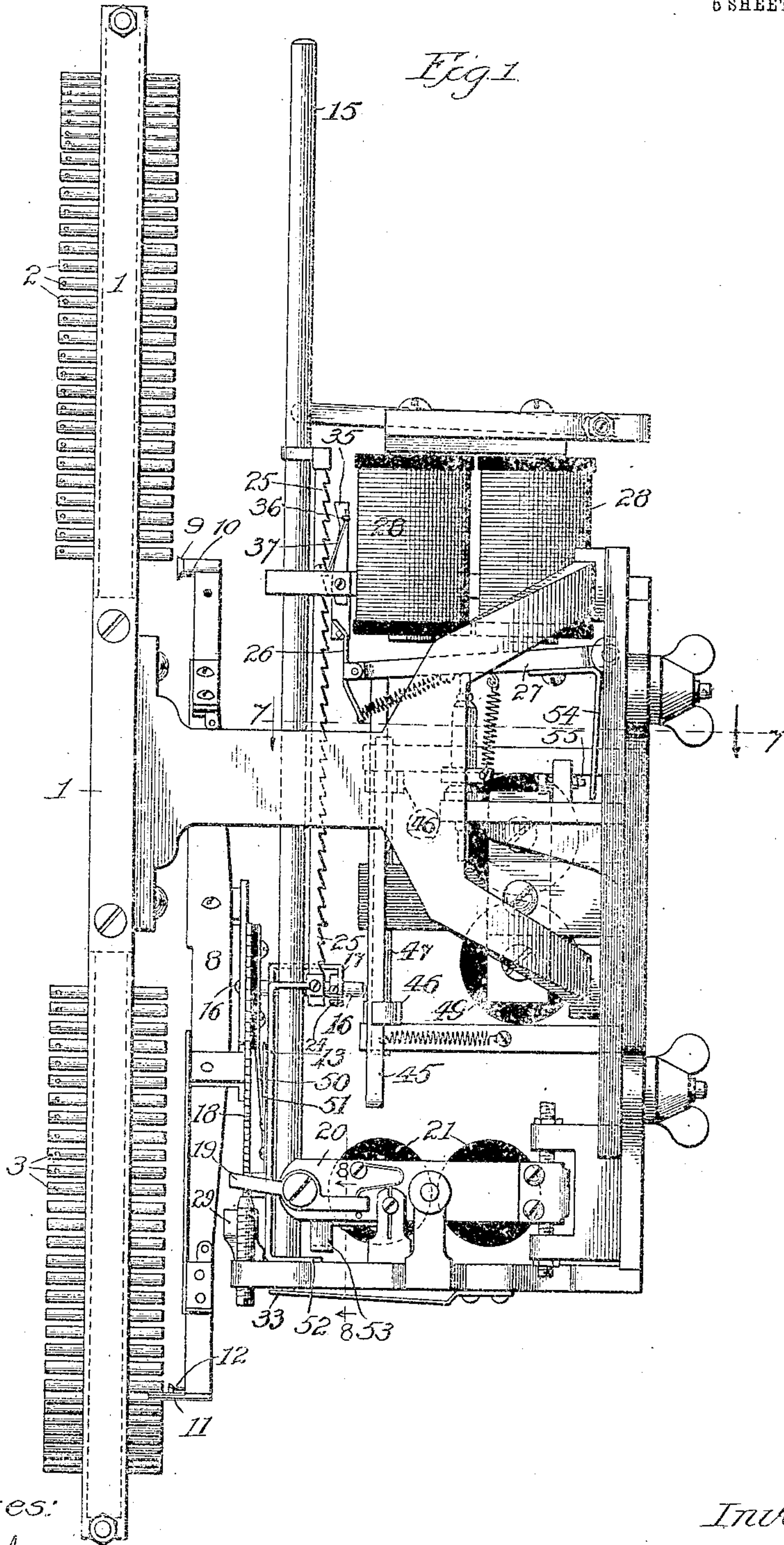


F. H. LOVERIDGE.
 AUTOMATIC TELEPHONE EXCHANGE SELECTOR.
 APPLICATION FILED AUG. 2, 1906.

931,072.

Patented Aug. 17, 1909.

5 SHEETS—SHEET 1.



Witnesses:
 H. H. Leach
 Geo. C. Dawson

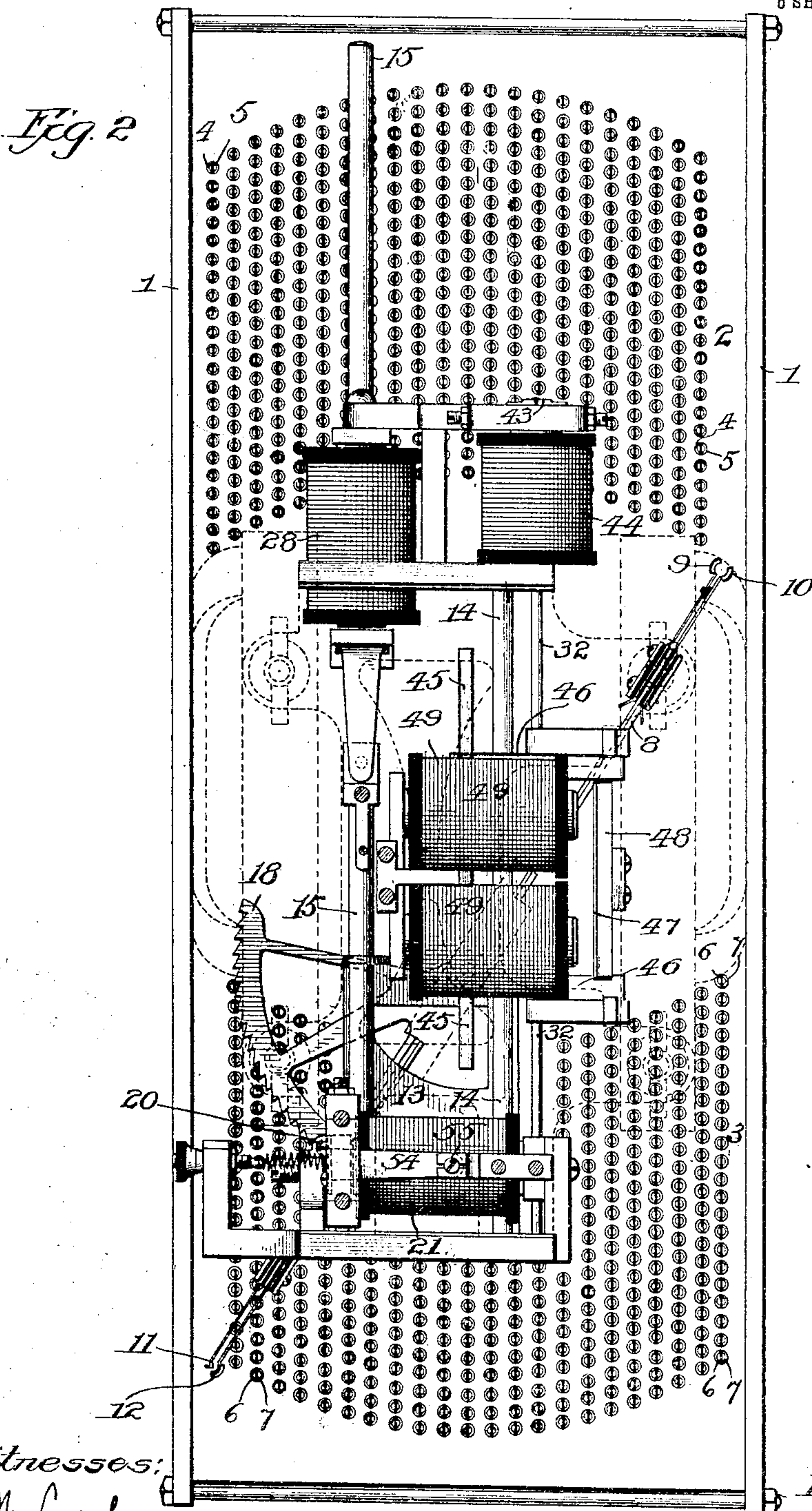
Inventor:
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Witnesses:
 H. A. Lusk
 Geo. C. Davis

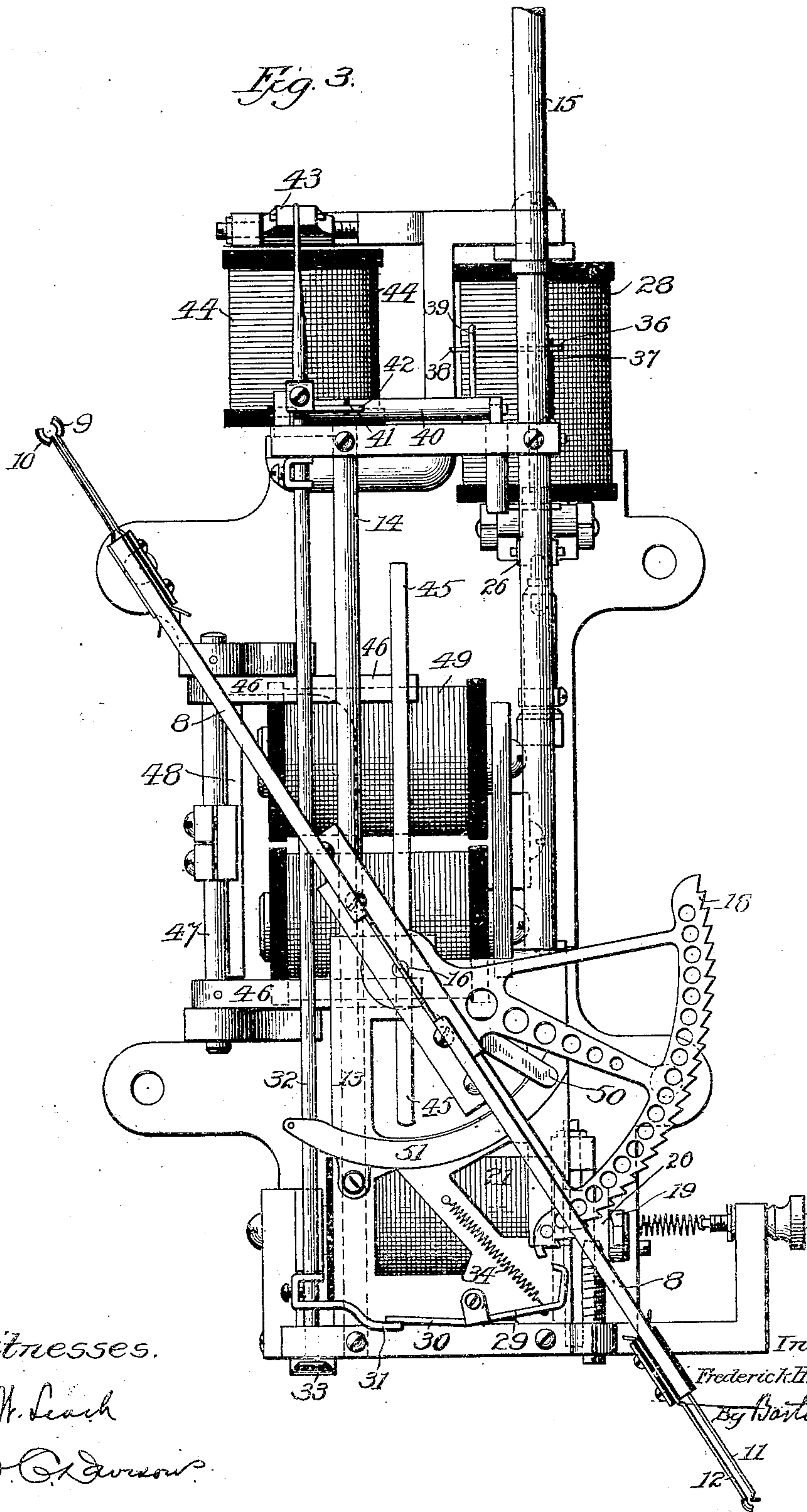
Inventor:
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5 SHEETS—SHEET 3.



Witnesses.

H. H. Leach

Ed. O. Dawson

Inventor.

Frederick H. Loveridge.

By Barton, J. A. & Co.

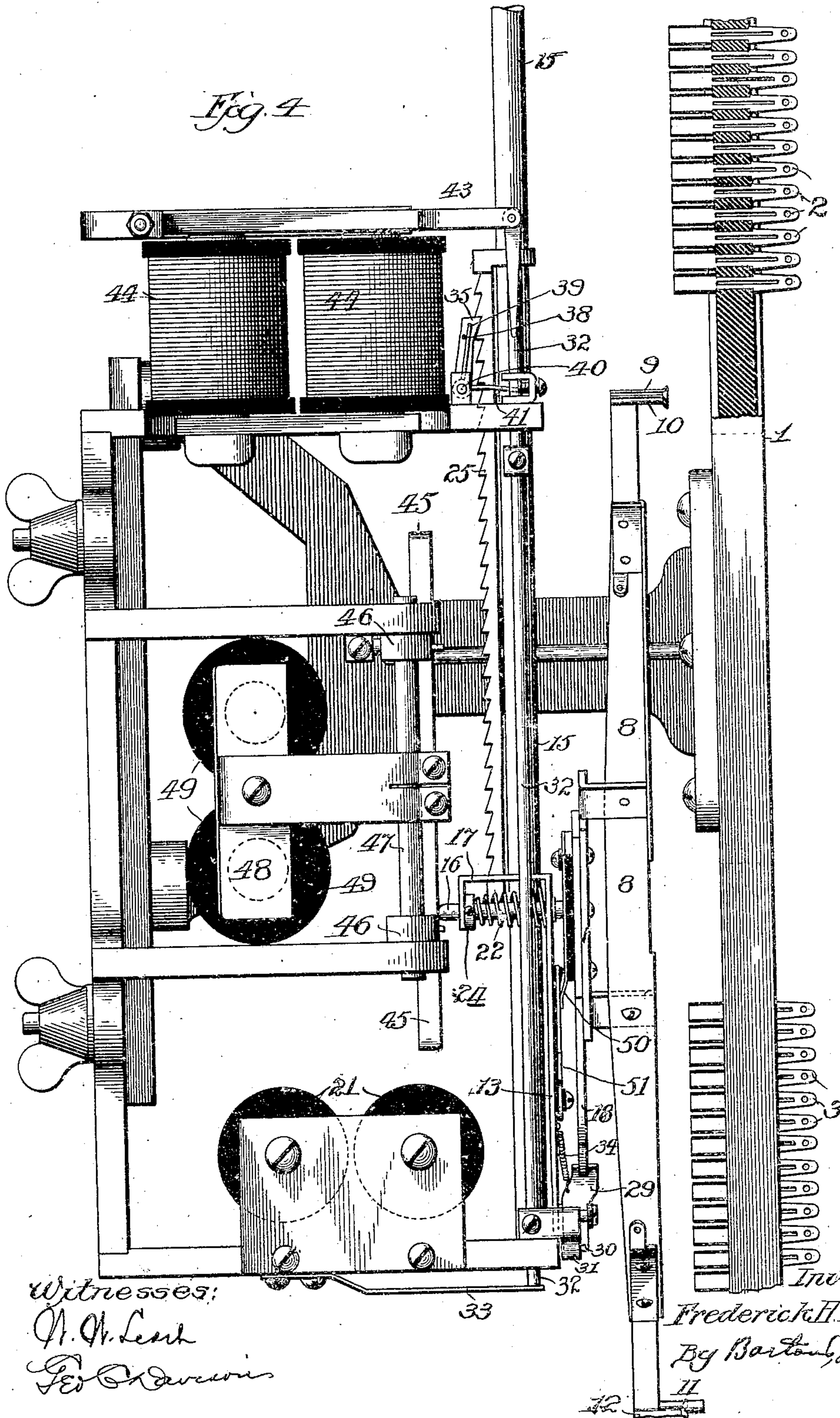
Attys

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5 SHEETS—SHEET 4.



Witnesses:
 H. H. Lusk
 Geo. O. Dawson

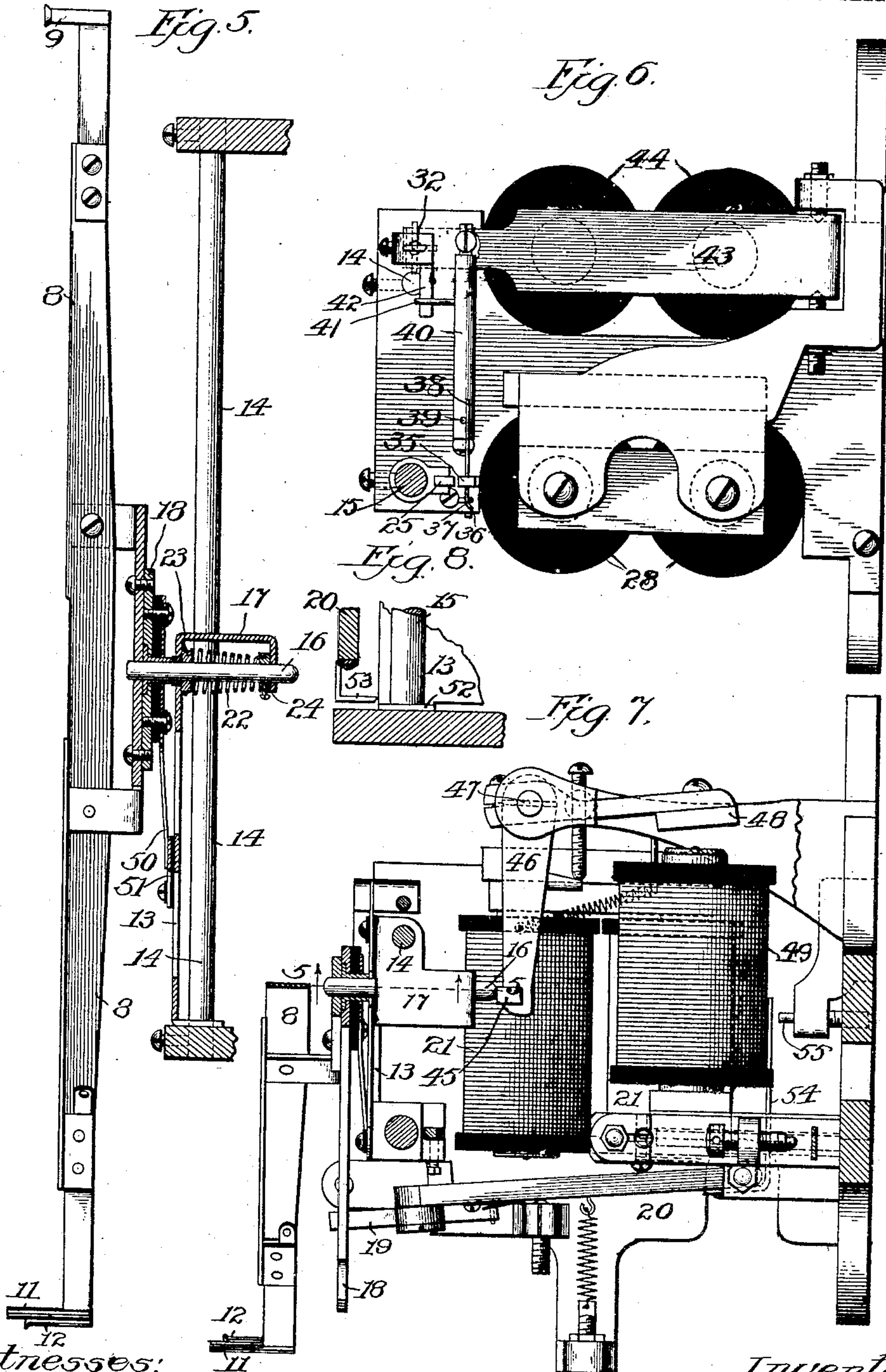
Inventor:
 Frederick H. Loveridge
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6 SHEETS—SHEET 5.



Witnesses:

W. M. Clark
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UNITED STATES PATENT OFFICE.

FREDERICK H. LOVERIDGE, OF CHICAGO, ILLINOIS, ASSIGNOR TO WESTERN ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

AUTOMATIC TELEPHONE-EXCHANGE SELECTOR.

No. 931,072.

Specification of Letters Patent.

Patented Aug. 17, 1909.

Application filed August 2, 1906. Serial No. 328,834.

To all whom it may concern:

Be it known that I, FREDERICK H. LOVERIDGE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Automatic Telephone-Exchange Selectors, of which the following is a full, clear, concise, and exact description.

My invention relates to an automatic telephone exchange selector, and has for its object to provide an improved and efficient machine for automatically effecting the interconnection of subscribers' lines in an automatic exchange.

Generally speaking, my invention contemplates a selector having a number of rows of line terminals arranged in a plane field, together with a contact arm adapted to be rotated to select any one of said rows, and to be moved longitudinally to the desired terminal in the selected row.

A feature of my invention consists in the arrangement whereby the contact arm during its act of selecting a desired terminal, remains free from engagement with all of said terminals, and the provision of means operated when the arm rests opposite the desired terminal, to move the same into connection therewith.

Another feature consists in the provision of a bank of local contacts corresponding to said line terminals, said arm carrying line brushes for the line terminals, and a local brush for the local contacts, said local brush in the selecting movement of the arm trailing over the local contacts in its path.

Other features consist in the details of construction to the hereinafter described.

I will describe my invention by reference to the accompanying drawings, which represent the preferred embodiment thereof, reserving for the appended claims a statement of the parts, improvements and combinations which I regard as novel with me.

In the drawings, Figure 1 is a side elevation of a selector embodying my invention; Fig. 2 is a front view of the same; Fig. 3 is a back view of the selector mechanism, the banks of contacts being removed; Fig. 4 is a side elevation, partially in section, with portions omitted for clearness, showing the retaining magnet energized; Fig. 5 is a detail vertical sectional view on line 5—5 of Fig. 7; Fig. 6 is a plan view of the selector

mechanism; Fig. 7 is a plan view on line 7—7 of Fig. 1; Fig. 8 is a detail sectional view on line 8—8 of Fig. 1.

The same numerals of reference indicate the same parts wherever shown.

The back plate 1 of the frame carries two banks 2, 3, of terminals arranged in a vertical plane, the upper bank 2 comprising a series of rows of line terminals 4, 5, respectively, while the lower bank comprises rows of local and individual terminals 6, 7, respectively, corresponding to the line terminals above, said terminals being insulated from each other, as shown. A vertical contact arm 8 is provided for said terminals, carrying at its upper end a pair of insulated line brushes 9, 10, adapted to engage the line terminals, said brushes normally lying below said bank 2. The arm 8 carries at its lower end a pair of insulated brushes 11, 12, lying below said bank 3, the brush 11 being the local brush adapted to engage the local terminals 6. Said brush 11 is made long enough so that when moved over a vertical row of terminals to select a desired terminal therein, it will trail over the local terminals in its path. The arm 8 is adapted to be rotated to select corresponding vertical rows in said terminal banks 2, 3. Said arm 8 is rotatably mounted upon a vertically movable carriage 13 mounted upon guide rods 14, 15, carried by the frame of the selector, a rotatable shaft 16 being mounted in bearings formed by said carriage and an extension 17 thereof, and carrying said arm 8. A segmental rack 18 is secured to the shaft 16, said rack being adapted to be engaged while the carriage is in its normal position, by a stepping pawl 19 adapted to be operated by the armature 20 of an electromagnet 21. Said pawl 19 is adapted to effect the rotation of arm 8 against the tension of a spring 22 surrounding the shaft 16 and connected between a hub 23 secured to the carriage and a collar 24 secured to said shaft. The carriage 13 carries a rack bar 25 adapted to be engaged by a stepping pawl 26 operated by an armature 27 of an electromagnet 28, to lift the carriage 13 and the arm 8 carried thereby. Thus after the arm 8 has been rotated to select the desired rows of terminals, the carriage 13 is lifted to bring said arm to the proper terminals on said rows.

A retaining pawl 29 is provided for the segmental rack 18, said pawl being pivoted

to the carriage 13, and provided with an arm 30 adapted to be normally engaged by a finger 31 carried by a rod 32 mounted vertically in the frame of the selector, a spring 33 engaging said rod to force said finger against said arm 30 of the retaining pawl 29. Said pawl is provided with a spring 34 adapted when the finger 31 is withdrawn to force said retaining pawl into engagement with the rack 18. The rack bar 25 is provided with a retaining pawl 35 pivoted to the frame of the selector and carrying a cross pin 36 adapted to be engaged by a spring 37 tending to force said retaining pawl into engagement with rack 25. Said pawl, however, carries a cross pin 38 adapted to be engaged by a vertical projection 39 mounted upon a horizontal rocking shaft 40. Said shaft carries a lug 41 adapted to be engaged by a finger 42 carried by said rod 32 to normally maintain the retaining pawl 35 away from the rack bar 25. The rod 32 is adapted to be depressed against the tension of spring 33 to withdraw fingers 31, 42, and allow the retaining pawls 29, 35, to engage their respective racks, by the armature 43 of magnet 44, as shown in Fig. 4. The arm 8 while undergoing its rotary and longitudinal movements, remains free from engagement with any of the terminals, the local brush 11, however, during the longitudinal movement preferably trailing over the local terminals 6 in its path, or in the row selected. When the arm reaches a position with its brushes 9, 10, 12, opposite the desired terminals, the arm is arranged to be given a horizontal movement to cause said brushes to engage the desired terminals. To this end, the rotary shaft 16 which carries the arm 8 is arranged to be movable longitudinally in its bearings, said shaft when so moved compressing the spring 22. The shaft is arranged to be moved by a presser bar 45 carried by arms 46, 46, of a rocking shaft 47 supported by the frame and adapted to be operated by the armature 48 of a connecting magnet 49. The spring 22 is preferably made conical in shape, so as to serve as the restoring force to return the arm 8 to normal position from both its rotary and horizontal movements.

The shaft 16 supports an insulated wiper finger 50 moving with the arm 8 during its rotary travel, over a segmental anvil 51, said finger 50, however, when the arm is given its horizontal or "connecting" movement, being separated from its anvil 51.

It will be observed that the tooth of the retaining pawl 29 is of considerable width, so that when the shaft 16 is moved longitudinally in the "connecting" movement of the arm, said retaining pawl will remain in engagement with the rack 18.

I preferably provide means for locking the carriage 13 against movement while the

magnet 21 is operating stepping pawl 19 to rotate the contact arm 8. To this end I preferably provide a lip 52 upon the base of the carriage 13 adapted while the armature 20 is operating to form, with an angular lug 70 or finger 53 carried by said armature, a lock for said carriage, said finger riding over said lip 52.

I preferably provide the armatures of the stepping magnets with means whereby they will be rapidly retracted. Each of the armatures of the stepping magnets carries a stiff leaf spring 54 adapted as the armature completes its attractive movement to engage a stop 55, and be placed under tension, so that said armatures, when their magnets are deenergized, will be given a very quick retractive movement.

The operation of said selector may be briefly described as follows: The first step is the energization of magnet 44, the armature whereof, when attracted, depresses rod 32, withdrawing fingers 31, 42, and permitting springs 34, 37, to move retaining pawls 29, 35, into engagement with racks 18, 25, respectively. The magnet 21 is now energized to vibrate armature 20 and cause the stepping pawl 19 to rotate rack 18 and the contact arm 8 against the tension of spring 22, bringing the brushes 9, 10, 11, 12, in line with the desired corresponding rows of terminals in the banks 2, 3. It will be understood that the middle vertical rows in the banks 2, 3, will correspond in number, but that the first row to the left of the central row in the upper bank will have for its corresponding row in the lower bank the first row to the right of the middle, and so on, according to the displacement of the arm from its central or vertical position. The magnet 28 is now intermittently energized to cause pawl 26 to engage rack 25 and lift the carriage 13 to bring the brushes of the arm 8 opposite the desired terminals in the selected rows. The connecting magnet 49 is now energized to cause the presser bar 45 to move the shaft 16 longitudinally, compressing spring 22 and forcing the brushes on arm 8 into engagement with the selected terminals in said banks 2, 3. When the magnets are deenergized, the spring 22 withdraws the arm 8 from the terminals, and the retaining pawls being withdrawn from the racks, the carriage 13 falls by gravity to normal position, and the spring 22 restores the arm 8.

I claim:

1. In a selector, the combination with a series of rows of terminals, of a contact arm, a carriage upon which said arm is rotatably mounted, means for rotating said arm to select any one of said rows, and means for moving said carriage longitudinally to bring said arm to the desired terminal in said row.

2. In a selector, the combination with a

series of rows of terminals, of a contact arm, a rotatable shaft for said arm, a carriage for said shaft, a rack carried by said shaft, an electromagnetically operated stepping pawl
 5 for said rack adapted to rotate said arm to select one of said rows, a rack carried by said carriage, and an electromagnetically operated stepping pawl for said rack adapted to move said carriage to bring said arm to
 10 the desired terminal in the selected row.

3. In a selector, the combination with a series of rows of terminals, of a contact arm, a rotatable shaft for said arm, a carriage for said shaft, a rack carried by
 15 said shaft, an electromagnetically-operated stepping pawl for said rack adapted to rotate said arm to select one of said rows, a rack carried by said carriage, an electromagnetically-operated stepping pawl for
 20 said rack adapted to move said carriage to bring said arm to the desired terminal in the selected row, retaining pawls for said racks, and an electromagnet controlling both of said pawls.

4. In a selector, the combination with a series of vertical rows of terminals, of a contact arm, a carriage upon which said arm is mounted to rotate, vertical guide rods upon
 30 which carriage is adapted to move, means for rotating said arm to select one of said vertical rows of terminals, and means for moving said carriage upon said guide rods to bring said arm to the desired terminal in the selected row.

5. In a selector, the combination with a series of vertical rows of terminals, of a contact arm, a rotatable shaft for said arm, a carriage supporting said shaft, vertical
 40 guide rods upon which said carriage is adapted to move, a rack carried by said shaft, means for operating said rack to rotate said arm in a vertical plane and select one of said rows, a vertical rack carried by said carriage, and means for operating
 45 said rack to lift said support and bring said arm to the desired terminal in the selected row, and means for restoring said carriage and arm to their normal positions.

6. In a selector, the combination with line
 50 terminals, of a vertical, rotatable contact arm and vertically movable carriage therefor, racks and stepping pawls for moving said arm and carriage, retaining pawls for said racks, means tending to move said
 55 retaining pawls into engagement with said racks, mechanism normally maintaining said retaining pawls away from said racks, and a magnet adapted to withdraw said mechanism.

7. In a selector, the combination with line
 60 terminals, of a rotatable contact arm and vertically movable carriage therefor, racks and stepping pawls for moving said arm and carriage, pivoted retaining pawls for
 65 said racks, springs tending to move said

retaining pawls to engage said racks, a spring-actuated rod carrying fingers adapted normally to remove said retaining pawls from said racks, a magnet and an armature therefor adapted when attracted to move
 70 said rod against its spring to withdraw said fingers and permit the retaining pawls to engage said racks.

8. In a selector, the combination with a number of rows of line terminals, of a
 75 contact arm therefor, a carriage, a rotatable shaft carrying said arm and mounted in bearings in said carriage, a spring surrounding said shaft, means for rotating said arm against the tension of said spring to select
 80 a row of said terminals, means for moving said carriage to bring said arm opposite the desired terminal in said row, said arm remaining away from said terminals, and means for moving said shaft longitudinally
 85 to move said arm into engagement with the desired terminal, and to compress said spring, said spring being adapted to restore said arm from its rotary movement and said shaft from its longitudinal movement,
 90 and means for restoring said carriage.

9. In a selector, the combination with a number of rows of line terminals, of a contact arm therefor, a carriage, a rotatable
 95 shaft carrying said arm and mounted in bearings in said carriage, a conical spring surrounding said shaft and connecting the same to said carriage, means for rotating said arm against the tension of said spring to select any row of terminals, means for
 100 moving said carriage to bring said arm opposite the desired terminal in said row, said arm during its movement remaining away from said terminals, a magnet, a presser bar operated thereby for moving said shaft lon-
 105 gitudinally to move said arm into engagement with said desired terminal and to compress said spring, and means for restoring said carriage to normal position, said spring restoring said arm and shaft.
 110

10. In a selector, the combination with line terminals, of a rotary contact arm adapted to select a terminal, said arm nor-
 115 mally and during selection being out of engagement with said terminals, a wiper finger carried by said arm, a segmental anvil therefor, said finger during the rotation of said contact arm wiping over said anvil, and means for moving said arm bodily to engage
 120 the desired terminal, said finger in such movement being separated from its anvil.

11. In a selector, the combination with two groups of terminals, of a contact arm carrying contact brushes for said groups,
 125 means for rotating said arm to select a row in each group, and means for moving said arm longitudinally to the desired terminals in said rows.

12. In a selector, the combination with a number of rows of terminals, of a contact
 130

arm carrying contact brushes, means for rotating said arm to select any row of said terminals, and means for moving said arm longitudinally to bring said brushes to the
 5 desired terminals in said row, one of said brushes during such longitudinal movement of said arm trailing over the terminals in the selected row.

13. In a selector, the combination with
 10 two groups of terminals, of a contact arm pivoted between said groups of terminals, said arm carrying contact brushes at its ends for said groups, means for rotating said arm to select a row in each group of terminals, and means for moving said arm longitudinally to the desired terminals in said
 15 rows, one of said brushes during the longitudinal movement of the arm trailing over the terminals in its selected row.

20 14. In a selector, the combination with a number of rows of line terminals, of a corresponding number of rows of local terminals, a contact arm pivotally mounted between said rows, said arm carrying at one
 25 end line brushes for said first mentioned line terminals, and at the other end a local brush for said local terminals, means for rotating said arm to select a row of line terminals and the row of local terminals correspond-

ing thereto, and means for moving said arm 30 longitudinally to the desired terminals in said rows, said local brush in such movement trailing over the local terminals in its path.

15. In a selector, the combination with
 35 two vertical groups of terminals, of a vertical contact arm carrying at its ends, below said groups, brushes therefor, means for rotating said arm in a vertical plane to select rows of said groups, and means for lifting
 40 said arm to bring said brushes to the desired terminals in the selected rows.

16. In a selector, the combination with a longitudinally movable carriage, of a contact arm, a rotatable shaft carrying said arm and mounted in bearings in said carriage, a
 45 segmental rack carried by said shaft, a magnet, an armature therefor, a pawl operated by said armature adapted to engage said rack, a lip carried by said carriage, a finger
 50 carried by said armature, adapted during the operation thereof to cooperate with said lip to lock said carriage against movement.

In witness whereof, I hereunto subscribe my name this 30th day of July, A. D. 1906.

FREDERICK H. LOVERIDGE.

Witnesses:

C. A. COGGINS,

ROY T. ALLOWAY.