

No. 738,157.

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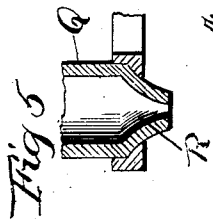
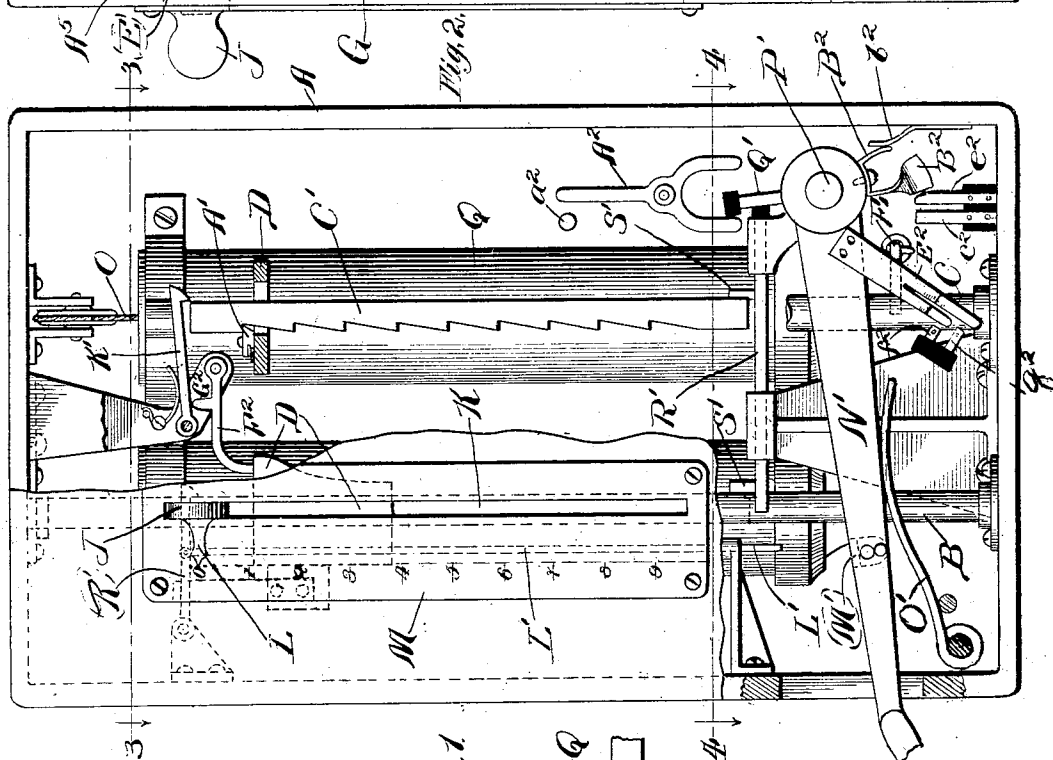
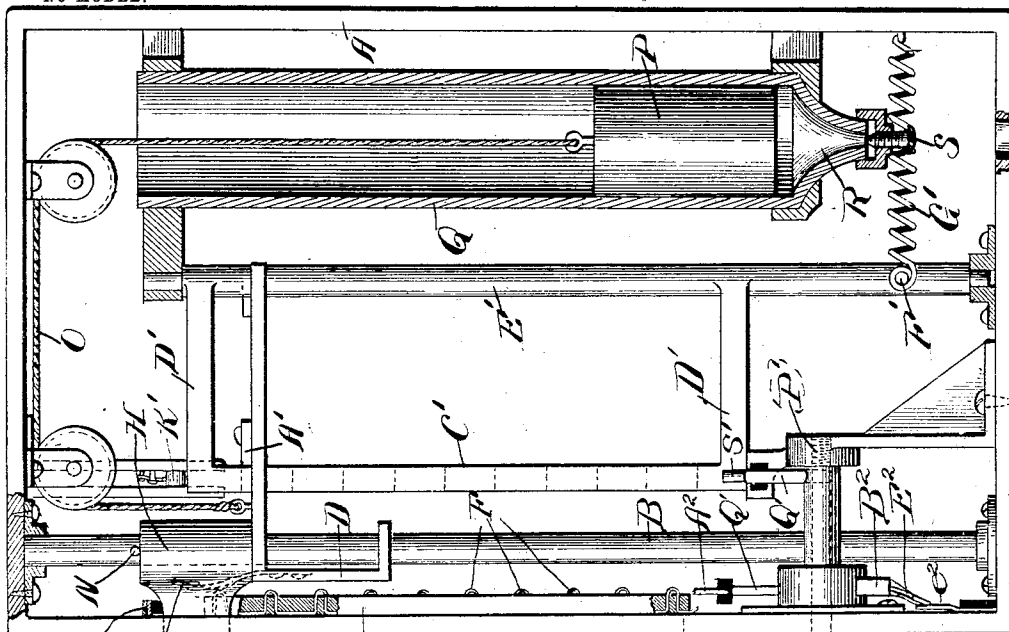
J. J. BROWNRIGG & J. K. NORSTROM.

CALLING MECHANISM FOR AUTOMATIC TELEPHONE SYSTEMS.

APPLICATION FILED DEC. 26, 1900. RENEWED MAY 2, 1903.

NO MODEL.

3 SHEETS—SHEET 1.



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3 SHEETS—SHEET 2.

Fig. 4.

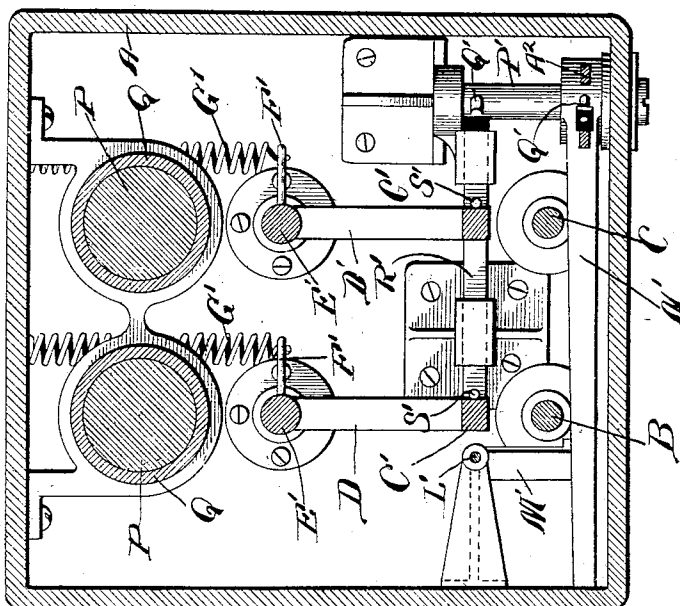
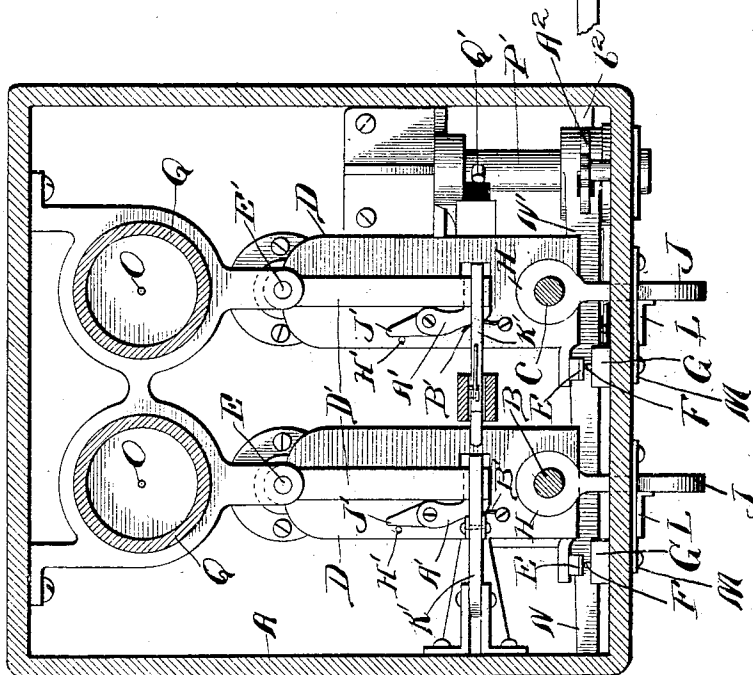


Fig. 3.



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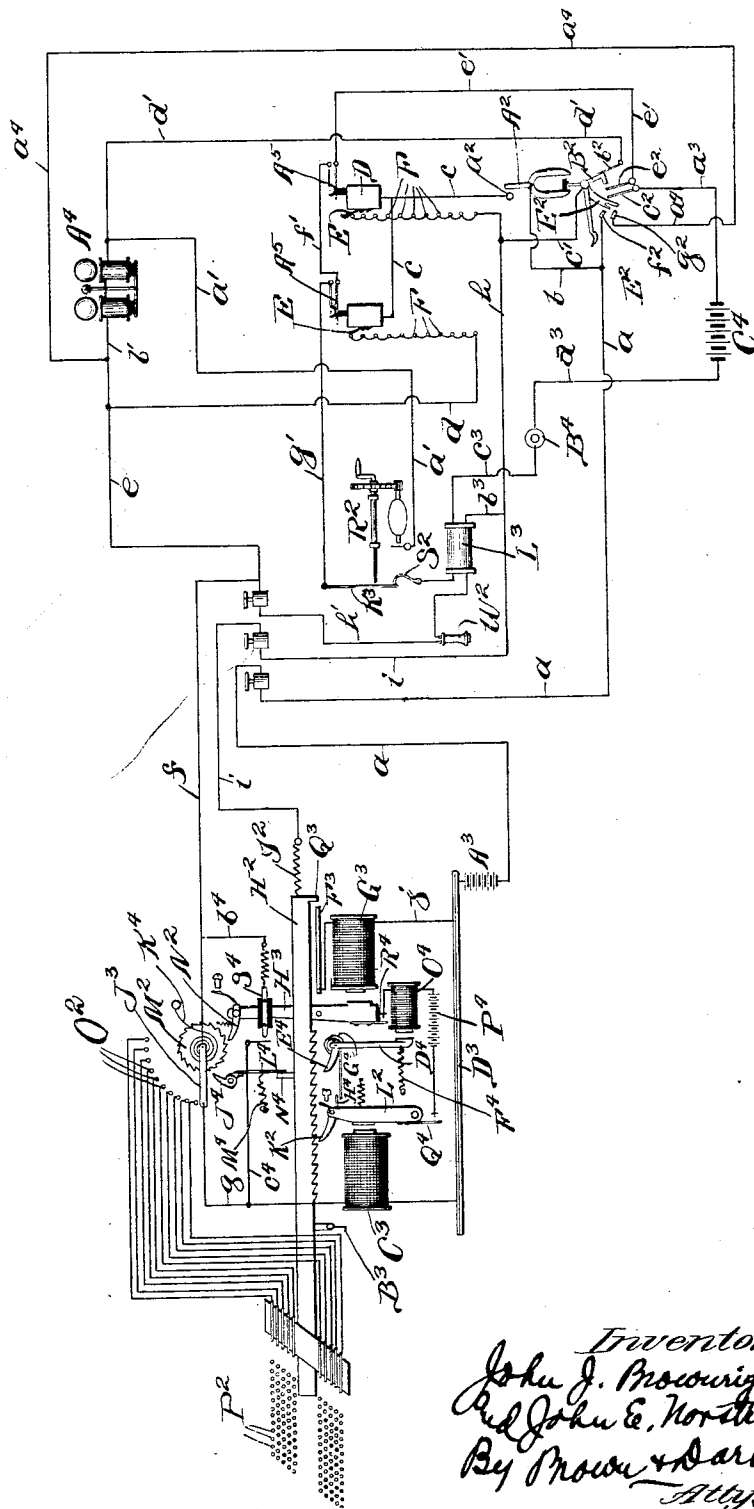
CALLING MECHANISM FOR AUTOMATIC TELEPHONE SYSTEMS.

APPLICATION FILED DEC. 26, 1900. RENEWED MAY 2, 1903.

NO MODEL.

3 SHEETS—SHEET 3.

Fig. 6.



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UNITED STATES PATENT OFFICE.

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CALLING MECHANISM FOR AUTOMATIC TELEPHONE SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 738,157, dated September 8, 1903.

Application filed December 26, 1900. Renewed May 2, 1903. Serial No. 155,313. (No model.)

To all whom it may concern:

Be it known that we, JOHN J. BROWNRIGG and JOHN K. NORSTROM, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Calling Mechanism for Automatic Telephone Systems, of which the following is a specification.

This invention relates to calling mechanism for automatic telephone systems.

The object of the invention is to provide a construction and arrangement which is simple and efficient, whereby one subscriber of a system may readily and quickly call any other subscriber.

The invention consists, substantially, in the construction, combination, location, and arrangement, all as will be more fully hereinafter set forth, as shown in the accompanying drawings, and finally pointed out in the appended claims.

Referring to the accompanying drawings and to the various views and reference-signs appearing thereon, Figure 1 is a view in front elevation, a portion of the front plate or board broken away, showing a construction of call device embodying the principles of the invention. Fig. 2 is a longitudinal transverse section of the construction shown in Fig. 1. Fig. 3 is a transverse section on the line 3 3, Fig. 1, looking in the direction of the arrows. Fig. 4 is a similar view on the line 4 4, Fig. 1, looking in the direction of the arrows. Fig. 5 is a broken detached detail view in section, showing a modified arrangement of the cylinder. Fig. 6 is a diagram illustrating the action of the apparatus.

In carrying out my invention the various contacts and mechanical operations may be effected by a wide variety of different mechanical constructions. In the accompanying drawings various constructions for accomplishing the desired result are shown. In the drawings is shown a form of construction and arrangement embodying the principles of the invention, and this construction and arrangement will first be described.

Reference-sign A designates a box or cas-

ing in which the various working parts of the apparatus are inclosed. Arranged within this casing are suitable guide-rods B C, upon each of which is mounted a slide or carrier D, each slide or carrier carrying a contact plate or strip E, arranged to operate over a series of contacts F, formed in a continuous strip carried in a suitable board G, of insulating material. The contacts F of each series are arranged a suitable distance apart, whereby when the carrier D moves in a direction to carry the contact-plate T thereover said plate will make intermittent contact with the contact-points F, the purpose of which will be more fully explained hereinafter. Loosely mounted upon each guide-rod B C is a sleeve H, each sleeve provided with a handle J, arranged to project through a slot K in the front plate of the call-box into convenient position to be grasped by the subscriber or operator. Each handle may be provided with a pointer L, coöperating with a graduated scale, (indicated at M, Fig. 1.) A stop N may serve to limit the movement of sleeve H in one direction. Each sleeve is arranged to bear upon the carrier D of its guide-rod B C, so that when either handle J is grasped and moved lengthwise through the slot K such movement of sleeve H upon its guide pin or post will effect a corresponding movement of carrier D along said post. A cord, thread, or rope (indicated at O) is connected at one end to each carrier D, and after riding over suitable guide-sheaves the other end of said rope is connected with a plunger P, arranged to operate in a cylinder Q. The relative weights of plunger P and carrier D are so proportioned that the plunger P, operating as a counterbalance or counterweight for the carrier, will overbalance the carrier D sufficiently to overcome not only the weight of said carrier, but the friction, and hence constantly tends to maintain the carrier in one limit of its movement or to return such carrier when it is displaced by the manipulation of the handle J, as above explained. It is important and desirable to provide means whereby the return of a carrier when it has

once been displaced to initial position may be graduated and regulated. It is also desirable that such return may be effected by a uniform movement. Many specifically different arrangements for accomplishing this result may be provided. In the particular form shown, to which, however, the invention is not limited or restricted, the cylinder Q may be provided with a contracted open end, as indicated at R, and the opposite end of said cylinder is opened to the fullest extent to the outer air. The result of this arrangement is that when carrier D is displaced and plunger P is raised in cylinder Q a too-rapid movement of the carrier D is avoided by reason of the contracted opening R at the lower end of the cylinder, and when the handle J is released by the operator the plunger P will descend in cylinder Q, the contracted opening R regulating the exhaust of air from said cylinder, and hence securing a uniform return of the carrier to its initial position. If desired, means may be provided for graduating or regulating the amount of opening of the contracted passage R—as, for instance, by means of a pointed pin or screw S. (See Fig. 2.) This feature, however, may be omitted. (See Fig. 5.)

It will be observed from the foregoing description that the sleeves H have no connection with the carrier D except a bearing thereon. Therefore when a sleeve H is displaced longitudinally upon its guide-rod D said sleeve will merely carry before it a carrier D; but the sleeves H may be returned to initial position without carrying with them the carriers D. This is a desirable arrangement, because thereby the contact E is not carried over the contacts F too rapidly. In other words, the sleeves H may be returned to normal or initial position, while the return of carriers D is regulated and controlled and is made uniform in speed by reason of the contracted throat or opening R at the discharge end of the cylinder Q.

Upon each carrier D is pivoted a pawl A', each pawl being held by a spring B' in engaging relation with the teeth of a ratchet-bar C', the teeth of said ratchet-bars being presented in a direction to permit the pawl A' to ride thereover when said carriers are moved under the influence of the sleeves H, but permitting said pawl to engage in said teeth to prevent the return movement of said carriers so long as the rack-bars are held in engaging relation with respect to the pawls. The rack-bars C' are carried by arms D', formed in or secured to pivotally-mounted rods E'. Each rod E' is provided with an arm or pin F', to which is connected a spring G', the tension of which is constantly exerted in a direction to rock said rod E' and to carry the rack-bars C' out of engaging relation with respect to the pawls A'. A pin or stop (indicated at H') may be arranged to engage a tail projection J' of the pawls to prevent said pawls under the influence of their springs B'

from following up the rack-bars when said rack-bars are permitted to move out of engaging relation with respect to said pawls. When the racks C' are moved into engaging relation with respect to the pawls A', they are held in such position by means of latches K'. One of said latches K' has connected thereto a rod L', having the free end thereof arranged to be engaged by a projection or flange M', carried by the receiver-lever N', when said receiver-lever is permitted to rise under the influence of spring O'. In other words, when the receiver is removed from its hook, the receiver-lever N' is sleeved upon a rock-shaft P' in the usual manner. An arm or pin Q', arranged to be rocked by the receiver hook or lever, is arranged to engage a rod or bar R', mounted to slide in suitable bearings, and which bar is provided with pins or studs S', adapted to engage the rack-bars C' to move the same into engaging relation with respect to the pawls A'. The movements of the receiver-hook N' also effect actuation of contact devices A², B², and E², the contact devices A² serving to complete circuit through a contact-point a². The contact device B² is arranged to complete circuit when in position through a contact b² and when in another position arranged to bridge the contacts c² e², and the contact device E² is arranged to make a wiping-bridge between the contact-points f² g², the purpose of all of which will be more fully explained herein-after.

The mechanical operation of the construction so far described is as follows, assuming the parts to be in the relative positions thereof indicated in the drawings: When a subscriber desires to call up any other subscriber of the system, whose number is—for instance, the subscriber before removing his receiver from its hook grasps one of the handles J—say, for instance, the one on the left—and draws the same down until the pointer L thereof coincides with the numeral 6 of the scale, thereby correspondingly moving the carrier D and contact E, associated therewith. The operator also grasps the other handle J and draws it down until its pointer coincides with the numeral 5 on its dial or scale. The subscriber's receiver is then raised from its hook, permitting said hook to swing into upper position. This movement causes flange or projection M' to engage the end of rod L' and project the same vertically, thereby causing hook-ratchet K' to be released from its rack, and when the carrier D first actuated returns to its initial position said carrier is arranged to engage a lever F², which is provided with a lug or projection G², arranged to engage the holding-ratchet K' of the other rack, thereby releasing both racks, permitting said racks to be moved out of engaging relation with respect to their holding-pawls A'. Of course it will be understood that neither of the carriers D will be returned to initial position until after the local receiver is raised from

its hook, and the first action occurring after the raising of said hook is to detach the holding-ratchet of the first rack and permit it to swing out of the way of its pawl and the return of the first carrier, the second carrier not being released until the first carrier arrives at its initial position and releases the latch K' , which holds the rack of the second carrier. The same movement of the receiver-hook completes circuit between the contact device A^2 , and contact-point a^2 breaks the circuit between contact device B^2 , and contact b^2 bridges the space between contact-points c^2 and e^2 and effects a wiping-bridge between contact-points f^2 and g^2 . The subscriber in the meantime having secured his desired connection, as will presently be more fully explained, proceeds with his message, and when such message is finished he replaces his receiver upon hook N' , thereby breaking contact between device A^2 and contact-point a^2 , completing contact between contact device B^2 and b^2 , breaking circuit between contact-points c^2e^2 and also breaking contact between contact-points f^2g^2 . The same action effects a projection of rod or bar R' , thereby restoring racks C' through the engagement thereof with lugs or projections S' into position for said racks to be engaged by the detaining hook-latches K' and in engaging relation with respect to the pawls A' . Thus the apparatus is restored to initial position, ready for further operation.

Many specifically different arrangements of apparatus for effecting a selection of the desired wires by the subscriber may be employed in connection with the calling apparatus above described. A selector mechanism construction which has been found in practice to be efficient and satisfactory is shown somewhat diagrammatically in Fig. 6, wherein reference-sign H^2 designates a movable rack-bar provided with ratchet-teeth corresponding in number to the number of contacts F , over which a contact-plate E of one of the carriers operates. This rack-bar may be normally held in any suitable manner—as, for instance, by means of a spring J^2 or otherwise—and is adapted to be moved from such normal position by means of a pawl K^2 , carried by a lever L^2 , upon which is mounted or which constitutes the armature of an electromagnet C^3 , whereby when said electromagnet is energized said lever L^2 is rocked to cause pawl K^2 to engage in a tooth of rack-bar H^2 to move the same one step. The arrangement of circuit is such, as will be presently more fully explained, that electromagnet C^3 is energized as many times as there are contacts F , over which contact-plate E of the first series above mentioned operates, each energization of electromagnet C^3 effecting a feed or movement of bar H^2 one step. Thus in the example above given, wherein the first carrier is moved to the numeral 6—that is, into position for the contact E —when the carrier returns to its initial po-

sition to move over six of the series of contacts F the magnet C^3 will be energized six different times, and hence bar H^2 will be advanced six distinct steps. Associated with bar H^2 is a selector-arm, (indicated at J^3 ,) said arm being carried by or connected to move with a ratchet-disk M^2 , said ratchet-disk being rotatively actuated by means of a pawl N^2 , carried by a lever H^3 , said lever carrying or forming the armature of an electromagnet G^3 , and the arrangement of the circuits and the operation of the apparatus is such that electromagnet G^3 is energized as many times as there are contacts over which the contact E of the other carrier moves when displaced and returned to initial position. Thus in the example given above where the second carrier is moved to number 5 on the dial, the return movement of said carrier to initial position causes its contact-plate E to move over or to make successive contacts with five of its series of contact-points F , and hence the electromagnet G^3 will be energized five times, thereby actuating ratchet-disk M^2 five steps and advancing lever J^3 to make contact with the fifth of a series of contacts O^2 . The combined and coöperative action of rack-bar H^2 and selector-arm J^3 effects the proper circuit connection from the calling-station to any desired circuit-terminal, (indicated diagrammatically at P^2 ,) thereby completing line-connection from the calling-station to the station to be called.

The electric operation of the system will now be described, particular reference being had to the diagram in Fig. 6. When it is desired to call up and to make automatic connection with a station of another subscriber in the system, the operator sets the buttons or handles J at the desired point, as above explained, thereby displacing to corresponding positions the contact-carriers D . The handles J are then released and the operator removes his receiver from its supporting-hook. The first effect, as above explained, of removing the receiver from its supporting-hook is to release the holding-rack bar C' of the first button, thereby causing the corresponding carrier to return to initial position and the contact E thereon to travel over the desired number of contacts F , and hence sending the desired number of pulsations through electromagnet C^3 through the following circuit: from battery A^3 , wire a , wire b , contact device A^2 , contact a^2 , wire c , traveling contact or wiper E , and contacts F of the first button, wire d , wire e , wire f , selector-arm J^3 , (which is in normal or retracted position,) wire g , magnet C^3 , conductor-strip D^3 , which is a strip common to all the subscribers' lines, thence to battery A^3 . The resulting pulsations in electromagnet C^3 effects the feed of rack H^2 a corresponding number of steps. The return of the second button or carrier D to its initial or normal position causes its wiper or contact-plate E to travel over the desired number of contacts F , and hence ef-

fects pulsations of current through magnet G^3 , corresponding in number to the number of contacts F , over which the wiper or contact-plate E of the second button or carrier travels through the following circuit: from battery A^3 , wire a , wire b , contact device A^2 , contact a^2 , wire c , wiper E , contacts F , wire h , wire i , bar H^2 , conductor-strip F^3 , magnet G^3 , wire j , conductor-strip D^3 , to battery A^3 .

Bar H^2 when in its normal or retracted position is out of circuit with magnet G^3 , but is provided with a contact Q^3 , arranged to complete circuit from said bar to said magnet through conductor-strip F^3 when said bar H^2 is advanced its first step through the first actuation of lever L^2 , as above explained. The pulsations thus sent through magnet G^3 effect a corresponding number of oscillations or vibrations of lever H^3 and a consequent movement of selector-arm J^3 to the desired contact of the series O^2 . These movements and the operation above described place the subscriber's line-wire in communication with the line-wire of the subscriber he desires to call. When the proper line connections are thus effected, the calling subscriber actuates his generator. (Indicated at R^2 .) The generator is arranged when actuated to effect an opening between points K^3 and point S^2 in a well-known manner and the closing of circuit between K^3 and the generator R^2 . The calling-circuit is thereupon completed, as follows: from the generator R^2 , through wire a' , signal device A^4 , wire b' , wire e , wire f , selector-arm J^3 , the particular line-wire in connection with which said selector-arm J^3 is in contact, thence to what will be termed the "normal" connection of the party to be called and indicated at B^3 .

Suppose now the diagram in Fig. 6 illustrates the apparatus at the station of the party to be called. The signal-current enters through the normal connection B^3 and continues through bar H^2 , wire i , wire h , wire c' , the receiver-hook contact device B^2 , contact b^2 , wire d' , call device A^4 , wire b' , wire e , wire f , selector-arm J^3 , wire g , electromagnet C^3 , common conductor-strip D^3 , thence returning to the apparatus of the party making the call. Now assuming that the illustration in Fig. 6 is the apparatus of the calling party, said signal-current runs from the common conductor-strip D^3 , through wire j , magnet G^3 , strip F^3 , bar H^2 , wire i , wire h , wire c' , receiver-hook contact device B^2 , contact e^2 , wire e' , wire f' , wire g' , contact K^3 , to the other side of the generator R^2 . Thus the subscriber has not only selected and made proper circuit connection with the line-circuit of another subscriber, but he has effected the proper signal to the other subscriber with whom he desires to communicate. The talking-circuit will now be traced. When the actuation of the generator is arrested, contact is again restored between contacts K^3 and S^2 and the generator-circuit is broken thereupon and talking-circuit is completed as follows: from

contact K^3 to contact S^2 , the secondary winding of induction-coil L^3 , the receiver w^2 , wire h' , wire f , selector-arm J^3 , the selected wire as above explained, thence to normal connection B^3 of the other subscriber. Now supposing the diagram to illustrate the arrangement of apparatus at the other party's station. The circuit continues from normal connection B^3 to bar H^2 , wire i , wire h , wire c' , the receiver-hook contact device B^2 , contact e^2 , wire e' , wire f' , wire g' , contact K^3 , contact S^2 , the secondary of the induction-coil L^3 , receiver w^2 , wire h' , wire f , selector-arm J^3 , wire g , electromagnet C^3 , conductor-strips D^3 , thence returning to the apparatus of the calling party through wire j , magnet G^3 , strip F^3 , contact Q^3 , bar H^2 , wire i , wire h , wire c' , receiver-hook contact device B^2 , contact e^2 , wire e' , wire f' , wire g' , to starting-point at K^3 . The transmitter (indicated diagrammatically at B^4) is included in circuit with the battery C^4 and the primary coils of the induction-coil L^3 . This circuit is completed when the receiver is raised from its hook as follows: from battery C^4 , through wire a^3 , contact c^2 , contact device B^2 , wire c' , wire h , wire b^3 , the primary coils of induction-coil L^3 , wire c^3 , transmitter B^4 , wire d^3 , to battery C^4 .

The circuit above traced, which includes the wire f' , is in the arrangement shown closed whenever the carriers D are in their normal or initial position, as indicated at A^5 , Fig. 2.

As above described, the bar H^2 is advanced one step each time the magnet C^3 is energized by reason of the pawl K^2 engaging with the teeth formed on or connected to bar H^2 . It is important to provide means whereby when pawl K^2 is released—that is, whenever the circuit including magnet C^3 is broken—said bar is prevented from returning to its initial position. A simple construction for accomplishing this result is illustrated, wherein a lever D^4 carries a pawl E^4 . Lever D^4 is acted on by a spring F^4 , the tension of which is normally exerted to carry pawl E^4 into engagement with the rack-teeth on bar H^2 . When the parts are in their normal and initial position, the pawl E^4 is held out of engaging relation with respect to the rack-teeth of bar H^2 by means of an arm G^4 , carried by or connected to lever D^4 , being engaged underneath a lug or projection H^4 on lever L^2 . When, however, in the operation of the apparatus the magnet C^3 is first energized and lever L^2 is rocked to advance bar H^2 its first step of advancement, the projection or detent H^4 is released in respect of its engagement with arm G^4 , thereby releasing lever D^4 and permitting spring F^4 to rock said lever into position for the pawl E^4 thereof to engage in the rack-teeth of bar H^2 to hold the same against return whenever the circuit of magnet C^3 is broken. After a disengagement between projection H^4 and arm G^4 has once been effected holding-pawl E^4 will continue in engagement with rack-teeth of bar H^2 ,

however many times the pawl K² may act, and until the parts are again restored to their normal and initial position. Similarly the ratchet-wheel M² after being actuated or rotatively moved by pawl N² is held or locked against reverse rotation by means of a holding or locking pawl J¹ and against the action of spring K¹. The locking-pawl J⁴ is carried by a lever L¹, upon which acts a spring M¹, the tension of which normally operates to throw pawl J⁴ into engaging relation with respect to said ratchet-wheel M². When bar H² is in its retracted or initial position, a stop N⁴ thereon engages lever L⁴ to rock holding-pawl J⁴ out of engaging relation with respect to ratchet-wheel M². When, however, bar H² is moved its first or initial step, the lug N⁴ is carried free of lever L⁴, hence permitting pawl J⁴ to engage in a tooth of ratchet-disk M², which engaging relation is maintained until bar H² is restored to its normal position.

The construction, arrangement, and operation for restoring bar H² to its initial or retracted position will now be described.

Lever D¹ carries or has formed therewith an armature for an electromagnet O⁴, the coils of which are included in circuit with a battery P¹. Whenever magnet O⁴ is energized, lever D¹ is attracted against the tension of spring F¹ in a direction to disengage pawl E⁴ from rack-teeth of bar H² and to carry the arm G¹ into engaging relation behind the lug or projection H¹. The circuit of battery P¹ is normally open, but is closed through contacts Q¹ R¹, respectively, carried by levers L² H³. Therefore in order to energize magnet O⁴ it is necessary for both magnets C³ G³ to be simultaneously energized. This simultaneous energization is effected by the act of hanging up the subscriber's receiver upon its hook. This act causes the wiper E² of the hook to momentarily bridge the space between the contacts f² g², thereby completing the following circuit: from battery A³ through wire a, contact f², wiper E², contact g², wire a¹, wire e, wire f, wire b⁴, contact S⁴, wire c¹, through magnet C³, and thence to battery A³ through conductor-rod D³. At the same time the following circuit will be established: from battery A³ through wire a to contact f², through wiper E², wire c¹, wire h, wire i, bar H², contact Q³, contact-strip F³, magnet G³, wire j to battery A³. Thus both magnets G³ C³ are simultaneously energized, thereby closing the circuit of magnet O⁴, releasing the holder-pawl E⁴, and permitting bar H² to return to initial or normal position, and when said bar arrives at its initial or retracted position stop N⁴ thereon will release holder-pawl J⁴, thus restoring the parts to their initial or normal positions.

It is to be understood that many other forms and specific constructions and arrangements of parts of selecting apparatus may be employed without departure from the spirit and scope of my invention.

In the foregoing description I have set forth one form of construction embodying the principles of the invention for successively energizing electromagnets C³ G³, and in which is employed an air-cushion for regulating and controlling the movements of the successive contacts or of the apparatus by which the circuits of the electromagnets are made and broken in effecting a call by the subscriber, and it has been stated that other specific forms of apparatus may be employed for accomplishing the same results.

Many other specifically different constructions embodying the principles of the invention may be employed for accomplishing the same result. The invention is therefore not limited or restricted in the specific construction and arrangement of the mechanical details thereof to the constructions shown and above described. It is also obvious that many variations and changes in the details of construction and arrangement of parts would readily occur to persons skilled in the art and still fall within the spirit and scope of the invention.

Having now set forth the object and nature of the invention and various constructions embodying the principles thereof, what is claimed as new and useful, and sought to be secured by Letters Patent of the United States, is—

1. In a calling apparatus for automatic telephone systems, means for selecting any subscriber's wire including movable contacts, means for manually displacing said contacts from normal position in making a selection, means for locking said displaced contacts in displaced position, mechanical devices for effecting the return of said displaced contacts to initial position, said contacts operating upon the return movement thereof to effect the desired call, devices for cushioning the return movement of said contacts, and means for releasing said lock, as and for the purpose set forth.

2. In a calling apparatus for automatic telephone systems, selector devices for selecting any desired subscriber's wire including relatively stationary and cooperating movable contacts, manually-actuated devices for displacing said movable contacts to the desired position, said movable contacts cooperating with said stationary contacts upon the return movement thereof to effect the call, means for locking said movable contacts in displaced position, means for rendering the return movements of said contacts uniform, and means for automatically releasing said locks, as and for the purpose set forth.

3. In a calling apparatus for automatic telephone systems, electrical devices for selecting any desired subscriber's line, circuits for said electrical devices, means arranged at the calling-station for controlling said circuits, said controlling means including relatively stationary and movable contacts, manually-actuated devices for displacing said movable

contacts, said movable contacts cooperating on the return movement thereof to normal position with said stationary contacts to effect the desired call, means for locking said displaced contacts in displaced position, an air-cushion apparatus for regulating and controlling the return movements of said displaced contacts whereby said return movement is made uniform, and means for releasing said lock, as and for the purpose set forth.

4. In a calling apparatus for automatic telephone systems, electrical devices including electromagnets for selecting the line-circuit of any desired subscriber, circuits for said magnets, means arranged at the calling-station for controlling said circuits including stationary and movable contacts, means for displacing said movable contacts to desired position preparatory to making a call whereby when said movable contacts are returned to initial position they make successive contact with said stationary contacts to effect the call, and means for imparting uniform speed to said movable contacts during the return thereof to initial position and while making said successive calling-contacts, as and for the purpose set forth.

5. In a calling apparatus for automatic telephone systems, electrical devices operating to select any desired subscriber's line, circuits for said devices, a make-and-break device arranged in said circuit and including a series of stationary contacts and cooperating movable contacts, manually-actuated devices for displacing said movable contacts relative to said series of stationary contacts and in position preparatory to making a call, means for locking said movable contacts in displaced position, means for releasing said lock, and an air-cushion for controlling the return movement of said movable contacts to initial position, said return movement effecting the desired call, as and for the purpose set forth.

6. In a calling apparatus for automatic telephone systems, electrical devices arranged to select the line-wire of any desired subscriber, circuits for said electrical devices, a circuit-interrupter arranged in said circuit and including movable contacts, means under the control of the subscriber for displacing said movable contacts into position preparatory to effecting the desired interruptions of said circuit, said movable contact operating to effect the desired circuit interruptions during the return movement thereof to initial position, and an air-cushion for controlling the speed of said movable contact during the return movement thereof, as and for the purpose set forth.

7. In a calling apparatus for automatic telephone systems and in combination with electrical devices for selecting any desired subscriber's wire, a circuit for said electrical devices, a series of stationary contacts arranged in said circuit, a movable contact arranged to operate over said series of stationary con-

tacts to successively make and break said circuit, manually-actuated devices for displacing said movable contact into position preparatory to effecting said successive makes and breaks, a plunger connected to said movable contact and operating to return the same to initial position when displaced, and an air-cylinder in which said plunger operates whereby during the return movement of said movable contact in making and breaking the circuit of said selector devices the speed of movement of said movable contact is rendered uniform, as and for the purpose set forth.

8. In a calling apparatus for automatic telephone systems and in combination with electrical devices for selecting a subscriber's wire, a circuit for said devices including a series of stationary contacts, a cooperating movable contact, manually-actuated devices for displacing said movable contact into position to cooperate during the return movement thereof to initial position with said stationary contacts to successively make and break said circuit, a plunger connected to said movable contacts as a counterbalance therefor and normally operating to return said movable contacts to initial position, an air-cylinder in which said plunger operates, and means for regulating the exhaust of air from said cylinder whereby during the return of said displaced movable contact and while successively making and breaking the selector-circuit the movement of said movable contacts is rendered uniform, as and for the purpose set forth.

9. In a calling apparatus for automatic telephone systems, a movable contact, a carrier therefor, a series of relatively fixed contacts over which said movable contact operates, manually-actuated devices for displacing said carrier to any desired position with reference to said fixed contacts whereby when said movable contact is returned it will make successive contact with said series of fixed contacts to make and break, an electric circuit, an overbalancing-plunger for returning said carrier, means for locking said carrier in displaced position, means for automatically releasing said lock, a chamber in which said plunger operates, and means actuated by the make and break of said electric circuit for selecting a subscriber's wire, as and for the purpose set forth.

10. In a calling apparatus for automatic telephone systems, a call-box, a circuit, make-and-break devices arranged within said box, said make-and-break devices including a movable contact and series of stationary contacts, means for displacing said movable contact into position to cooperate with said stationary contacts to successively make and break said circuit, a lock for holding said movable contact in displaced position, a receiver-hook, means actuated by the removal of the receiver from said hook for releasing said lock, and an air-cushion for controlling

the return movement of said movable contact to initial position, as and for the purpose set forth.

11. In a calling apparatus for automatic telephone systems, a call-box, a guide-rod arranged therein, a carrier mounted to slide upon and to be guided by said rod and carrying a contact-plate, means for displacing said carrier upon said rod into position preparatory to effecting a call, a series of fixed contacts over which said contact-plate operates to effect successive makes and breaks of an electric circuit during the return movement of said contact-plate to initial position, an overbalancing-counterweight for said carrier normally operating to hold said carrier in initial or retracted position, and an air-chamber in which such counterbalance operates whereby the return movement of said contact-plate is rendered uniform in speed, as and for the purpose set forth.

12. In a calling apparatus for automatic telephone systems, a call-box, a cylinder arranged therein, a plunger operating in said cylinder, a movable contact, connections between said contact and plunger, said plunger forming an overbalancing-counterweight for said contact and normally operating to hold the same in retracted position, a series of contact-points over which said movable contact operates, means for displacing said movable contact against the action of said counterweight, a lock for locking said movable contact in displaced position, a receiver-hook, and means actuated by the removal of the receiver from said hook for releasing said lock, as and for the purpose set forth.

13. In a calling apparatus for automatic telephone systems, a series of fixed contacts, a movable contact operating thereover, a plunger connected to and serving as a counterweight for said movable contact and operating to hold the same in a normal position, and manually-actuated devices arranged to disconnectively engage said contact for displacing the same relative to its normal position, as and for the purpose set forth.

14. In a calling apparatus for automatic telephone systems, a series of fixed contact-points, a movable contact operating thereover, an overbalancing-counterweight arranged to hold said movable contact in a normal position, a handle or button disconnected from said contact but arranged to engage the same when manually actuated to displace said movable contact whereby said movable contact is returned to normal position by its overbalancing-counterweight, as and for the purpose set forth.

15. In a calling apparatus for automatic telephone systems, a series of fixed contact-points, a movable contact operating thereover, a plunger forming a counterbalance for said movable counterweight and operating to hold the same in a normal position, a handle or button disconnected from but arranged to engage said movable contact and adapted for

manually actuating to displace said movable contact to any desired relation with respect to said fixed contact-points, and a cylinder in which said counterweight operates whereby when said movable contact is displaced it is returned at a uniform speed to its normal position, as and for the purpose set forth.

16. In a calling apparatus for automatic telephone systems, a series of fixed contact-points, a movable contact coöperating therewith, means for displacing said movable contact manually relative to said series of fixed contact-points and to any desired point of displacement preparatory to making a call, means normally operating to return said displaced contact to initial position, means for locking said movable contact in displaced position, means for automatically releasing said lock, and means for controlling the speed of the return movement of said movable contact to initial position, as and for the purpose set forth.

17. In a calling apparatus for automatic telephone systems, a series of fixed contact-points, a movable contact operating thereover, manually-actuated devices for displacing said movable contact from normal position to any desired point with reference to said stationary contacts whereby said movable contact during the return movement thereof to initial position will make successive contacts with said fixed contacts, a lock for holding said movable contact in displaced position, an air-cylinder, a plunger therein, connections between said plunger and said movable contact, said plunger operating as an overbalancing-counterweight for said movable contact and tending to normally hold said movable contact in retracted or initial position, a receiver-hook and devices actuated by the movement of said hook when the receiver is removed therefrom for releasing said lock, as and for the purpose set forth.

18. In a calling apparatus for automatic telephone systems, a call-box, stationary contacts arranged in sets, a movable contact operating over each set of stationary contacts, overbalancing means connected to each movable contact and operating to normally hold the same in initial position, manual devices for independently displacing each movable contact from initial position thereof and against the action of its overbalancing means, and means for independently cushioning the return movement of each of said movable contacts whereby the speed of such movement is rendered uniform, as and for the purpose set forth.

19. In a calling apparatus for automatic telephone systems, a plurality of fixed contact-points, a movable contact operating over each series of fixed points, an overbalancing-counterweight for each movable contact, means for independently displacing said movable contacts against the action of its overbalancing-counterweight, a lock for each movable contact to hold the same in displaced re-

lation, and means actuated by the return of one of said movable contacts to normal position for releasing the lock of the next adjacent contact, as and for the purpose set forth.

5 20. In a calling apparatus for automatic telephone systems, a plurality of series of contact-points, a movable contact operating over each series of fixed points, means for displacing said movable contacts to any desired position, a lock for holding each contact
10 in displaced position, means for automatically detaching one of said locks to permit its corresponding movable contact to return to initial position, and means actuated by the return of said movable contact to initial position
15 for releasing the lock of the next adjacent contact, as and for the purpose set forth.

21. In a calling apparatus for automatic telephone systems, a plurality of series of
20 fixed contact-points, a movable contact operating over each series of points, means for independently moving each of said movable contacts to any desired relation with respect to its corresponding series of fixed points,
25 means normally operating to maintain said contacts in initial or normally retracted position, an independent lock for holding each movable contact in displaced position, automatically-actuated devices for releasing the
30 holding-lock of one of said movable contacts, and means actuated by the return of said released contact to normal or retracted position for releasing the holding-lock of the next adjacent contact, as and for the purpose set
35 forth.

22. In a calling apparatus for automatic telephone systems, a call-box, a plurality of series of fixed contact-points arranged therein, a guide-rod arranged adjacent to each series of contact-points, a carrier arranged to
40 be guided by each rod and carrying a cooperating contact, a plunger forming an overbalancing-counterweight for each carrier, a cylinder in which each plunger operates,
45 means for independently displacing each carrier against the action of its counterweight, locks for holding said carriers in displaced position, and means for automatically releasing said locks, as and for the purpose set forth.

50 23. In a calling apparatus for automatic telephone systems, a call-box, a series of fixed contact-points arranged therein, a movable contact operating thereover, a plunger connected to and serving as an overbalancing-counterweight for said movable contact to
55 return the same to initial position, a pawl connected to said movable contact, a rack arranged to be engaged by said pawl to hold said contact in any desired displaced relation, and means for disengaging said pawl
60 from said rack to permit said carrier to return to normal position, as and for the purpose set forth.

24. In a calling apparatus for automatic
65 telephone systems, a call-box, a rock-shaft journaled therein and carrying a rack, a carrier having a pawl arranged to engage in the

teeth of such rack, a detent arranged to hold said rack in engaging relation with respect to said pawl, a plunger connected to and
70 serving as an overbalancing-counterweight for said carrier and operating to normally hold said carrier in initial or retracted position, means for displacing said carrier against the action of said counterweight, and means
75 for detaching said detent, as and for the purpose set forth.

25. In a calling apparatus for automatic telephone systems, a call-box, a rock-shaft arranged therein, a spring normally tending
80 to rock said shaft, a rack carried by said shaft, a carrier having a pawl arranged to engage in the teeth of said rack, a contact-plate carried by said carrier, a series of fixed contact-points over which said contact-plate operates, a counterbalance for said carrier operating to maintain the same in normally retracted position, means for displacing said carrier with reference to said rack, a latch or
85 detent operating to hold said rack against the action of said spring and in engaging relation with respect to said pawl, and means for automatically releasing said latch or detent, as and for the purpose set forth.

26. In a calling apparatus for automatic
95 telephone systems, a call-box, a plurality of rock-shafts mounted therein, a spring connected to each shaft and normally operating to rock the same in one direction, a rack connected to each shaft, a contact-carrier associated with each rack and each provided with
100 a pawl arranged to engage in the teeth of such rack, detents for holding said racks in engaging relation with respect to the pawl of its carrier, a counterweight for each carrier
105 operating to normally maintain said carrier in retracted position, means for independently displacing said carriers against the action of their counterweights, means for automatically releasing the detent of one of said racks
110 to permit its carrier to return to initial or normal position, and means operated by said carrier when it arrives at its initial or normal position for releasing the next adjacent rack, as and for the purpose set forth.

27. In a calling apparatus for automatic
115 telephone systems, a call-box, a shaft journaled therein and having a receiver-hook mounted thereon, a movable rack, a contact-carrier operated manually in one direction, means for normally tending to return said carrier to initial position, said carrier being held
120 in displaced position by said rack, means for moving said rack out of engaging relation with respect to said carrier to permit the latter to return to initial position, and means actuated by said hook-supporting shaft for restoring said rack into engaging relation with respect to said carrier, as and for the purpose set forth.

28. In a calling apparatus for automatic
130 telephone systems, a call-box, a plurality of racks arranged therein, a contact-carrier associated with each rack, an independent latch for retaining each rack in engaging relation

with respect to its associated carrier, means for normally tending to move said racks out of engaging relation, said racks adapted to be manually displaced, means normally tending
 5 to return said carriers to initial position, a receiver-hook, means actuated by the rocking of said hook in one direction for releasing the holding-latch of one of said racks to permit the carrier associated with said rack to return
 10 to normal position, and means actuated by the return of said carrier to normal position for releasing the latch of the next adjacent rack, as and for the purpose set forth.

29. In a calling apparatus for automatic
 15 telephone systems, a call-box, movable contact-carriers arranged therein, said carriers adapted to be independently displaced manually, means normally operating to return
 20 said carriers to initial position, a rack arranged to hold each carrier in displaced position, a latch for each rack for locking the same in engaging relation with respect to its associated carrier, means normally tending to
 25 move said racks out of engaging relation, a receiver-hook, means actuated by the movement of said hook in one direction for releasing said racks to permit said carriers to return to initial position, and means actuated by said receiver-hook when moved in the opposite di-
 30 rection for restoring said racks to engaging position, as and for the purpose set forth.

30. In a calling apparatus for automatic telephone systems, a call-box, independent contact-carriers arranged therein, said contact-carriers adapted to be displaced manu-
 35 ally, means normally tending to return said carriers to initial position, engaging devices arranged to engage said carriers and lock the same in whatever position to which they may
 40 be displaced, a receiver-hook and means actuated by the release of said hook for successively releasing said carriers from said lock, as and for the purpose set forth.

31. In a calling apparatus for automatic
 45 telephone systems, a call-box, movable contacts arranged therein, a pointer and scale associated with each movable contact, said contacts arranged to be moved manually to any desired position indicated by said scale,
 50 means normally tending to return said contacts to initial position, a lock for holding each movable contact in the position to which it has been manually displaced, means normally tending to release said lock, a receiver-
 55 hook, means actuated by the movement of said hook in one direction for releasing said lock, and means actuated by the movement of said hook in the opposite direction for restoring said lock to engaging position, as and
 60 for the purpose set forth.

32. In a calling apparatus for automatic telephone systems, a call-box, a plurality of movable contacts arranged therein, said con-
 65 tacts adapted to be displaced manually, means normally operating to return said contacts to initial position, locking-racks arranged to hold said carriers in their displaced positions,

means normally operating to move said racks out of locking relation with respect to said contacts, independent latches for locking said
 70 racks in locking position, a rod connected to one of said latches, a receiver-hook, means actuated by the removal of the receiver from said hook for engaging said rod to disengage
 75 said latch thereby permitting one of said movable contacts to return to initial position, a release-lever arranged to engage the next adjacent latch, said lever being actuated by the return of the first movable contact to initial
 80 position to release said latch whereby the next adjacent contact is permitted to return to initial position, as and for the purpose set forth.

33. In a calling apparatus for automatic telephone systems, a call-box, a bar arranged therein and carrying a series of contact-
 85 points, a movable contact operating over said points, a carrier for said contact, a guide-rod on which said carrier slides, a sleeve loosely mounted on said rod and arranged to rest
 90 upon said carrier whereby said carrier may be manually displaced, a plunger, a cylinder in which said plunger operates, connections between said plunger and said carrier where-
 95 by said carrier when displaced is returned automatically to initial position, a rock-shaft, a rack carried thereby, a pawl mounted on said carrier and arranged to engage said rack
 100 whereby said carrier is locked when displaced, means operating to normally rock said shaft to disengage said rack from said pawl, a latch for locking said rack in engaging relation, a
 105 receiver-hook, means actuated thereby when moved in one direction for releasing said latch, and means actuated by said hook when moved in the other direction for moving said rack into engaging relation with respect to
 said latch, as and for the purpose set forth.

34. In a calling apparatus for automatic telephone systems, a call-box, a plurality of contact-bars arranged therein, each carrying
 110 a series of contact-points, a guide-rod arranged adjacent to each contact-bar, a movable carrier guided by each rod and carrying a contact arranged to operate over the contact-points on said bar, a sleeve mounted on
 115 each rod and arranged to rest upon the carrier guided by said rod to afford means for manually displacing said carrier, a plunger connected to each carrier, a cylinder in which each plunger is mounted to operate, a pawl
 120 mounted on each carrier, a rack arranged to form a lock for each carrier when manually displaced to hold the same in displaced position, means normally operating to move each rack out of engaging relation with respect to
 125 its associated pawl, a latch for locking each rack in engaging relation with respect to its pawl, a receiver-hook, means actuated by the movement of said hook in one direction for releasing said latch, and means actuated by
 130 the movement of said hook in the opposite direction for restoring said racks into engaging relation with respect to said latches, as and for the purpose set forth.

35. In a calling apparatus for automatic telephone systems, a call-box having slots or openings therein, buttons or handles arranged within said call-box and projecting through
5 and adapted to be manually moved along said openings, a pointer carried by each button and operating in association with a scale, a movable contact arranged to be moved in
10 one direction by each button, means for normally returning or restoring each contact to normal position, and means actuated by the return of said contacts to initial position for completing circuit through said call-box to the line-wire of another subscriber, as
15 for the purpose set forth.

36. In a call mechanism for automatic telephone systems, a series of movable contacts, contact-points over which each of said movable contacts operates, means normally operating to maintain said movable contacts in

retracted position, means for displacing said movable contacts into position to make successive contact with the contact-points over which they operate upon the return thereof
25 to initial position, means for locking said movable contacts in displaced position, means for releasing one of said movable contacts, and means actuated by the return of said movable contact to initial position for releasing the next movable contact of the series, as
30 and for the purpose set forth.

In witness whereof we have hereunto set our hands, this 17th day of December, 1900, in the presence of the subscribing witnesses.

JOHN J. BROWNRIGG.
JOHN K. NORSTROM.

Witnesses:

CHARLES H. SEEM,
S. E. DARBY.