement with their corresponding punches, such punches and dies arranged to give indications of progressive values in one or more cycles in each series, a complete cycle in each one of such series except the last standing for a step in a cycle of the next series of higher denomination, means whereby an operative relation may be established between the co-operating punches and dies standing for each step in each cycle in each one of such series and a suitable actuating mechanism only in regular progressive order throughout each cycle in such series, and by advances of one step at a time only in one or more of such series except the first, and only after an operative relation has been established between all the coöperating punches and dies and the actuating mechanism therefor standing for a

complete cycle in the next series of lower denomination, means for preventing a reestablishment of an operative relation between the cooperating punches and dies and the actuating mechanism therefor standing for a first step in a cycle of one or more of such series except the last until an operative relation has been established between the cooperating punches and dies and the actuating mechanism therefor standing for the next succeeding step in a cycle of the next series of higher denomination and means whereby the mechanism for actuating such punches and dies is inoperative except when a punch or its corresponding die in each series, standing for some one relation between the several steps in the cycles of the punches and dies in such different series, is in operative relation to its actuating mechanism.

17. Two or more series of marking characters arranged to give indications of progressive values in one or more cycles in each series, a complete cycle in each one of such series, except the last, standing for a step in a cycle of the next series of higher denomination, means whereby an operative relation may be established between the marking characters standing for each step in each cycle in each one of such series and a suitable actuating mechanism only in regular progressive order throughout each cycle in such series, and by advances of one step at a time only in one or more of such series except the first, and only after an operative relation has been established between all the marking characters and the actuating mechanism therefor standing for a complete cycle in the next series of lower denomination, means whereby each reestablishment of an operative relation between the marking characters and the actuating mechanism therefor standing for a first step in a cycle of one or more of such series except the last, establishes an operative relation between the marking characters and the actuating mechanism therefor standing for the next succeeding step in a cycle of the next series of higher denomination, means whereby all of the marking characters that are in operative relation with their actuating mechanism standing for each different relation between the several steps in the cycles of the marking characters in such different series may be actuated simultaneously, or nearly so, and means whereby the mechanism for actuating such characters is inoperative except when a character in each one of such series is in operative relation to its actuating mechanism.

18. Two or more series of marking characters arranged to give indications of progressive values in one or more cycles in each series, a complete cycle in each one of such series, except the last, standing for a step in a cycle of the next series of higher denomination, means whereby an operative relation may be established between the marking characters standing for each step in each cycle in

each one of such series and a suitable actuating mechanism only in regular progressive order throughout each cycle in such series, and by advances of one step at a time only in one or more of such series except the first, and only after an operative relation has been established between all the marking characters and the actuating mechanism therefor standing for a complete cycle in the next series of lower denomination, means whereby each reestablishment of an operative relation between the marking characters and the actuating mechanism therefor standing for a first step in a cycle of one or more of such series except the last, establishes an operative relation between the marking characters and the actuating mechanism therefor standing for the next succeeding step in a cycle of the next series of higher denomination, means whereby all of the marking characters that are in operative relation with their actuating mechanism standing for each different relation between the several steps in the cycles of the marking characters in such different series may be actuated simultaneously, or nearly so, and means whereby at the time of such actuation of such characters, there is opposed to each one of such characters mechanism cooperating therewith to displace from the plane of a ticket portions thereof conforming in outline to such characters.

19. Two or more series of marking characters arranged to give indications of progressive values in one or more cycles in each series, a complete cycle in each one of such series, except the last, standing for a step in a cycle of the next series of higher denomination, means whereby an operative relation may be established between the marking characters standing for each step in each cycle in each one of such series and a suitable actuating mechanism only in regular progressive order throughout each cycle in such series, and by advances of one step at a time only in one or more of such series except the first, and only after an operative relation has been established between all the marking characters and the actuating mechanism therefor standing for a complete cycle in the next series of lower denomination, means whereby each reestablishment of an operative relation between the marking characters and the actuating mechanism therefor standing for a first step in a cycle of one or more of such series except the last, establishes an operative relation between the marking characters and the actuating mechanism therefor standing for the next succeeding step in a cycle of the next series of higher denomination, means whereby all of the marking characters that are in operative relation with their actuating mechanism standing for each different relation between the several steps in the cycles of the marking characters in such different series may be actuated simultaneously, or nearly so, means whereby at the time of such actuation of such characters,

there is opposed to each one of such characters mechanism cooperating therewith to displace from the plane of a ticket portions thereof conforming in outline to such characters, and means whereby the mechanism for actuating such characters is inoperative except when a character in each one of such series is in operative relation to its actuating mechanism.

20. Two or more series of marking characters arranged to give indications of progressive values in one or more cycles in each series, a complete cycle in each one of such series, except the last, standing for a step in a cycle of the next series of higher denomination, means whereby an operative relation may be established between the marking characters standing for each step in each cycle in each one of such series and a suitable actuating mechanism only in regular progressive order throughout each cycle in such series, and by advances of one step at a time only in one or more of such series except the first, and only after an operative relation has been established between all the marking characters and the actuating mechanism therefor standing for a complete cycle in the next series of lower denomination, means whereby each reestablishment of an operative relation between the marking characters and the actuating mechanism therefor standing for a first step in a cycle of one or more of such series except the last, establishes an operative relation between the marking characters and the actuating mechanism therefor standing for the next succeeding step in a cycle of the next series of higher denomination, means whereby at the time of the actuation of such characters, there is opposed to each one of such characters mechanism cooperating therewith to displace from the plane of a ticket portions thereof conforming in outline to such characters, and means whereby the mechanism for actuating such characters is inoperative except when a character in each one of such series is in operative relation to its actuating mechanism.

21. Two or more series of marking characters arranged to give indications of progressive values in one or more cycles in each series, a complete cycle in each one of such series, except the last, standing for a step in a cycle of the next series of higher denomination, means whereby an operative relation may be established between the marking characters standing for each step in each cycle in each one of such series and a suitable actuating mechanism only in regular progressive order throughout each cycle in such series, and by advances of one step at a time only in one or more of such series except the first, and only after an operative relation has been established between all the marking characters and the actuating mechanism therefor standing for a complete cycle in the next series of lower denomination, means for preventing a reestablishment of an operative relation be-

tween the marking characters and the actuating mechanism therefor standing for a first step in a cycle of one or more of such series except the last, until an operative relation has been established between the marking characters and the actuating mechanism therefor standing for the next succeeding step in a cycle of the next series of higher denomination, means whereby all of the marking characters that are in operative relation with their actuating mechanism standing for each different relation between the several steps in the cycles of the marking characters in such different series may be actuated simultaneously, or nearly so, and means whereby the mechanism for actuating such characters is inoperative except when a character in each one of such series is in operative relation to its actuating mechanism.

22. Two or more series of marking characters arranged to give indications of progressive values in one or more cycles in each series, a complete cycle in each one of such series, except the last, standing for a step in a cycle of the next series of higher denomination, means whereby an operative relation may be established between the marking characters standing for each step in each cycle in each one of such series and a suitable actuating mechanism only in regular progressive order throughout each cycle in such series, and by advances of one step at a time only in one or more of such series except the first, and only after an operative relation has been established between all the marking characters and the actuating mechanism therefor standing for a complete cycle in the next series of lower denomination, means for preventing a reestablishment of an operative relation between the marking characters and the actuating mechanism therefor standing for a first step in a cycle of one or more of such series except the last, until an operative relation has been established between the marking characters and the actuating mechanism therefor standing for the next succeeding step in a cycle of the next series of higher denomination, means whereby all of the marking characters that are in operative relation with their actuating mechanism standing for each different relation between the several steps in the cycle of the marking characters in such different series may be actuated simultaneously, or nearly so, and means whereby at the time of such actuation of such characters, there is opposed to each one of such characters mechanism cooperating therewith to displace from the plane of a ticket portions thereof conforming in outline to such characters.

23. Two or more series of marking characters arranged to give indications of progressive values in one or more cycles in each series, a complete cycle in each one of such series, except the last, standing for a step in a cycle of the next series of higher denomination, means whereby an operative relation may be established between the marking characters

standing for each step in each cycle in each one of such series and a suitable actuating mechanism only in regular progressive order throughout each cycle in such series, and by
 5 advances of one step at a time only in one or more of such series except the first, and only after an operative relation has been established between all the marking characters and the actuating mechanism therefor standing
 10 ing for a complete cycle in the next series of lower denomination, means for preventing a reestablishment of an operative relation between the marking characters and the actuating mechanism therefor standing for a first
 15 step in a cycle of one or more of such series except the last, until an operative relation has been established between the marking characters and the actuating mechanism therefor standing for the next succeeding step
 20 in a cycle of the next series of higher denomination, means whereby all of the marking characters that are in operative relation with their actuating mechanism standing for each different relation between the several steps
 25 in the cycles of the marking characters in such different series may be actuated simultaneously, or nearly so, means whereby at the time of such actuation of such characters, there is opposed to each one of such characters
 30 mechanism cooperating therewith to displace from the plane of a ticket portions thereof conforming in outline to such characters, and means whereby the mechanism for actuating such characters is inoperative except
 35 when a character in each one of such series is in operative relation to its actuating mechanism.

24. Two or more series of marking characters arranged to give indications of progressive values in one or more cycles in each se-

ries, a complete cycle in each one of such series, except the last, standing for a step in a cycle of the next series of higher denomination, means whereby an operative relation may be established between the marking
 45 characters standing for each step in each cycle in each one of such series and a suitable actuating mechanism only in regular progressive order throughout each cycle in such series, and by advances of one step at a time
 50 only in one or more of such series except the first, and only after an operative relation has been established between all the marking characters and the actuating mechanism therefor standing for a complete cycle in the
 55 next series of lower denomination, means for preventing a reestablishment of an operative relation between the marking characters and the actuating mechanism therefor standing for a first step in a cycle of one or more of
 60 such series except the last, until an operative relation has been established between the marking characters and the actuating mechanism therefor standing for the next succeeding step in a cycle of the next series of
 65 higher denomination, means whereby at the time of the actuation of such characters, there is opposed to each one of such characters mechanism cooperating therewith to displace from the plane of a ticket portions thereof
 70 conforming in outline to such characters, and means whereby the mechanism for actuating such characters is inoperative except when a character in each one of such series is in operative relation to its actuating mechanism. 75

WM. H. COOLEY.

Witnesses:

D. EUNICE EATON,
 ETHA M. SMITH.