G. S. PIGGOTT.

SPACE TELEGRAPHY.

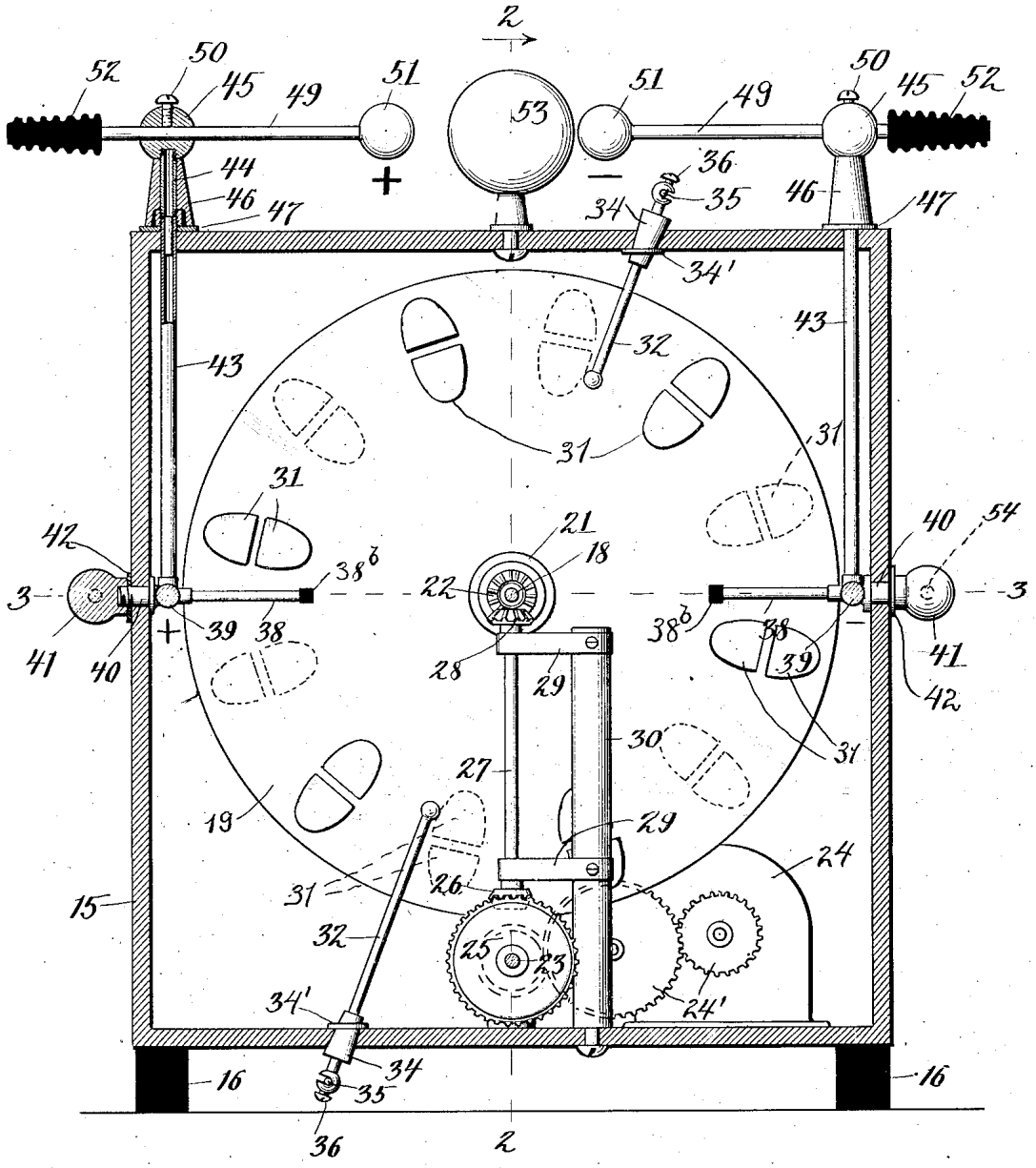
APPLICATION FILED JUNE 19, 1903.

1,006,786.

Patented Oct. 24, 1911.

7 SHEETS—SHEET 1.

Fig. 1.



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7 SHEETS—SHEET 2.

Fig. 3.

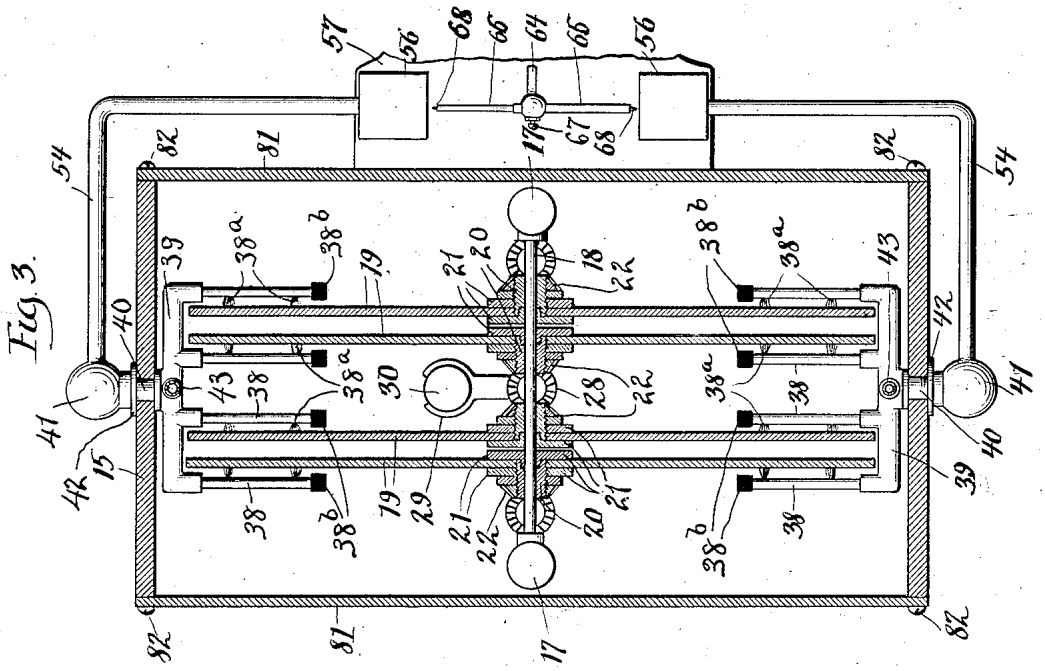
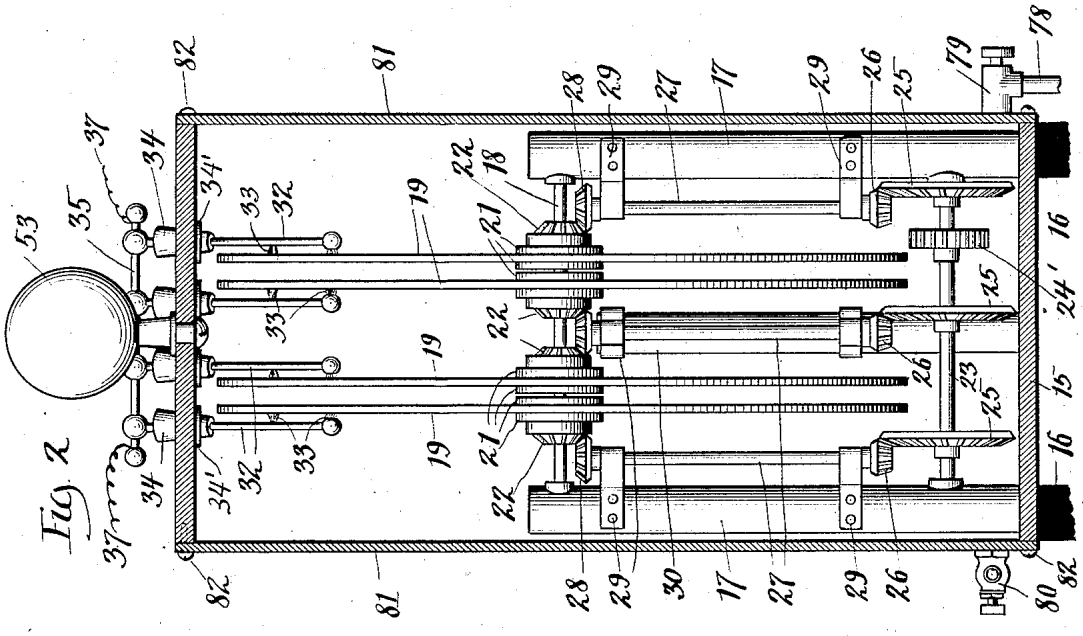


Fig. 2.



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7 SHEETS—SHEET 3.

Fig. 5.

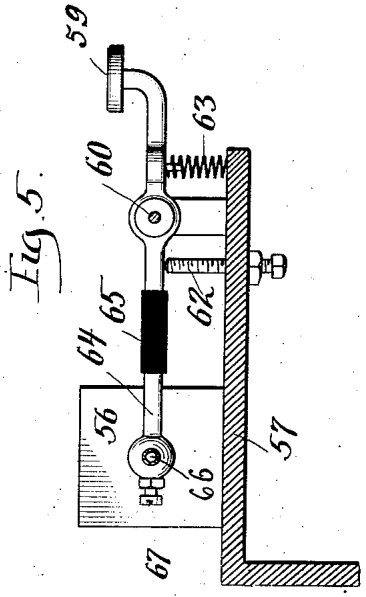
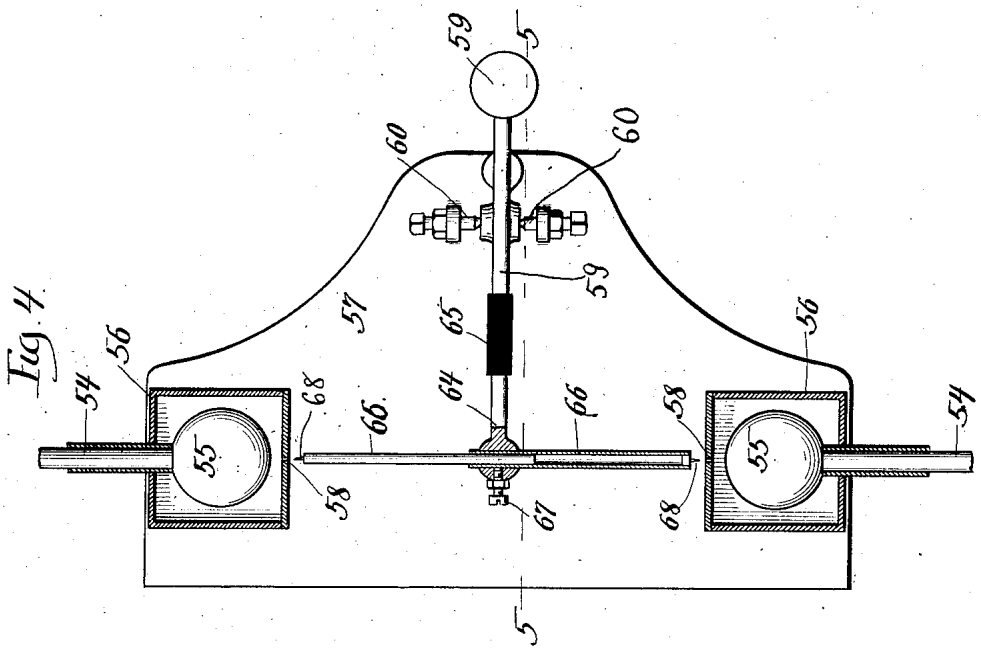


Fig. 4.



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7 SHEETS—SHEET 4.

Fig. 6.

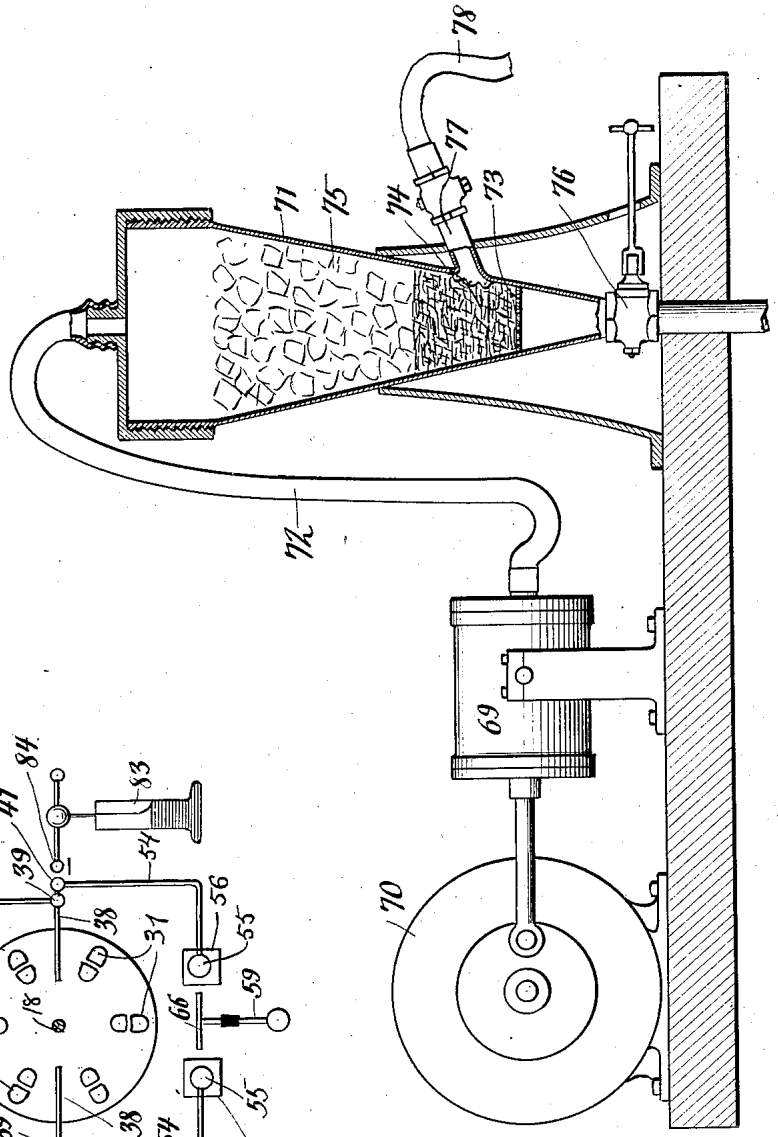
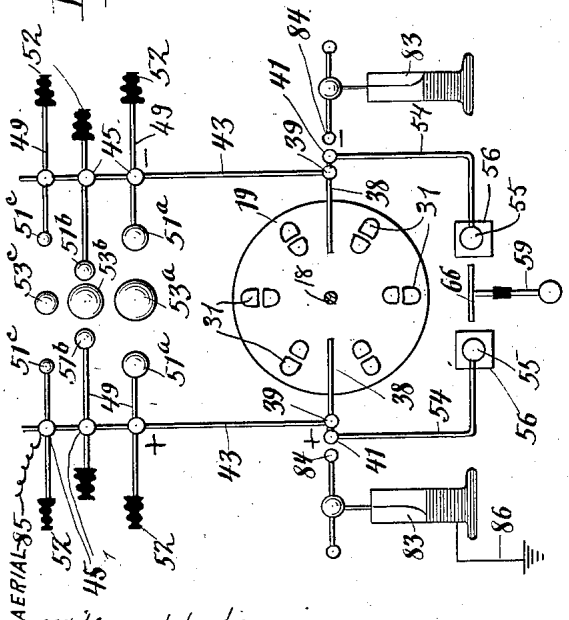


Fig. 7.



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7 SHEETS—SHEET 5.

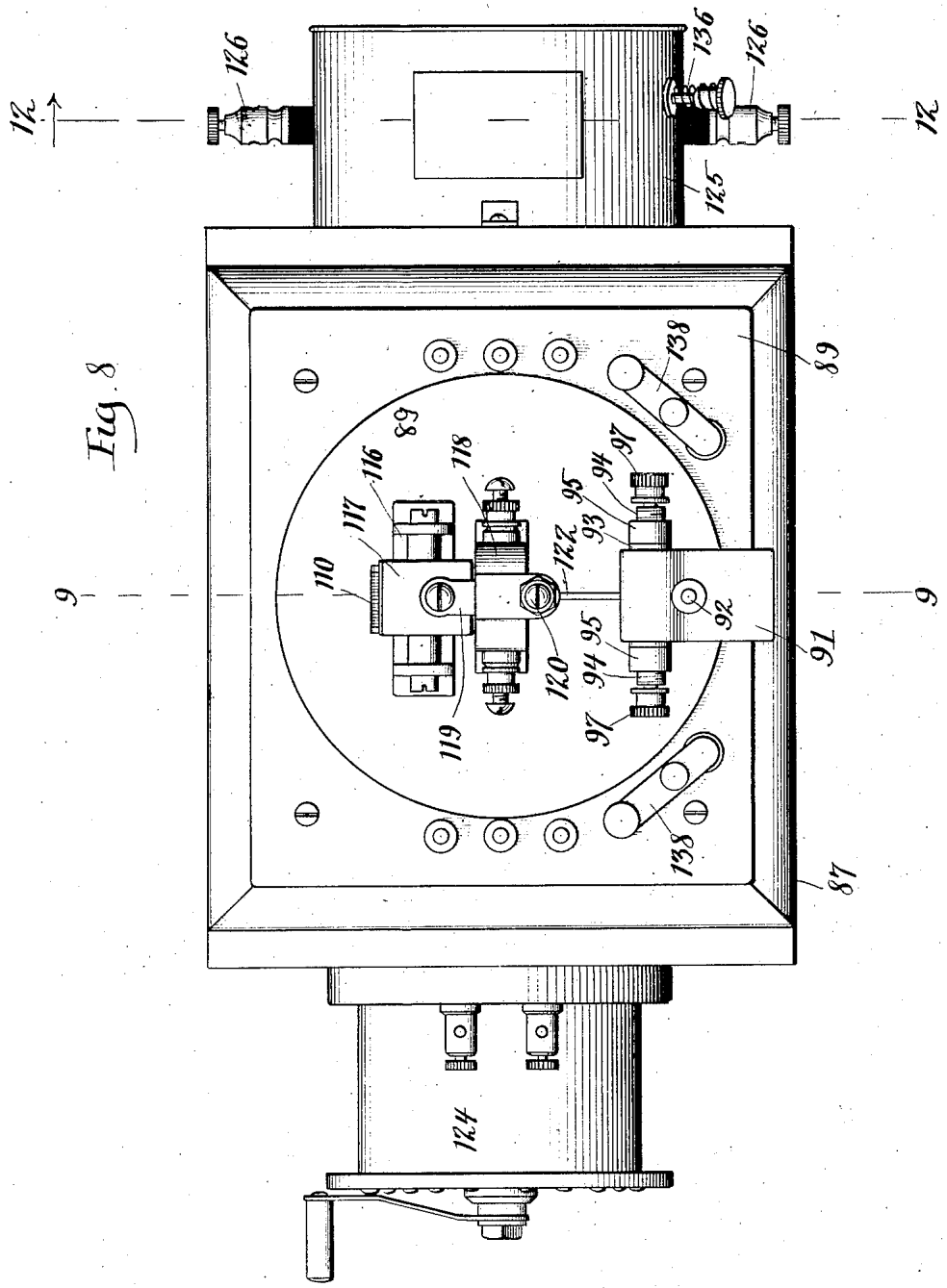

Fig. 8.

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7 SHEETS—SHEET 6.

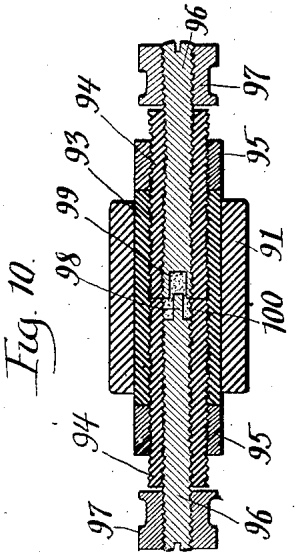

Fig. 10.

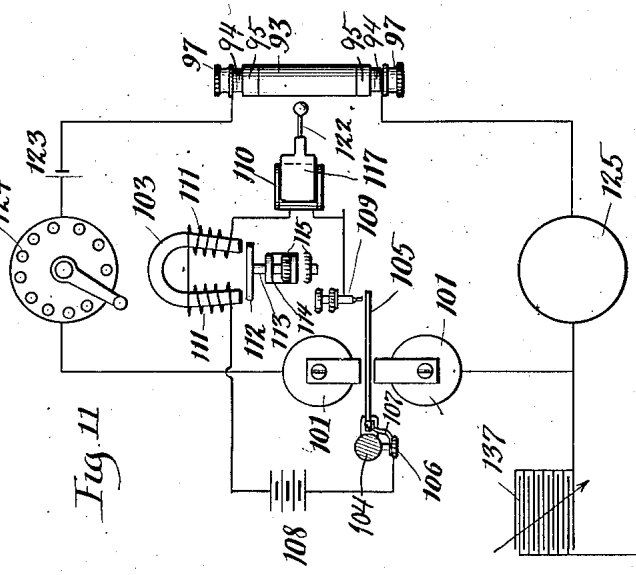

Fig. 11.

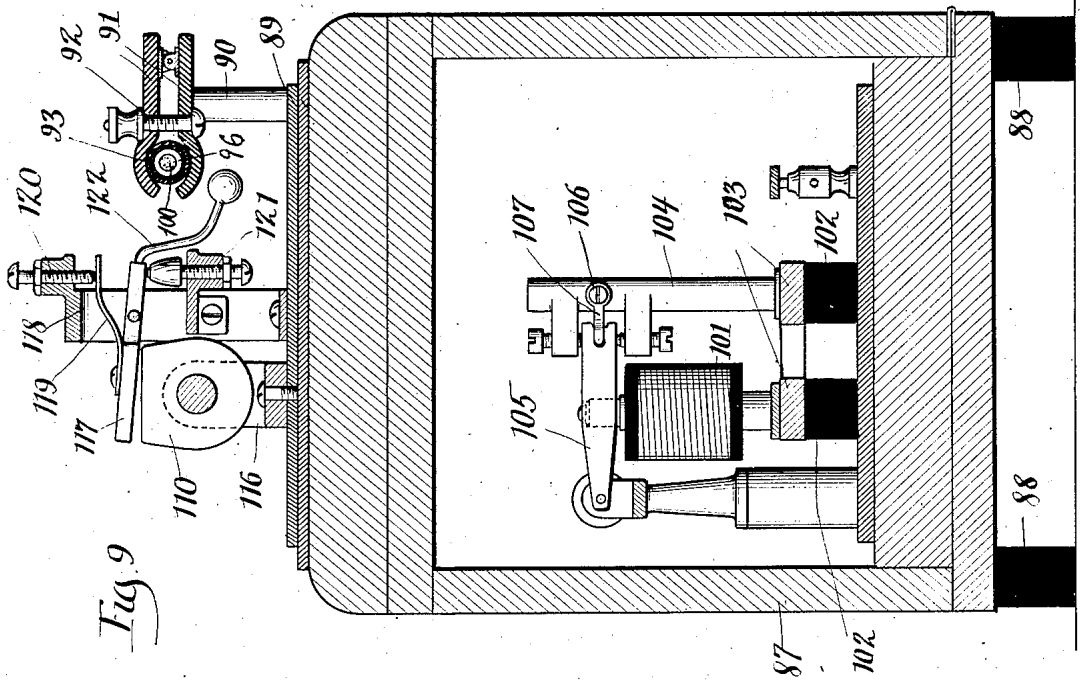

Fig. 9.

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7 SHEETS—SHEET 7.

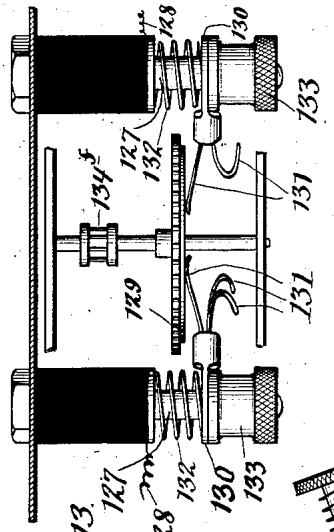

Fig. 13.

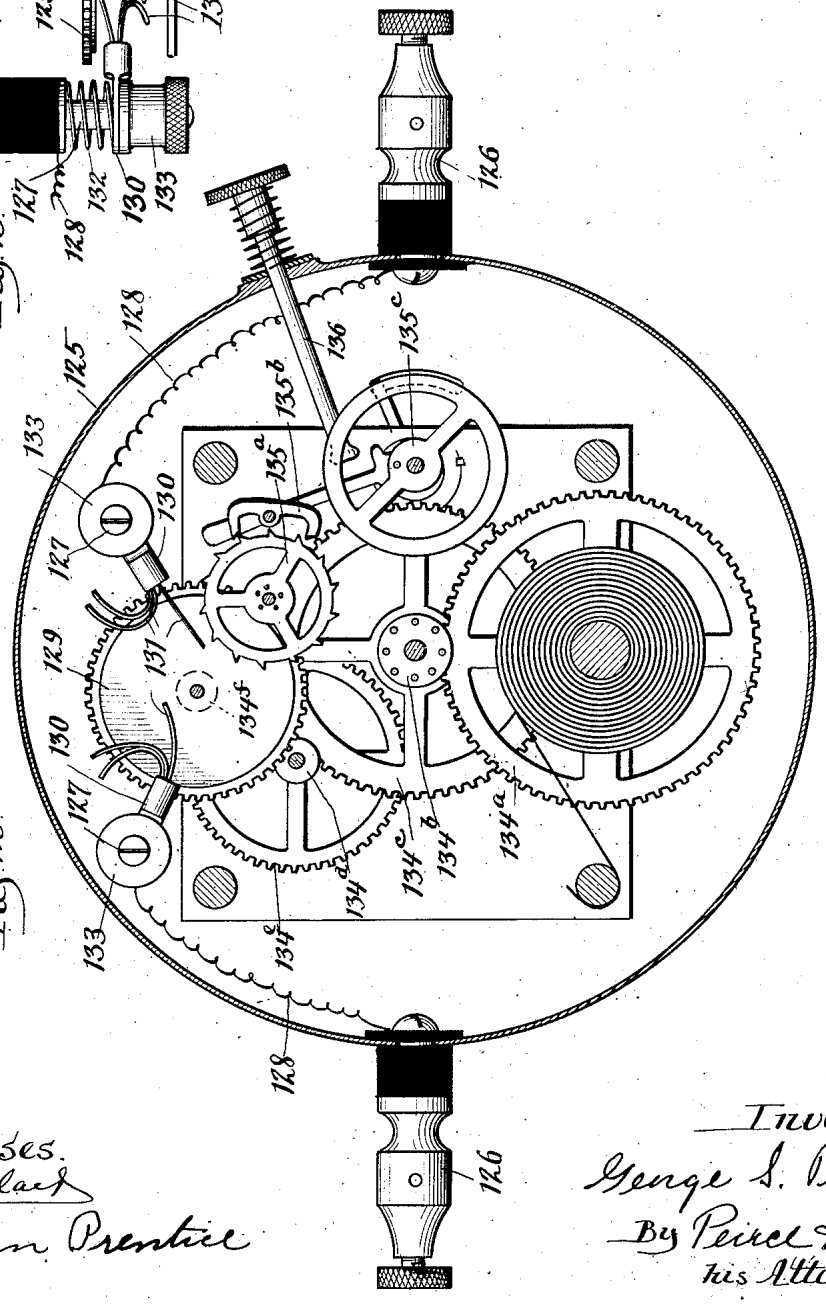

Fig. 12.

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UNITED STATES PATENT OFFICE.

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SPACE TELEGRAPHY.

1,006,786. Specification of Letters Patent. Patented Oct. 24, 1911.

Application filed June 19, 1903. Serial No. 162,182.

To all whom it may concern:

Be it known that I, GEORGE S. PIGGOTT, a citizen of the United States, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Space Telegraphy, of which the following is declared to be a full, clear, and exact description.

The invention relates to signaling systems in which radiant electric energy transmitted from suitable sparking apparatus, is employed to effect suitable detectors at the receiving stations.

The present improvement employs sparking or discharge terminals connected to the poles of a static electric machine and seeks to provide an effective form of that type of machine, together with signaling means for controlling the discharge between the sparking terminals.

Other objects of the invention are to provide an effective form of detecting or receiving apparatus for use in connection with such a transmitting device. To provide means whereby the transmitting and receiving apparatus may be syntonized and to provide an effective system of space telegraphy which will be certain and rapid in operation which may be readily syntonized and with which aerial wires or ground connections are not necessary, although both may be employed with the present improved system if desired.

With these objects in view, the invention consists in the improved arrangements and combinations set forth in the following description, illustrated in the accompanying drawings and more particularly pointed out in the appended claims.

In the drawings Figure 1 is a sectional elevation of the improved transmitter or radiant electrical generator. Fig. 2 is a vertical section on line 2—2 of Fig. 1. Fig. 3 is a horizontal section on line 3—3 of Fig. 1. Fig. 4 is a detail plan view of the signaling instrument, parts being shown in section. Fig. 5 is a sectional view thereof on the line 5—5 of Fig. 4. Fig. 6 is a detail elevation of part of the transmitting apparatus. Fig. 7 is a diagrammatic view of the transmitting apparatus. Fig. 8 is a plan view of the detector or receiving apparatus. Fig. 9 is a sectional elevation thereof. Fig. 10 is a longitudinal section through the variable resistance or coherer. Fig. 11 is a diagram of the detector circuits. Fig. 12 is a detail section on the line 12—12 of Fig. 8. Fig. 13 is a detail view of parts shown in Fig. 12.

The radiant electrical generator or transmitter preferably comprises a suitable inclosing casing 15, which is made of insulating material and is preferably shellacked inside and outside and which is mounted upon insulating blocks 16 of hard rubber or other suitable substance. Within the casing 15 are mounted a pair of uprights 17 of hard rubber or other suitable insulating material which are secured rigidly to the bottom of the casing. Between the upper ends of uprights or standards 17 is fixed a shaft 18, preferably of steel upon which are mounted the revoluble disks 19. Disks 19 are arranged, as shown in pairs, any number of which may be employed in accordance with the desired capacity of the machine and the separate disks of each pair are driven by suitable gearing in opposite directions. Each disk is preferably mounted (see Fig. 3) upon a hub 20 of hard rubber having a tubular brass core and is clamped in position thereon between disks 21 of hard rubber which are securely fastened to the hubs 20 by right and left hand screw threads. Upon the outer end of each hub is threaded a beveled gear 22 which is preferably formed of raw hide and, as shown, the gears connected to each pair of disks 19 face in opposite directions.

The disks 19 are rotated from a main drive shaft 23 suitably journaled between the lower ends of the uprights 17. This shaft is preferably driven through gears 24′ by a small electric motor 24 mounted inside and upon the base of the casing 15 and the metallic parts of which are well insulated. Main drive beveled gears 25 fixed upon shaft 23 mesh with beveled pinions 26 fixed upon the lower ends of vertically disposed counter-shafts 27, and beveled pinions 28 and the upper ends of the counter-shafts 27 engage the beveled pinions 22 connected, as above described, to the disks 19. Gears 25, 26, 28 and 22 are, for the sake of perfect insulation, preferably made of raw hide. Counter-shafts 27 are preferably formed of hard brass and are journaled in hard brass bearings 29 fixed to the end uprights 17 and to an intermediate upright or uprights 30 (see Fig. 1).

As above stated, any number of pairs of

disks 19 may be employed (two sets being shown in the drawings) and by the gearing described, the disks of each pair or set will be driven in opposite directions. The disks 19 are formed of suitable dielectric material such as glass or hard rubber, but preferably of the former and these disks are preferably provided with a coating of shellac. Thin metal contact plates or sectors 31 are cemented to the outer faces of each set of disks 19 by shellac or other suitable adhesive. These contact plates are preferably formed of aluminum and are preferably divided into two or more parts, the sectors shown in the drawings being divided into two parts.

Separate sets of contact brush holders 32 extend through the top and bottom of the casing and outside of each set of disks 19. These brush holders are, as shown in Figs. 1 and 2, arranged at diametrically opposite points and extend radially toward the center of the disks 19 and at an angle of about 70 degrees to the horizontal. Each holder 32 is provided with two or more contact brushes 33 of aluminum wire which are adapted to contact with the faces of disks 19 and with the sections of the divided contact plates 31. The brush holders 32 are formed of brass or aluminum rods and are held in place by soft rubber plugs 34 inserted in openings in the top and bottom of the casing 15 and snugly fitted in such openings to prevent leakage of air.

It is desirable to maintain dry air under pressure within the casing 15 and for that reason the brush holders 32 and other parts which extend through the casing, are suitably sealed so that the casing may be substantially air tight. Brush holders 32 are provided at their outer ends with slotted metal balls so that the upper and lower sets may be electrically connected by a metal rod 35 set within the slotted balls and held in place by screws 36. The upper and lower rods 35, connected respectively to the upper and lower sets of contact brush holders, are electrically connected by coiled insulating conductors 37. To hold the brush holders 32 securely in place against the outward pressure of the air within the casing 15, the soft rubber plugs 34 are preferably provided with flanges 34′ which engage the inner face of the top and bottom of the casing.

Condenser brush holders 38 are arranged in a horizontal plane extending through the center of the disks 19 and at diametrically opposite points. These holders are formed of aluminum or brass tubing and at each side are threaded into a common metal support 39 having a central shouldered projection 40 which extends through the end of the casing and which is firmly held in place by a ball 41, preferably of brass, which is threaded upon the end of the projection 40. A washer 42 between the ball 41 and the casing renders the joint practically air tight. The brush holders 38 are arranged in pairs on the outside of each pair of oppositely rotating disks 19 and are provided with brushes 38ª of fine aluminum wire which extend toward, but do not contact with the disks.

To each support 39 for the condenser brushes, is threaded or otherwise suitably fixed, a tubular rod 43 of aluminum which extends upwardly through the top of the casing. The upper end of the tubular rod 43 is plugged to prevent leakage of air and is connected by a short piece of metal tubing 44 with a brass ball 45. A hard rubber thimble 46 and a washer 47 between the ball 45 and the top of the casing seals this joint. A metal rod or tube 49 is mounted to slide horizontally through a bore in the ball 45 and may be held firmly in any adjusted position therein by a screw 50. A similar rod 49 is connected in a similar manner to the other side of the machine and the inner ends of these rods are provided with sparking or discharge terminals or balls 51, while the outer ends of the rods are provided with handles 52 which may be grasped to adjust the position of the sparking terminals and which are of hard rubber, preferably corrugated as shown. Between the sparking terminals or balls 51 and in line therewith, is preferably located a large metal discharge ball 53 preferably of brass which is secured to the top of the casing.

A short circuit connects the opposite sides or poles of the machine and consists of bent pieces 54 (see Fig. 3) of brass or aluminum which are secured to the balls 41 at the ends of the machine. The bent pieces 54 are preferably covered with insulating material and the end balls or terminals 55 of the shunt circuit are inclosed in receptacles 56 of hard rubber or other suitable material. The receptacles 56 are mounted upon a bracket 57, preferably of insulating material secured to the casing 15, and the opposing faces of the receptacles 56 are provided with small openings 58 in line with which normally extends a shiftable conductor connected to the signaling key.

The signaling key 59, preferably formed of brass, is pivoted between a pair of bearing pins 60 and is normally held in uplifted position with its inner end against an adjustable stop 62 by a cushion spring 63 which is interposed between the outer end of the key and the shelf or support 57. The inner end 64 of the key is connected to the main body thereof by an insulating section 65. The shiftable conductor is formed of separate pieces of brass or aluminum tubing 66 fitted to adjustably slide one within the other and adjustably held in place upon the end of the key by a screw 67. Each of the tubular sections 66 is fitted at its end with

a pointed steel plug 68 and, in normal position, the conducting sections 66 and points 68 extend in line with the openings 58 in the receptacles 56

When the electric generator described, is operated the condenser brushes and sparking terminal upon one side or pole of the machine will become charged with positive and those upon the other side or pole of the machine will become charged with negative electricity. A part of the charge however will leak across from the short circuit terminals 55 through the shiftable conductor or switch 66, the points of which are in line with the openings 58 in the receptacles 56 which inclose the short circuit terminals. A sufficient amount of the charge will thus leak from one side or pole of the machine to the other to prevent any disruptive discharge or spark between the discharge terminals 51. When however, the sparking terminals are properly adjusted and the key is depressed, a disruptive discharge or single spark at once occurs between the discharge terminals, since the conductor or switch 66 is by the depression of the key moved out of line of the openings 58 in the receptacles 56. The leakage of current between the poles of the machine is thus interrupted so that a heavy spark at once takes place between the discharge terminals.

Numerous advantages are incident to the employment of such a static machine as a transmitter for space telegraphy. At each quick depression of the signal key a single strong heavy spark having little heat occurs between the positive and negative terminals instead of a series of sparks having considerable heat such as occur at the spark gap when a coil is employed for the production of a high tension current. Moreover, the sparking terminals are always ready to discharge at the instant the signal key is depressed and there is no magnetic lag to overcome as is the case with a sparking coil, thereby increasing the speed of transmission. With the present improved transmitter a single spark or discharge is employed to represent a "dot" while two sparks or discharges in quick succession represent a "dash" so that signals may be rapidly and accurately transmitted. The machine moreover, can be readily adjusted for selective signaling as hereinafter explained and does not require the employment of an aerial wire or ground connection, although either or both may be employed if desired for transmission of signals over long distances.

The discharge balls 51 and 53 may be of any suitable size but good results have been obtained with the discharge terminals 51 of about an inch and a half in diameter and with the intermediate discharge ball of three to four inches in diameter. When a signal is to be transmitted the negative terminal 51 is preferably adjusted to a position quite close to the intermediate discharge ball 53 while the positive discharge terminal 51 is placed about an inch away from the center discharge ball so that a heavy strong spark occurs between the positive sparking terminal and the center discharge ball. The sections of the shifting conductor or switch 66 may be readily adjusted to correct position to prevent a discharge between the terminals until the signal key 59 is depressed.

To prevent leakage between the condenser brushes and the central steel shaft of the machine, the ends of the brush holders 38 are preferably provided with blocks 38^b of insulating material.

The efficiency of the machine is found to be considerably increased by maintaining air under pressure within the substantially air-tight casing 15 which incloses the generator disks, plates and brushes and preferably the air within the casing is maintained as dry and as free from moisture as possible. For this purpose a small air pump 69 (see Fig. 6, the oscillating type of pump being illustrated in the drawings,) is driven from a suitable electric or other motor 70 and supplies air under pressure to the upper end of a casing 71 through a flexible pipe 72. The casing 71, which is preferably upwardly flaring as shown, is provided with a grating 73 at its lower end upon which is superposed a layer 74 of cotton wool which serves to filter the air. Above the layer of cotton wool is placed a layer 75 of anhydrous calcium chlorid which removes all moisture from the air. The lower end of the casing 71 is provided with a drain cock 76. A valved outlet nozzle 77 near the lower end of the casing is provided with a screen and is connected by a flexible pipe 78 with an inlet valve 79 (see Fig. 2) on one side of the machine casing 15. An outlet valve 80 is provided on the opposite side of the casing and is set to maintain a pressure of about thirty pounds within the same. By thus maintaining dry air under pressure within the machine, the efficiency of the latter is found to be considerably increased and the machine is not affected by the varying atmospheric conditions. The sides 81 (see Fig. 2) of the casing 15 are preferably removably held in place by screws 82, rubber packing being provided between the sides and the edges of the casing to produce a tight joint.

The transmitter may be readily syntonized for selectively signaling a series of stations by providing a series of discharge terminals 51^a, 51^b, 51^c, etc. (see Diagram Fig. 7) and by providing a series of intermediate discharge balls 53^a, 53^b, 53^c, etc., the size of which terminals and balls is varied to vary the capacity and thus vary the intensity, length and thickness of the sparks

transmitted. The signals are transmitted from the desired set of terminals by properly adjusting that set while the others are withdrawn as indicated in Fig. 7.

The efficiency of the transmitter is increased and it may be further syntonized by providing condensers of varying capacity on one or both sides of the machine. In Fig. 7 these condensers are indicated in the form of Leyden jars 83 having their poles 84 arranged adjacent the balls 41 on opposite sides from the machine. A series of such condensers may be employed if desired. Moreover, if desired for transmitting signals over long distances, the positive side of the machine may be connected to an aerial wire 85 and too, if desirable, the condenser or capacity arranged adjacent the positive side of the machine may be connected to the ground by a wire 86.

The detector or receiving device at the receiving stations comprises a suitable inclosing casing 87 preferably of wood, thoroughly shellacked and mounted upon insulating feet 88. A plate 89 of hard rubber or other suitable insulating material upon the upper face of the casing, carries an upright 90 also of hard rubber, to which is fixed the lower section of a hinged clamp 91 the members of which are also formed of hard rubber. The curved open ends of the clamp embrace and rigidly support in horizontal position the coherer or variable resistance apparatus, the latter being securely held in place by a thumb screw 92 extending between the hinged members of the clamp.

The coherer or variable resistance apparatus comprises a tubular casing 93 preferably of hard rubber within opposite ends of which are threaded hollow plugs 94 also of hard rubber. The inner ends of the plugs 94 abut, as shown within the casing 93 and they are securely held and clamped in position by lock nuts 95 of hard rubber. The conducting plugs 96 are adjustably threaded through the hollow plugs 94 and are provided on their ends with thumb nuts 97 by which suitable conductors may be connected thereto. The conducting plugs 96 are preferably formed of silver 500 to 600 fine and partly of nickel. The inner end of one of the plugs is provided with a cylindrical extension 98, while the inner end of the opposite plug is provided with a cylindrical depression or recess 99 slightly larger in diameter than the extension 98. The filings 100 intermediate the ends of the conducting plugs are preferably of soft iron, medium fine, mixed with about two per cent. of platinum filings. Preferably, to increase the sensitiveness of the coherer, the soft iron filings are first placed under magnetic influence or tension before they are put into position between the conducting plugs 96.

The arrangement described has been found extremely sensitive in operation. The hollow supporting plugs 94 of hard rubber and the conducting plugs 96 carried thereby may be removed and threaded back into position without disturbing the adjustment between the ends of the conducting plugs. By forming the parts of hard rubber they are bound very tightly together and the adjustment of the conducting plugs is not readily displaced. The hard rubber parts are preferably shellacked and highly polished so that the filings will not become tarnished by the sulfur or other component parts of the rubber.

The coils 101 of a polarized relay are in circuit with the coherer, as indicated in Fig. 11. In order that the operation of the relay may not interfere with the operation of the coherer and in order that the relay contacts may be kept free from dust, such relay is preferably mounted within the casing 87 and preferably upon a series of insulating blocks 102. The relay coils 101 are mounted upon one pole of a permanent horse shoe magnet 103, the cores of the coils being in electrical connection with such pole of the permanent magnet. A metal upright 104, fixed to the other pole of the permanent magnet 103, pivotally supports the horizontally disposed armature 105 which is arranged to vibrate between the poles of the relay. A binding post 106 is fixed to the upper end of upright 104 and a leaf spring 107 is connected to the binding post and its free end engages the vibrating armature 105 in line with its pivot, thus maintaining a secure electric contact therewith. The circuit through the relay, armature and contact may be traced in Fig. 11 from battery 108 to binding post 106, contact spring 107, armature 105, relay contact 109, tapper actuating magnet 110 and through oppositely wound coils 111 upon the members of the permanent magnet 103 and from thence back to battery. By thus directing the circuit from battery 108 through oppositely wound coils on the members of the permanent magnet 103, any loss of magnetism in the latter is compensated for and the full strength of the magnet maintained.

To adjust the sensitiveness of the relay, an armature 112 (see Fig. 11) is provided in line with the poles of the magnet 103 and is adjustable to and from such poles. A screw threaded extension 113 upon the armature extends through guides upon a suitable support 114 and lock nuts 115 threaded on the extension serve to hold the armature in adjusted position at any desired distance from the poles of magnet 103.

The tapper actuating magnet 110 is mounted upon a suitable support 116 upon the upper portion of the casing with its poles facing upwardly. Its armature 117 is pivoted to a suitable upright 118 on the top

of the casing and its outer end extends in substantially horizontal direction over the upwardly facing poles of the magnet 110. A leaf spring 119 is fixed to the outer end of the armature and extends inwardly over its pivot. The inner upwardly bent free end of spring 119 is engaged by an adjusting screw 120 threaded through a suitable projection upon the support 118 and normally holds the inner end of the armature against an adjusting screw 121 also threaded through an extension fixed to the support 118. The tapper 122 fixed to the inner end of the armature extends downwardly and inwardly beneath the end of the coherer supporting clamp 91 in position to strike the clamp when the magnet 110 is energized. Since the signals are transmitted from the improved generator by single or individual disruptive discharges or sparks instead of a series of such discharges or sparks, the tapper actuating magnet 110 is non-self-interrupting, that is, the operating circuit therefor extends directly through its coil and not through an intermediate contact controlled by the vibration of its armature. In operation a single blow of the tapper against the coherer clamp represents a dot and two blows in quick succession represent a dash. Other similar codes could of course be employed if desired. When the tapper strikes the coherer clamp a clear resonant sound is emitted and the signal may be easily read. Other means may of course be employed for reading the signal as for example, a telephone interposed in the coherer circuit. By properly adjusting the screws 120 and 121, the operation of the tapper magnet may be rendered extremely sensitive.

The coherer circuit (see Fig. 11) derives current from a small battery 123 and in this circuit is also interposed a variable resistance or rheostat 124 for regulating the amount of current. This rheostat is conveniently mounted, as shown, upon one end of the casing. An intensifier 125 of improved construction, is also interposed in the coherer circuit as indicated in Fig. 11. The intensifier (see Figs. 12 and 13) comprises a suitable casing provided with binding posts 126 to which the conductors of the coherer circuit are conveniently attached. Binding posts 126 are in turn connected to a pair of binding posts 127 by conductors 128. A contact disk 129 is rotatably mounted between the binding posts 127 and a pair of brush holders 130, upon the outer ends of the binding posts, are each provided with a series of fine wire brushes 131 one of which upon each brush holder is bent to contact with the rotating disk 129. If one of the fine brushes is injured or burned another may be employed. Coiled springs 132 extend between shoulders on the binding posts 127 and the brush holders 130 and adjusting nuts 133 threaded upon the outer ends of the binding posts engage the outer faces of the brush holders 130 and serve to accurately adjust the same in desired position.

In operation the contact disk 129 is driven by a spring actuated clock train 134^a, 134^b, 134^c, 134^d, 134^e and 134^f. A suitable escapement mechanism 135^a, 135^b and 135^c is employed to maintain the speed of the rotating disk uniform. Any suitable form of motor and any suitable form of escapement mechanism may be employed in connection with the rotating contact disk 129. That illustrated is an ordinary form of clock train and need not be more fully described. A spring-held plunger 136 extends through the casing of the intensifier adjacent the escapement mechanism so that the rotation of the contact disk may be started and stopped as desired.

The employment of the rotatable contact intensifier in the coherer circuit materially increases the sensitiveness of the latter and renders the transmission of the signals accurate and certain.

In order to properly adjust the detectors or receiving instruments at various stations the intensifiers at such stations are set to rotate at different speeds and a condenser 137 (see Fig. 11) or other suitable capacity which may be varied, is connected to the coherer circuit and the opposite side of the condenser or capacity may be, if desired, connected to ground. The ground connection however has not been found necessary over short distances. This form of receiver having the peculiar intensifier, as described, is specially and peculiarly applicable for use in connection with an influence machine transmitter. It has been found in practice that by changing the length and thickness of the sparks generated by the static machine transmitter, by varying the speed of the intensifying disk at different stations and by properly arranging the capacity areas at the transmission station and at the different receiving stations, the selective transmission of signals may be accurately effected. By running the disk of the intensifier at high speed and using a small capacity area, the receiver will respond only to heavy discharges of the influence machine transmitter and by running the disk at low speed and increasing the capacity area the receiver will respond only to light sparks sent out by the transmitter.

It is obvious that numerous changes may be made in the details of structure and arrangement of parts without departure from the essentials of the invention.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. In space telegraphy, a transmitter com-

prising a static, direct current generator, sparking terminals connected directly to the opposite poles of said generator and a signaling switch controlling the flow of current between said terminals.

2. In space telegraphy, a transmitter comprising a static, direct current generator, sparking terminals connected to the opposite poles of said generator, and signaling means interposed in a short circuit between said poles.

3. In space telegraphy, a transmitting device therefor comprising a static, electric generator, sparking terminals connected to the poles of said generator, short circuit terminals connected to said poles and signaling means comprising a shiftable conductor normally extending in line with said short circuit terminals.

4. In space telegraphy, a transmitting device therefor comprising a static generator, sparking terminals connected to the poles of said generator, short circuit terminals connected to said poles, insulating receptacles surrounding said terminals, oppositely disposed openings in said receptacles and a signaling switch comprising a conductor normally extending in line with said openings and a key for shifting said conductor.

5. In space telegraphy, a transmitting device therefor comprising a static generator, sparking terminals connected to the poles of said generator, short circuit terminals connected to said poles and a signaling switch comprising separate adjustable sections having pointed ends normally extending in line with said short circuit terminals and means for shifting said signaling switch.

6. In space telegraphy, a transmitting device therefor comprising oppositely rotating dielectric disks, contact plates fixed to said disks, contact brushes and condenser brushes coöperating with said plates and disks, discharge terminals and short circuit terminals connected to said condenser brushes, insulating receptacles surrounding said short circuit terminals provided with oppositely facing openings and signaling means comprising a suitable conductor normally extending in line with said openings.

7. In space telegraphy, a transmitting device therefor comprising oppositely rotating dielectric disks, contact plates fixed to said disks, contact brushes and condenser brushes coöperating with said plates and disks, a substantially air-tight casing inclosing said brushes and disks, means for maintaining air under pressure within said casing, sparking terminals connected to said condenser brushes and signaling means for controlling the discharge between said sparking terminals.

8. In space telegraphy, a transmitting device therefor comprising oppositely rotating dielectric disks, contact plates fixed to said disks, contact brushes and condenser brushes coöperating with said plates, operating gearing for said disks, a substantially air-tight insulating casing inclosing said disks, brushes and gearing, means for maintaining dry air under pressure within said casing, sparking terminals connected to said condenser brushes and signaling means for controlling the discharge between said terminals.

9. In space telegraphy, a transmitter comprising a static, electric generator, sparking terminals connected to the poles of said generator, signaling means for controlling the discharge between said terminals and means for varying the intensity of such discharges.

10. In space telegraphy, a transmitter comprising a static electric generator having rotating dielectric plates, condenser brushes coöperating therewith, a series of sparking terminals of varying capacity connected to said condenser brushes and signaling means for controlling the discharge between said terminals.

11. In space telegraphy, a transmitter comprising a static electric generator having rotating dielectric plates, condenser brushes coöperating therewith, a series of sparking terminals of varying capacity connected to said condenser brushes, a series of discharge balls of varying capacity arranged intermediate said sparking terminals and signaling means for controlling the discharge between said terminals and balls.

12. In space telegraphy, the combination with a static electric generator at the transmitting station, sparking terminals connected to the poles of said generator and signaling means for controlling the flow of single, individual discharges between said terminals, of a coherer at the receiving station, a relay in circuit therewith and a non-self-interrupting tapper for said coherer controlled by the operation of said relay.

13. In selective space telegraphy, the combination with an influence machine transmitter having signaling means for controlling the discharges between its terminals and means for varying the intensity of such discharges, of a receiver comprising a detecting instrument having a variable capacity and an intensifier in circuit therewith comprising a rotatable contact plate and a contact brush engaging said plate.

14. In selective space telegraphy, the combination with an influence machine transmitter having signaling means for controlling the discharges between its terminals and means for varying the intensity of such discharges, of a receiver comprising a detecting instrument having a variable capacity and an intensifier in circuit therewith comprising a rotatable contact plate and a contact brush engaging said plate, said brush being adjustable to and from the axis of ro-

tation of said plate, substantially as described.

15. In selective space telegraphy, the combination with an influence machine transmitter having signaling means for controlling the discharges between its terminals and means for varying the intensity of such discharges, of a receiver comprising a detecting instrument having a variable capacity, an intensifier in circuit therewith, comprising a rotatable contact disk, contact brushes engaging said disk and adjustable to and from the axis of rotation thereof, and means for rotating said disk at a uniform rate of speed.

16. In space telegraphy, a transmitter comprising a static electric machine having rotating dielectric plates, condenser brushes and sparking terminals coöperating therewith and a signaling instrument interposed in a short circuit between the poles of said machine.

17. In selective space telegraphy, the combination with an influence machine transmitter having signaling means for controlling the discharges between its terminals and means for varying the intensity of such discharges, of a receiver comprising a detecting instrument having a variable capacity, and an intensifier in circuit therewith comprising a movable contact.

18. In space telegraphy, the combination with an influence machine transmitter having signaling means for controlling the discharges between its terminals and means for varying the intensity of such discharges, of a receiver comprising a detecting instrument having a variable capacity, and an intensifier in circuit therewith comprising movable contact devices and means for moving the said devices in contact at different rates, substantially as described.

19. In selective space telegraphy, the combination with an influence machine transmitter having signaling means for controlling the discharges between its terminals and means for varying the intensity of such discharges, of a receiver comprising a detecting instrument and an intensifier in circuit therewith comprising movable contact devices, and clock mechanism for relatively moving said contact devices.

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Witnesses:

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