

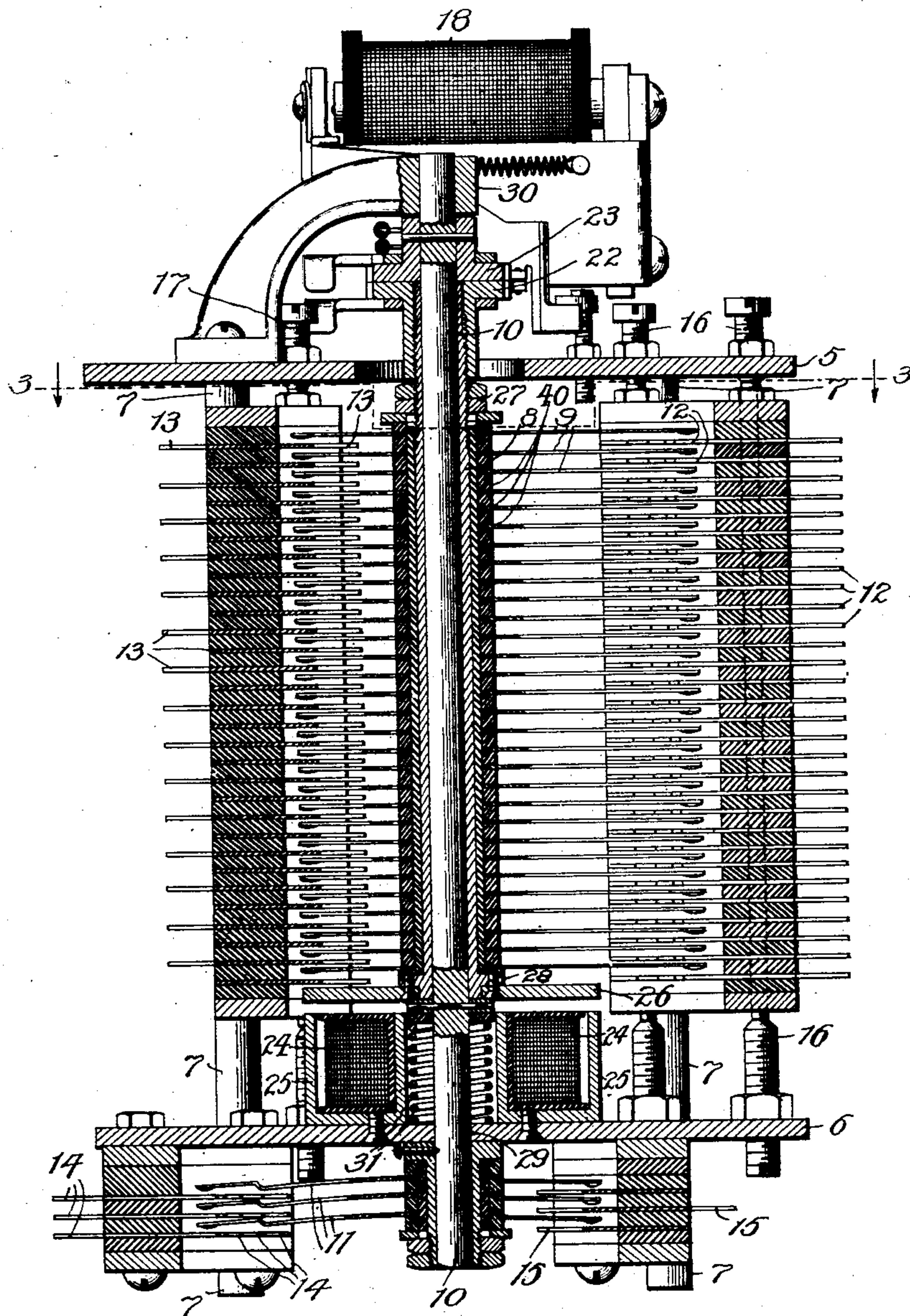
E. B. CRAFT.
 SELECTOR SWITCH.
 APPLICATION FILED NOV. 23, 1907.

973,762.

Patented Oct. 25, 1910.

3 SHEETS—SHEET 1.

Fig 1



Witnesses:
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Irving Mac Donald.

Inventor,
Edward B. Craft,
 By *Carlton, Munner & Folk*
 Attys

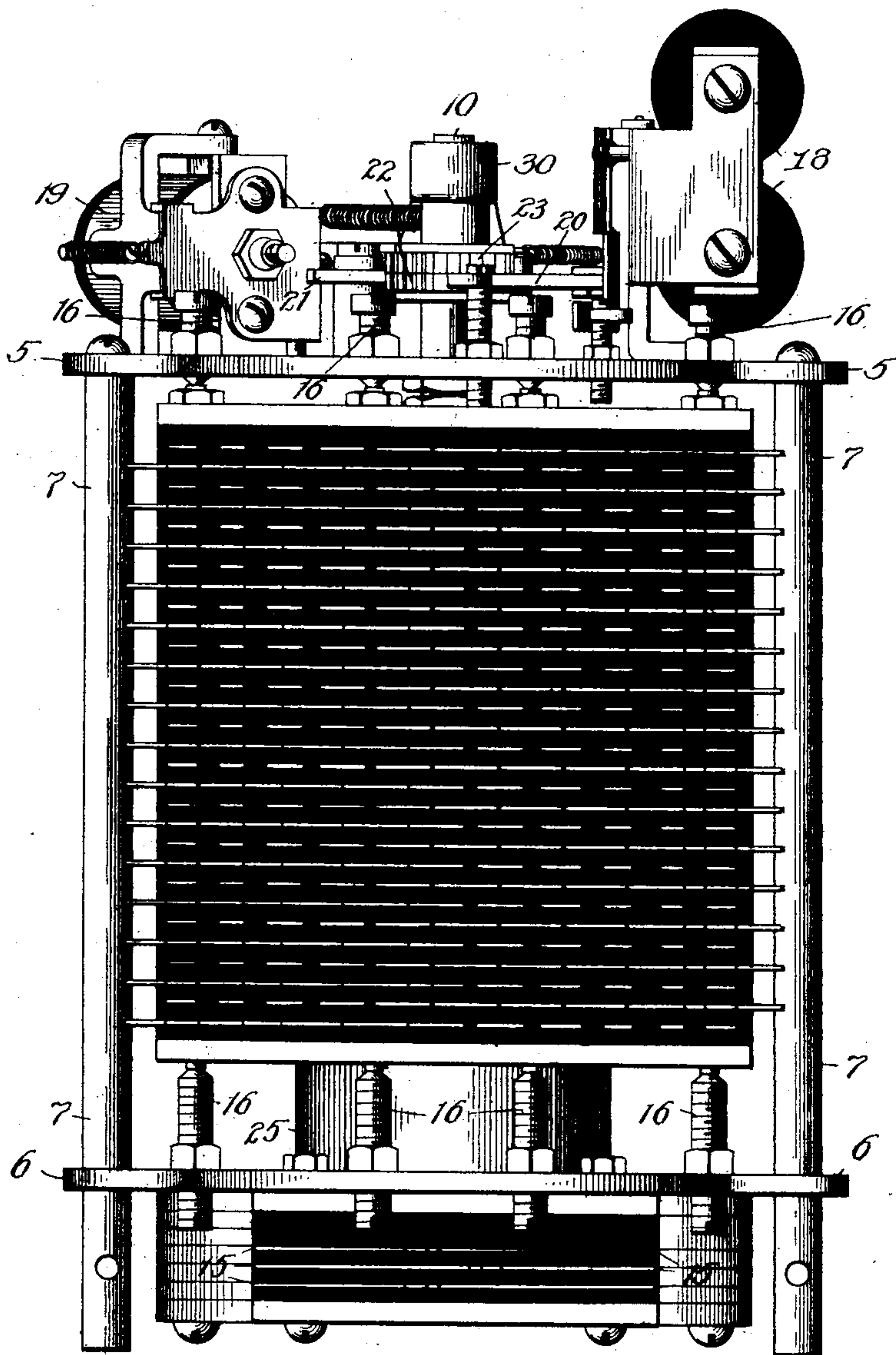
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3 SHEETS—SHEET 2.

Fig. 2.



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Ed. O. Brown
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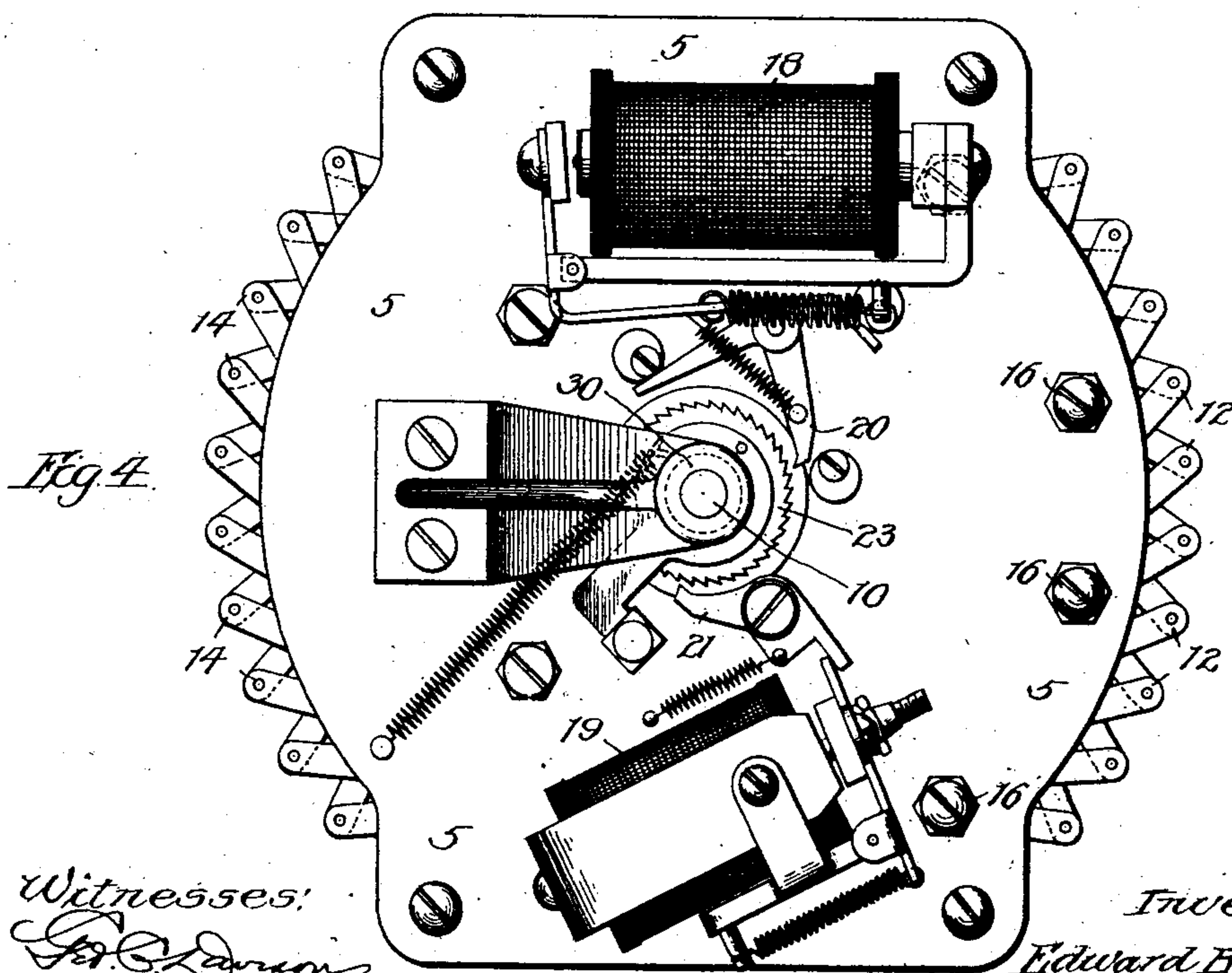
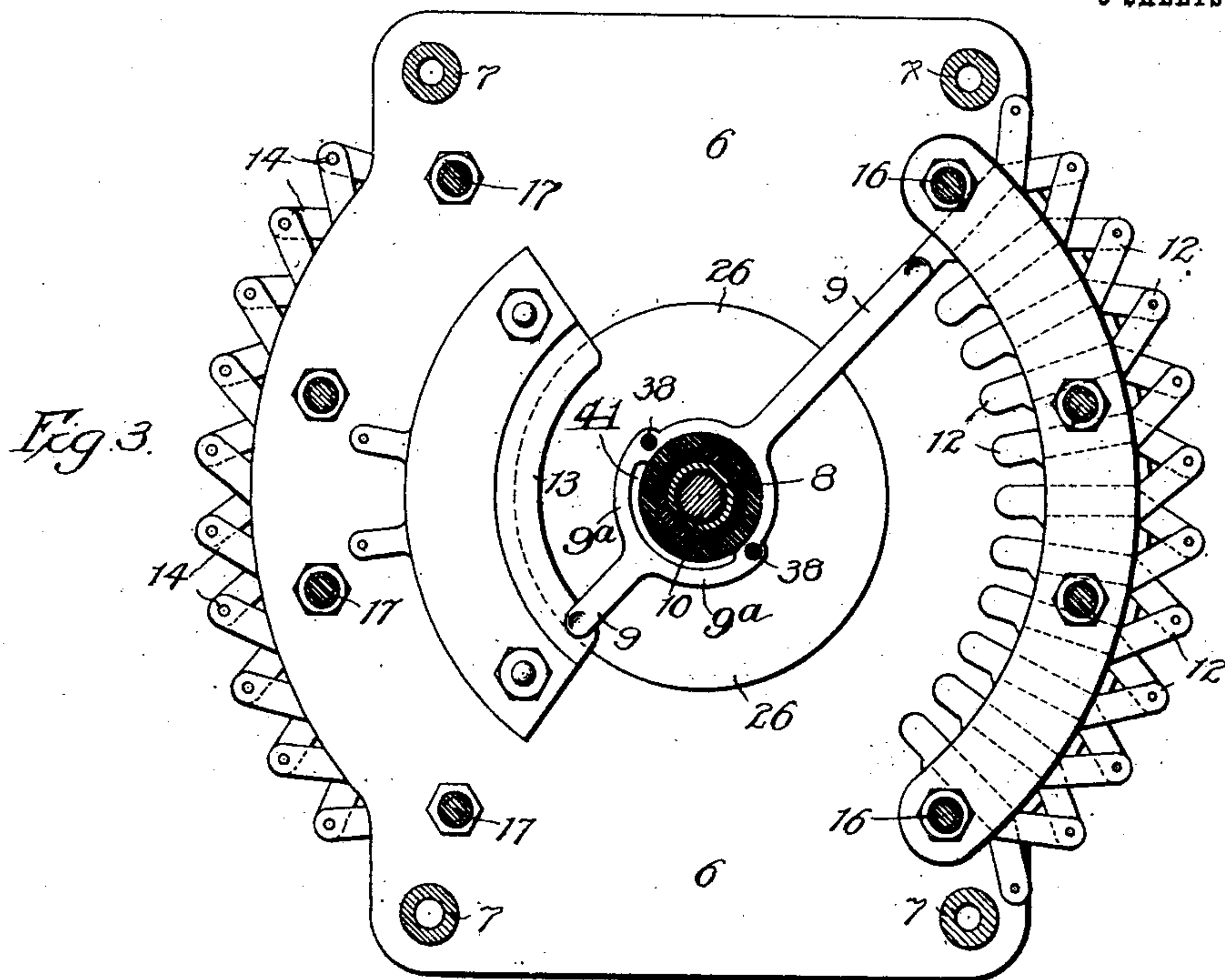
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3 SHEETS-SHEET 3.



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UNITED STATES PATENT OFFICE.

EDWARD B. CRAFT, OF CHICAGO, ILLINOIS, ASSIGNOR TO WESTERN ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

SELECTOR-SWITCH.

973,762.

Specification of Letters Patent.

Patented Oct. 25, 1910.

Application filed November 23, 1907. Serial No. 403,535.

To all whom it may concern:

Be it known that I, EDWARD B. CRAFT, 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 Selector-Switches, of which the following is a full, clear, concise, and exact description.

This invention relates to a selector switch of a type particularly adapted for use in automatic telephone exchange systems. Its object is to provide a selector mechanism in which the operating parts will be comparatively few and simple in construction, compactly arranged, easily assembled and adjusted, efficient in operation, and not easily put out of order.

The invention will be more particularly described, and further features thereof pointed out by reference to the accompanying drawings, and the parts, improvements or combinations which I regard as novel will be pointed out in the appended claims.

Figure 1 is a vertical sectional view of a selector switch embodying my invention; Fig. 2 is a full side view thereof; Fig. 3 is a sectional plan view on line 3—3 of Fig. 1; and Fig. 4 is a top plan view.

The same characters of reference indicate the same parts wherever they are shown.

The structure shown comprises both a main selector switch and an auxiliary or brush-choosing selector, both assembled in such a manner that they may be operated by the same driving mechanism.

The framework of the machines comprises upper and lower supporting plates 5 and 6 united by vertical supporting posts 7, said posts having extensions on their lower ends adapted to serve as standards. The switch parts of the main selector are mounted between the upper and lower supporting plates; the auxiliary selector switch is mounted on the under side of the lower supporting plate 6, and the operating or driving mechanism is mounted on top of the upper plate 5. The main selector switch comprises a group of stationary line terminals, a set of rotatably mounted contact brushes adapted to sweep over said line terminals, and a bank of segmental contact plates adapted to make contact with the respective brushes of the main selector in any of the positions to which they may be rotated. Each brush serves as a bridging member to connect the

corresponding segmental plate with any one of a series of stationary contact terminals arranged in an arc about its axis of rotation. The bank of main line terminals 12 and the bank of segmental contact plates 13 are supported between the upper and lower frame plates 5 and 6 upon the points of set screws 16, 17, mounted in said supporting plate. Each bank of terminals may thus be accurately positioned, adjusted vertically as may be required, and readily removed as a unit when desired for the purposes of inspection or repair.

The brushes 9 of the main selector consist of metal strips or punchings, each having a central disk portion by which it may be mounted upon the supporting shaft 8, and also having contact arms adapted to engage the stationary terminals 12 and the segmental plates 13 respectively. The brushes 9 are assembled one above another upon the brush carrier shaft or sleeve 8, with suitable insulating spacers 40 between them. They may also be kept in alinement by means of insulating rods 38 passing through the whole series of brushes. The pile of brushes and insulating spacers 40 are held upon the carrying shaft 8 between a flange 28 at one end and a clamping nut 27 at the other end of the pile. The brushes 11 of the auxiliary or brush-choosing selector are similarly mounted upon the shaft 10 concentric with the main shaft or sleeve 8.

In the selector shown, the main contact brushes 9 are not adapted to make wiping contact with the stationary terminals over which they pass; but after having been advanced to the desired position, they may be thrown into contact with the terminals so selected by means of a shift magnet 24 which is adapted to move both sets of brushes in the direction of their axis of rotation to throw them into contact with the terminals which they are facing at the time. The shift magnet or clutch 24 is preferably provided with an annular pole piece 25 which is adapted to attract a circular disk armature 26 mounted upon the brush carrier shaft 8. The main shaft or sleeve 8 and the concentric inner shaft 10, although mounted to rotate independently, are adapted to move together longitudinally, so that when the clutch magnet 24 is excited both the main brushes and the auxiliary brushes are thrown into contact with their respective

terminals. The inner shaft 10 which carries the movable brushes 11 of the auxiliary selector is journaled at top and bottom in bearings 29 and 30, and the sleeve 8 which carries the main selector brushes 9 is journaled upon the inner shaft 10 as an arbor. The shaft 10 is provided with a driving ratchet wheel 23, and the sleeve 8 is also provided with a similar driving ratchet wheel 22 mounted immediately below the ratchet 23. Suitable springs opposing the rotary movements of the respective shafts tend to keep the main and auxiliary selector brushes in their normal or zero position. A spring 31 is also arranged to oppose the longitudinal downward movement of the shafts 10 and 8, and tend to keep the brushes 9 and 11 out of contact with their respective stationary terminals. The tension of the spring 31 opposes the attractive movement of the disk armature 26 of the clutch 24.

Referring now to Fig. 4, it will be seen that the driving or operating mechanism of the selector comprises a step magnet 18 and a holding magnet 19 with the stepping and holding pawls 20 and 21 respectively, operated thereby. While the shafts 8 and 10 are maintained in their elevated position by spring 31, the ratchet wheel 22 of the shaft 8 is in position to be engaged by the stepping and holding pawls 20 and 21 of the operating mechanism. But, when the shift magnet 24 is excited and the shafts 8 and 10 depressed longitudinally, the ratchet 22 is thrown out of gear with the pawls 20 and 21, and the ratchet 23 thrown into gear therewith. The single driving mechanism thus serves to operate both the main selector switch and the auxiliary or brush-choosing switch, according as the shift magnet 24 is normal or excited.

As the segmental contact plates 13 are continuous throughout the arc of travel of the arm of the contact brush which sweeps over them, the size of these plates may be reduced by mounting them close to the shaft. The line terminals, however, must be mounted upon an arc of longer radius, in order to allow for suitable separation of the individual terminals. The arm of the contact brush sweeping over the line terminals will, therefore, be considerably longer than the other arm which sweeps over the segmental contact plates 13. In order that the shorter arm may have suitable resiliency, a crescent-shaped opening 41 is preferably punched out of the central disk portion of the brush on the side thereof next to the shorter arm, so that said arm instead of being joined radially to said central disk portion is joined thereto by branches 9^a which extend around the sides thereof. The effective length, and consequently the resiliency, of the shorter arm is thus increased.

The particular device shown is intended

to select any one of a hundred lines. As each line usually has three individual conductors, namely, the two main-circuit wires and the test-wire, the selector is provided with three hundred stationary terminal pieces 12, arranged in ten rows of thirty each. The main rotary member of the selector therefore has thirty brushes, which may be brought into engagement respectively with the thirty terminals of any row to which said rotary member is turned. Connection is made to the main brushes in any angular position thereof by means of the segmental contact plates 13, there being one of these for each of the thirty main brushes. To select any given set of the ten sets of brushes, the brush chooser is provided, having a set of three brushes 11 arranged to sweep over ten rows of terminals 14, and to contact respectively with the three terminals 14 of any row. Each row of three stationary terminals on the brush chooser represents a set of three of the main brushes, being connected by wires (not shown) to the respective segmental contact plates 13. Connection is made to the three brushes of the brush-chooser by means of the segmental contact plates 15 with which said brushes are adapted to engage in any angular position to which said brush chooser may be rotated. A three-wire circuit may thus be extended from the three plates 15 of the brush-chooser to the brushes 11 thereof, thence to the selected set of terminals 14, thence to the corresponding set of three segmental contact plates 13 of the main selector, thence to the corresponding three main brushes 9, thence to the set of three line terminals 12 selected by the rotary movement of said main brushes, and so to the line represented by such terminals.

Suppose, for example, it be desired to select line No. 57. Five impulses are first sent through the stepping magnet 18 (the holding magnet 19 being also excited) and through the agency of stepping pawl 20 and ratchet 22 the main brush-carrier is thereby advanced to bring the main brushes into alinement with the fifth vertical row from zero. The clutch or shift magnet 24 will then be energized, thereby bringing all the brushes into contact with the terminals which they face. The action of shift magnet 24 also throws the ratchet 22 out of gear and brings the ratchet 23 of the auxiliary or brush-choosing selector into position to be engaged by the stepping and holding pawls 20 and 21. The main brushes are now held in contact with the selected terminals by frictional engagement therewith. Seven additional impulses are now sent through the stepping magnet 18 which thereupon actuates the brush-selecting ratchet 23, rotating the shaft 10 and shifting the brushes 11 of the brush-choosing

selector into contact with the set of stationary terminals 14 which are connected by wires to the seventh set of segmental plates 13. The circuit is thus extended through the corresponding three main brushes to the line terminals upon which they rest, these terminals being those of line No. 57.

It will be seen that the magnetic clutch or shift magnet 24 serves the triple purpose of shifting the main brushes into contact with the selected line terminals, shifting the ratchets, and locking the first set of brushes in the selected position during the operation of the second set. This arrangement, aside from its simplicity and compactness, has the advantage of avoiding the brush friction of the first set of brushes, which in a selector having so many brushes would be considerable.

It will be apparent that modifications may be made in many respects without departing from the principal features of the invention as it is set forth. Certain features of the invention may be adopted with advantage in selectors which as a whole may be of different type from the one herein disclosed.

I claim:

1. In a selector, the combination with a hollow rotatable shaft and contact brushes mounted thereon, of rows of terminals 12 mounted in a bank concentric with said shaft, a series of segmental contact plates, one for each brush, also concentric with said shaft, each brush being adapted to connect its segmental plate with a corresponding terminal in any of the rows over which such brush is adapted to sweep in the rotary movement of the shaft, an auxiliary or brush-choosing selector associated with said main selector and having an operating shaft extending through said hollow main shaft, each of said shafts being provided with a ratchet, a stepping magnet, a stepping pawl operated thereby normally in position to drive one of said ratchets, a shift magnet, and means controlled thereby for causing said pawl to drive the other ratchet.

2. In a selector, the combination with a hollow shaft and brushes carried thereby, of rows of line terminals mounted in a bank concentric with said shaft, segmental contact plates, one for each of said brushes, also mounted concentric with said shaft, an auxiliary brush-choosing selector having an operating shaft extending through said hollow main shaft, a ratchet for each shaft, a stepping magnet, a stepping pawl operated by said magnet adapted to engage either ratchet, a magnet having an annular core surrounding the inner shaft, and a disk armature carried by the outer shaft and adapted to be attracted by said annular core to shift said shaft longitudinally.

3. In a selector, the combination with

rows of terminals and a movable row of brushes, corresponding in number to the terminals of each row, adapted to make contact with said terminals, of a stepping magnet, mechanism operated thereby for bringing the row of brushes into position to contact with any row of terminals, a shift magnet, means controlled by said shift magnet for holding the several brushes in contact with the respective terminals of the selected row of terminals, brush-chooser mechanism adapted to select a particular brush or brushes of the row, and mechanism also operated by the shift magnet, arranged to bring said brush-chooser mechanism under control of said stepping magnet to be operated thereby.

4. In a selector, the combination with a rotatable and longitudinally movable brush carrier, and brushes carried thereby, of a ratchet mounted upon said brush carrier, a stepping magnet and a stepping pawl operated thereby normally in position to engage said ratchet to rotate the brush carrier, a second brush carrier having an operating shaft concentric with the first-mentioned brush carrier, said shaft having an operating ratchet mounted thereon adjacent to said first-mentioned ratchet, sets of stationary terminals with which the brushes are adapted to engage, a clutch magnet and means operated thereby to shift both brush carriers longitudinally to bring their brushes into engagement with their respective terminals, and to shift the ratchet of the second brush carrier into operative relation to said stepping pawl.

5. A selector comprising upper and lower frame plates, and intermediate supports uniting them, a shaft 10 extending between said frame plates mounted in bearings supported respectively by said plates, a hollow tubular shaft 8 journaled upon said shaft 10, contact brushes carried by said tubular shaft 8, stationary contact terminals mounted between said plates, in position to be engaged by said brushes, electromagnetic operating mechanism for said brush-carrying shaft 8, mounted upon the outer side of one of said plates, and brush-chooser mechanism mounted upon the outside of the other plate, and connected with the aforesaid operating mechanism by said shaft 10.

6. A selector comprising a rotatable and longitudinally movable shaft carrying a series of contact brushes, sets of terminals arranged concentrically around said rotary shaft, each set containing terminals corresponding to the respective brushes, means for rotating said shaft to bring the brushes into position to engage any set of terminals, a disk armature carried by said shaft, and an electromagnet having an annular core concentric with said shaft, adapted to attract said disk armature to bring said con-

tact brushes into engagement with the selected terminals.

7. In a selector, the combination with a rotary brush carrier having a series of brushes thereon, of contact terminals mounted in a segmental cylindrical bank, a supporting frame having end plates 5, 6, and set-screws mounted in said end plates, and holding said bank of terminals at its ends upon the points of said set-screws, whereby said bank of terminals may be accurately positioned, adjusted and removed as a unit.

8. The combination with a rotary shaft, of terminals upon opposite sides of said shaft, at different distances therefrom, and a bridging contact member carried by said shaft for uniting said terminals, said member comprising a spring metal strip having an annular disk portion fixed upon said shaft, a contact arm extending radially outward from the edge of the disk portion toward the stationary terminals farthest from the shaft, and a second contact arm extending toward the stationary terminals on the other side, nearer to the shaft, said second arm being united to the disk portion by branches extending around the sides thereof, whereby the resiliency of the shorter arm is made more nearly equal to the resiliency of the longer arm.

9. The combination with a rotary shaft, of stationary terminals at different distances from said shaft at opposite sides thereof, a

bridging contact member for uniting said terminals, comprising a spring metal punch- ing having a disk portion intermediate its ends, mounted upon said shaft, and arms extending from opposite edges thereof to said stationary terminals, respectively, a crescent-shaped opening being punched out of said disk on the side toward the shorter arm, whereby the effective length and resiliency of said shorter arm are increased.

10. A selector comprising a rotatable and longitudinally movable hollow shaft carrying a series of contact brushes, sets of terminals arranged concentrically around said rotary shaft, each set containing terminals corresponding to the respective brushes, means for rotating said shaft to bring the brushes into position to engage any set of terminals, a disk armature carried by said shaft, an electromagnet having an annular core concentric with said shaft, adapted to attract said disk armature to bring said contact brushes into engagement with the selected terminals, an auxiliary selector and an operating shaft therefor passing through said hollow main shaft.

In witness whereof, I hereunto subscribe my name this 14th day of November A. D., 1907.

EDWARD B. CRAFT.

Witnesses:

CLARENCE G. STOLL,
JOHN J. LYNCH.