No. 809,237. PATENTED JAN. 2, 1906.

B. O. WAGNER.

SEMAPHORE MECHANISM.

APPLICATION FILED MAR. 9, 1905.

Fig. 2.

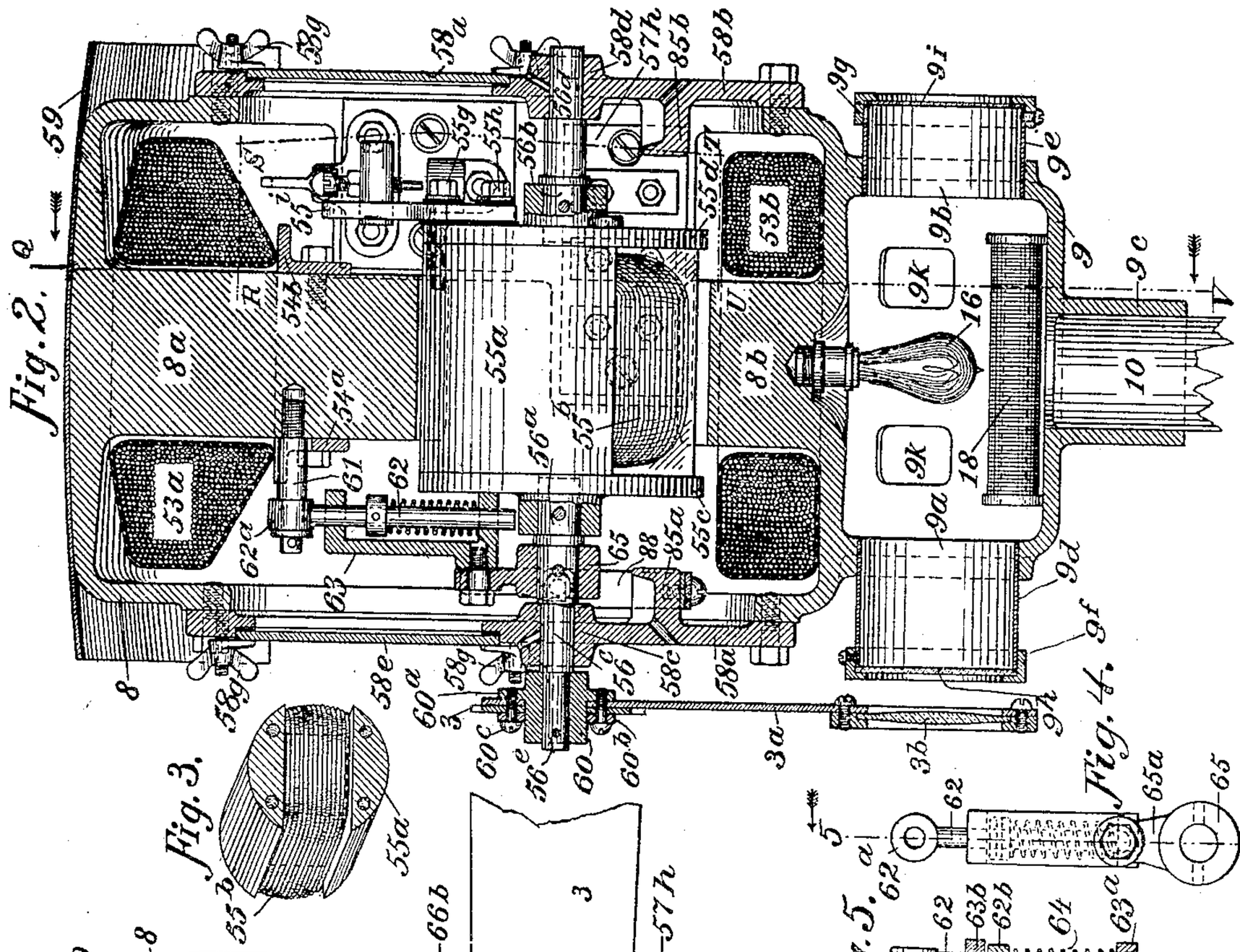


Fig. 3.

Fig. 4.

Fig. 5.

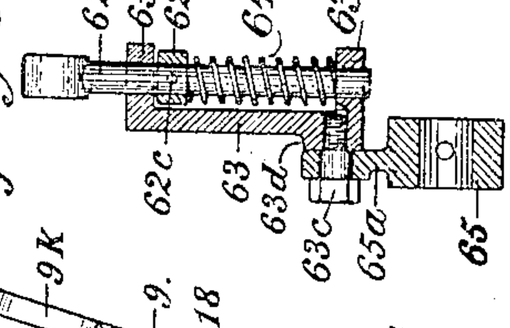


Fig. 1.

Fig. 6.

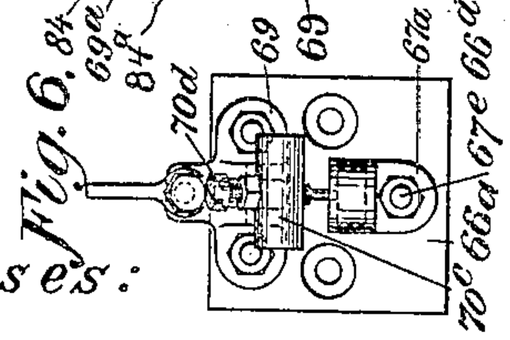


Fig. 7.

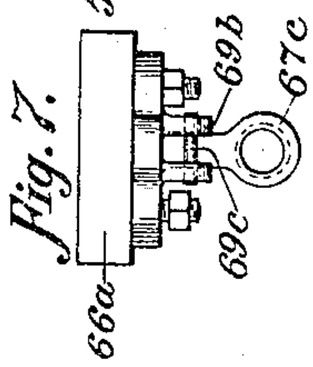
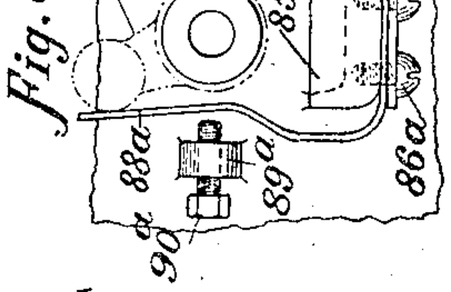


Fig. 8.



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BRUNO OTTO WAGNER, OF SWISSVALE, PENNSYLVANIA.

SEMAPHORE MECHANISM.

No. 809,237. Specification of Letters Patent. Patented Jan. 2, 1906.

Application filed March 9, 1905. Serial No. 249,316.

To all whom it may concern:

Be it known that I, BRUNO OTTO WAGNER, at present residing at Swissvale, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Semaphore Mechanisms, of which the following is a specification.

My present invention relates to certain new and useful improvements in semaphore mechanisms, and the same is more particularly adapted for use in connection with my improved system of electric signaling and switch-setting for railroads disclosed in my copending application, filed October 28, 1904, Serial No. 230,521.

Primarily my invention seeks to provide a semaphore mechanism always under the control of the operator and which includes means for closing branch circuits to operate indicating devices at the operator's station and to cut in a signal-lamp in the semaphore-casing to give a light-signal.

In its generic nature my invention comprises a casing adapted to be hermetically closed and forming the field-magnet of an electric motor, the pole-pieces of which motor are integrally formed with the casing. An armature is rotatably mounted between the pole-pieces in the casing and has its shaft extended to without the casing to receive the semaphore-blade, and means are connected with the armature for holding the same in its adjusted positions when the energizing-current has ceased.

The invention also includes circuit-closers within the casing adapted to be operated by the motor-armature and a supplemental chamber below the main chamber of the casing in which an electric lamp and resistance-coil are mounted, which chamber is provided with windows adapted to coöperate with the colored glass of the tail-plates of the semaphore for giving light-signals, said casing being provided with apertures for ventilating said supplemental chamber.

The invention also has for its object to so construct the casing that it will serve as a junction-box for the various terminals.

With other objects than have heretofore been enumerated the invention comprises certain details of construction and novel arrangement of parts, all of which will be first described in detail and then specifically pointed out in the appended claims, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section on the line Q R S T U V of Fig. 2 looking in the direction of the arrow. Fig. 2 is a central vertical section through the semaphore-housing. Fig. 3 is a perspective view of the semaphore-armature. Fig. 4 is a side view of the toggle-spring device. Fig. 5 is a vertical longitudinal section on the line 5 5 of Fig. 4. Fig. 6 is a side view of the circuit-closing device. Fig. 7 is a top view of the circuit-closing device. Fig. 8 is a front view of the swing-motion adjusting devices for the semaphore-blade.

Referring now to the accompanying drawings, in which like numerals of reference indicate like parts in all the figures, and, referring particularly to Figs. 1 and 2, it will be seen that 8 designates a cast-iron or soft-steel housing having two oppositely-arranged magnet-cores 8^a and 8^b that are cast with the frame in one piece. To provide ample space for the free operation of the two circuit-closing devices (hereinafter again referred to) within the upper portion of the housing, I make the upper pole-piece 8^a smaller in width than the lower one and provide it with a pole-shoe 8^c, which covers the same arc as the lower piece 8^b.

Within the housing 8 on its side walls and oppositely disposed to each other are two flat surfaces 8^d 8^e, respectively, while the front and rear walls of the housing are each provided with a large rectangular opening to allow of ready access to the interior of the housing and to permit insertion of the interior parts through said opening.

53^a and 53^b designate the energizing field-coils for the pole-pieces 8^a 8^b, respectively, the upper field-coil being larger than the lower one to compensate for the increased magnetic leakage of the said pole. Both field-coils consist of insulated copper wire and are connected in series to each other and wrapped in insulating material, such as cloth or tape. The upper coil 53^a rests on metallic angle-pieces 54^a 54^b, which are respectively fastened to the rear and front sides of the pole-piece 8^a by screws, as clearly shown in Figs. 1 and 2.

Arranged concentrically between the pole-pieces 8^a 8^b is an armature 55^a of the Siemen's shuttle type, as shown in detail in Fig. 3. On the soft-iron core 55^a the energizing armature-coil 55^b is wound, proper insulating material being interposed between the coil and the armature in the usual manner.

55^c 55^d designate disks of non-magnetic metal, which are secured to the armature 55^a at each end by suitable screws, as shown. The disks 55^c and 55^d are provided with central hubs, which are drilled, reamed, and pressed to the ends 56^a and 56^b, respectively, of two short steel shafts, to which they may be further secured by steel pins, as shown in Fig. 1.

The armature-disk 55^d is provided with a pair of insulating-bushings 55^e and 55^f, respectively, of hard fiber, hard rubber, or other suitable material to permit passage of the ends 55^k and 55^l, respectively, of the armature-coil 55^b, as clearly shown in Fig. 1 of the drawings. The ends 55^k and 55^l are helically rolled up to serve as flexible connections and are joined at their ends with the metallic stationary terminal blocks 57^a 57^b. In practice there are three terminal blocks in parallel, but insulated from each other on a plate of slate, lava, or other insulating material 57^g and 57^h, respectively. The terminal plates are fastened oppositely to each other on the flat surfaces 8^d and 8^e of the housing-wall, as shown in Fig. 1.

55^i designates a metallic lever secured by screws 55^g and 55^h to the armature-disk 55^d, but insulated therefrom by a plate of hard fiber or hard rubber and by screw-bushings of similar insulating material in the usual manner. The screw 55^g is longer than the screw 55^h, runs with suitable clearance through the disk 55^d, and is fastened in the armature-body 55^a. (See dotted lines in Fig. 2.)

The aforesaid rectangular openings in the front and rear walls of the housing are covered by weather-proof cap-plates 58^a and 58^b, respectively, which plates are secured to the housing by a number of cap-screws, and the said plates 58^a and 58^b are formed with bearings or journals 58^c and 58^d, respectively, for the short shaft-section 56^c and 56^d of the armature. The upper portions of the plates 58^a and 58^b are provided with rectangular apertures, which are closed by metallic covers 58^e and 58^f, respectively, a soft-rubber packing and a plurality of thumb-screws 58^g being provided for each plate to secure a weather-proof joint between the plates and the cover. These apertures serve as hand-holes to permit the insertion of the operator's hand to adjust or inspect the mechanism within the housing.

To further protect the joints against rain and snow, the housing 8 is covered with a roof 59, of galvanized sheet-iron, as shown in Figs. 1 and 2.

The shaft 56^c projects outside of the housing through the bearings 58^c and terminates in the stud 56^e, to which the metalic hub 60 is secured by a pin, as shown. The hub 60 is provided with a flange 60^a, to which the signal-arm 3 of the semaphore-blade is secured. (See Figs. 1 and 2.) The tail portion 3^a of the semaphore-blade, which carries the usual colored disk 3^b for effecting night-signals, may be either of a curved shape, as shown in dotted lines in Fig. 1, or it may be of any other design which may be found to be desirable to use. In order to balance the weight of the signal-arm and tail-plate, the latter may be made of a heavier piece of sheet metal than the former.

The total swinging motion of the semaphore-blade occupies an angle of about sixty degrees, and in order to mechanically lock said blade to its final positions a toggle-spring device (shown in detail in Figs. 4 and 5) is provided. The toggle-spring device comprises an eyebolt 62, whose eye 62^a is pivotally mounted on a stud 61, (see Fig. 2,) secured into an aperture in the pole 8^a, and the said eyebolt is carried by a bracket member 63 and passes through bearings 63^a and 63^b in the said bracket member, a collar 62^b, (see Fig. 5,) provided for the bolt 62 between the bearing portions 63^b and 63^a, and a coil-spring 64 is placed between a collar 62^b and the bearing 63^a to force the eyebolt in one direction, the movement of the eyebolt in the aforesaid direction being limited by the bearing 63^b. The bracket 63 is provided with a boss 63^d, into which a pivot-screw 63^c is screwed. 65 designates a metallic sleeve secured to the shaft-section 56^a, which sleeve is provided with a lever or arm 65^a, which is fulcrumed on the pole 63^c, before mentioned.

The limitation of the spring motion of the semaphore-blade is secured in a simple and elastical way by the device shown in detail in Fig. 8 and in cross-section in Fig. 2, by reference to which it will be seen that on the bottom face of the oil-drip pan 85^a of the housing-plate 58^a a U-shaped flat spring 88 is secured by a metallic plate 87 and a pair of cap-screws 86^a 86^b. The legs 88^a and 88^b of the spring 88 project upwardly on each side of the armature-shaft section 56^a. The housing-plate 58^a is provided with two bosses or lugs 89^a and 89^b, (see Fig. 8,) which carry set-screws 90^a and 90^b for coöperating with the legs 88^a and 88^b of the spring 88. When the semaphore-blade reaches one of its final positions, the bolt 62 and the bracket 63, as well as lever-arm 65, due to their cooperative arrangement, are swung into an angular position to the vertical center line of the apparatus, whereby the expansive force of the coil-spring 64 is tending to swing the toggle device until the collar 62^b strikes the bearing portion 63^b of the bracket 63. This striking would effect an impact toward the bolt 61, as well as the screw 63^c, and cause to loosen both of them. To prevent this objectionable feature, I use the adjustable limiting device shown in detail in Fig. 8. As the lever-arm 65^a is pressed against the spring-legs 88^a and 88^b, respectively, it

forces the latter outward until they touch the adjusting-screws 90^a and 90^b, respectively, and their bending moment equals the moment of said forces.

The circuit-closing device by which when the semaphore-blade reaches its final positions any suitable signal and circuits may be closed to indicate at the operator's station the position of the semaphore-blade are best shown in Figs 1, 6, and 7, by reference to which it will be seen that upon two base-plates 66^a and 66^b of slate, lava, or other insulating material, secured to the flat portions 8^d and 8^e of the housing 8 by countersunk cap-screws, as shown in Fig. 1, are mounted metallic angle-pieces 67^a and 67^b, respectively. The angle-pieces 67^a and 67^b are secured to their insulated base 66^a and 66^b, respectively, by means of bolts 67^e and 67^f, which are screwed into said pieces and project with their threaded portions to carry nuts for making wire connections. The heads of these bolts are deeply countersunk unto the rear side of said insulating base-plate, so that they do not touch the metallic housing-frame 8.

Combined with said metallic angle-pieces 67^a and 67^b are cup-shaped portions 67^c and 67^d, respectively, which are filled with mercury, as shown in Fig. 1. Above said angle-pieces and on the same base-plate 66^a and 66^b, respectively, I fasten by countersunk cap-screws metallic plates 69, each having an extending bracket portion 69^a at its top end and a pair of clevises 69^b at its lower end. These countersunk bolts for securing the metallic plates 69 to the insulating-base 66^a and 66^b are screwed into said metallic plates, and the extending portions of said screws are provided with nuts for making wire connections similarly to the arrangement with the angle-pieces 67^a and 67^b.

In the clevises 69^b upon a pin 69^c is supported a metallic bent lever 70, having a set-screw 70^a. The coil-spring 84 connects lever 70 with a stud 84^a, fastened to the extending portion 69^a of the metallic plate 69 and causes the set-screw to rest on said extending portion in the manner shown in the right-handed circuit-closer of Fig. 1.

The lower arm 70^b of each bent lever 70 terminates in a cross-arm 70, (see Fig. 6,) which carries a pivot-pointed metallic set-screw 70^d. Each of the set-screws 70^d are secured to their respective positions toward their respective arms by means of counter-nuts and are directly arranged over their respective mercury-cups 67^c and 67^d.

When the semaphore-blade reaches its final positions, the lever 55^i will press against the cross-arm 70^c and cause the set-screw 70^d to dip into the mercury-cup 67^c and 67^d, respectively, and thereby close a circuit (not shown) through the circuit-closer.

At the bottom of the housing 8 is cast to the same a supplemental casing 9 (see Figs. 1 and 2) with openings 9^a and 9^b in its front and rear sides, which openings are disposed oppositely to each other. To fasten the whole semaphore mechanism to the top of a supporting-pole, the casing 9 carries at its bottom a tubular portion 9^c, as shown. In the apertures 9^a and 9^b I fasten tubular metallic caps 9^d and 9^e, that are covered at their outer ends by transmitting-disks 9^h and 9^i, of which the disk 9^e is usually composed of colored glass. These glass disks are held in place by metallic rings 9^f and 9^g, secured to the caps 9^a and 9^e by screws, as shown.

Arranged centrally within the casing 9 is a signal-lamp 16, the socket for which is fastened into the upper wall of the casing 9. Said lamp 16 may be of the ordinary incandescent type and supplied with current in any approved manner—such, for instance, as disclosed in my copending application before referred to. As further shown in Figs. 1 and 2, a resistance 18 is placed within the casing 9, which resistance may be substituted for the lamp 16 when my present invention is used with the system disclosed in my copending application before referred to, or the said resistance 18 may be placed outside of the casing, if desired. The resistance 18 consists of a coil of insulated wire wound upon a spool-frame of insulating material, and the wire of the resistance 19 should preferably be such a composition of metals that will not change its resistance to any considerable degree under variations of temperature. The casing is further provided with apertures 9^a to allow of air circulation to keep the chamber within the casing 9 at as low a temperature as possible.

From the foregoing description, taken in connection with the accompanying drawings, it is thought the complete construction, operation, and many advantages of my invention will be readily understood by those skilled in the art to which it appertains, and I desire to say that while I have particularly referred to my present invention as being adapted for use in connection with the system disclosed in my copending application before referrd to, yet I desire it understood that my present invention can be used in connection with any semaphore-operating mechanism in which it would be applicable, the field-coils 53^a and 53^b, respectively, being energized in any approved manner, as also the armature-coil 55^b.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a mechanism of the character stated, a housing of magnetic material, pole-pieces integrally formed within said housing, energizing-coils carried by said pole-pieces, an armature mounted for limited rotatable movement between the pole-pieces, circuit-

closers within the housing, means carried by the armature for operating the circuit-closers at times, a semaphore-blade on the outside of the housing coöperatively connected to turn with the armature, said blade having a tailpiece provided with a colored glass, a supplemental housing formed with and below the first-mentioned housing, said supplemental housing adapted to receive an incandescent lamp and a resistance-coil, said supplemental housing having apertures diagonally opposite each other, one of which is adapted to register with the tailpiece-glass when the semaphore is in one position, and terminal blocks for making wire connections mounted within the housing.

2. In a mechanism of the character stated, a housing of magnetic material, pole-pieces integrally formed within said housing energizing-coils carried by said pole-pieces, an armature mounted for limited rotatable movement between the pole-pieces, circuit-closers within the housing, means carried by the armature for operating the circuit-closers at times, a semaphore-blade on the outside of the housing coöperatively connected to turn with the armature, said blade having a tailpiece provided with a colored glass, a supplemental housing formed with and below the first-mentioned housing, said supplemental housing adapted to receive an incandescent lamp and a resistance-coil, said supplemental housing having apertures diagonally opposite each other, one of which is adapted to register with the tailpiece-glass when the semaphore is in one position, terminal blocks for making wire connections mounted within the housing, and a supplemental roof for the housing.

3. In a semaphore mechanism, a housing formed of magnetic material, pole-pieces integrally formed within said housing, one of said pole-pieces being longer than the other, energizing-coils carried by said pole-pieces, an armature mounted for limited rotary movement between said pole-pieces, said housing having openings at its ends, closure-caps for said openings, said closure-caps being provided with bearings, said armature having shaft portions extending through said closure-cap bearings, a semaphore-blade secured to one of said shaft portions, circuit-closers within the housing, means carried by the armature for operating the circuit-closers, and toggle-spring devices for holding the armature to its moved positions.

4. In a semaphore mechanism, a housing formed of magnetic material, pole-pieces integrally formed within said housing, one of said pole-pieces being longer than the other, energizing-coils carried by said pole-pieces, an armature mounted for limited rotary movement between said pole-pieces, said housing having openings at its ends, closure-caps for said openings, said closure-caps being provided with bearings, said armature having shaft portions extending through said closure-cap bearings, a semaphore-blade secured to one of said shaft portions, circuit-closers within the housing, means carried by the armature for operating the circuit-closers, toggle-spring devices for holding the armature to its moved positions, said housing having a supplemental chamber at its under side and being provided with a collar portion by means of which it may be secured to a pole, an incandescent lamp and a resistance-coil in said supplemental chamber, said supplemental chamber having ventilating-apertures, said supplemental chamber having a pair of alining apertures in opposite walls, transparent covers for said alining apertures, said semaphore having a tailpiece carrying a colored glass for registering with one of said alining apertures, a resilient buffer-spring device for said armature substantially as shown and described.

5. In an apparatus of the character stated, a housing of magnetic metal, a pair of pole-pieces integrally formed therewith within the housing, one of said pole-pieces being of greater length than the other, an energizing-coil mounted on said longer pole-piece, means for holding said coil in place on said longer pole-piece, an energizing-coil for the other pole-piece, said housing having openings in its end walls, closure-plates having bearings and integrally-formed drip-pans, an armature, a disk secured to each end of the armature, short shafts secured to each disk and passing through the bearings in the closure-plates, an arm carried by one of said shafts, a bracket pivotally connected to said arm, an eyebolt carried by said bracket, said eyebolt being pivotally secured to the longer pole-piece, a collar and a coil-spring on said eyebolt for forcing the eyebolt in one direction, one of said armature-shafts projecting through its closure-plate, and a semaphore-blade mounted on said last-named shaft-section.

6. In an apparatus of the character stated, a housing of magnetic metal, a pair of pole-pieces integrally formed therewith within the housing, one of said pole-pieces being of greater length than the other, an energizing-coil mounted on said longer pole-piece, means for holding said coil in place on said longer pole-piece, an energizing-coil for the other pole-piece, said housing having openings in its end walls, closure-plates for said openings, said closure-plates having bearings and integrally-formed drip-pans, an armature, a disk secured to each end of the armature, short shafts, secured to each disk and passing through the bearings in the closure-plates, an arm carried by one of said shafts, a bracket pivotally connected to said arm, an eyebolt carried by said bracket, said eyebolt being pivotally secured to the longer pole-piece, a collar and a coil-spring on said eyebolt for forcing the eyebolt in one direc-

tion, one of said armature-shafts projecting through its closure-plate, a semaphore-blade mounted on said last-named shaft-sections, means mounted within the casing and adapted to be engaged by said shaft-arm as the armature has reached the limit of its movement in each direction to serve as a buffer-spring therefor, circuit-closers mounted within the casing, an arm secured to one of said armature-disks for operating the circuit-closers.

7. In an apparatus of the character stated, a housing of magnetic metal, a pair of pole-pieces integrally formed therewith within the housing, one of said pole-pieces being of greater length than the other, an energizing-coil mounted on said longer pole-piece, means for holding said coil in place on said longer pole-piece, an energizing-coil for the other pole-piece, said housing having openings in its end walls, closure-plates for said openings, said closure-plates having bearings and integrally-formed drip-pans, an armature, a disk secured to each end of the armature, short shafts secured to each disk and passing through the bearings in each closure-plate, an arm carried by one of said shafts, a bracket pivotally connected to said arm, an eyebolt carried by said bracket, said eyebolt being pivotally secured to the longer pole-piece, a collar and a coil-spring on said eyebolt for forcing the eyebolt in one direction, one of said armature-shafts projecting through its closure-plate, a semaphore-blade mounted on said last-named shaft-section, means mounted within the casing and adapted to be engaged by said shaft-arm as the armature has reached the limit of its movement in each direction to serve as a buffer therefor, circuit-closers mounted within the casing, an arm secured to one of said armature-disks for operating the circuit-closers, each of said circuit-closers comprising a fixedly-held mercury-cup and a pivotally-mounted arm, an adjustable contact-point carried by each arm, a coil-spring for normally holding the arm with its contact-point out of the mercury-cup and an insulating-base upon which said arm and said mercury-cup are secured.

8. In an apparatus of the character stated, a housing of magnetic metal, a pair of pole-pieces integrally formed therewith within the housing, one of said pole-pieces being of greater length than the other, an energizing-coil mounted on said longer pole-piece, means for holding said coil in place on said longer pole-piece, an energizing-coil for the other pole-piece, said housing having openings in its end walls, closure-plates for said openings, said closure-plates having bearings and integrally-formed drip-pans, an armature, a disk secured to each end of the armature, short shafts secured to each disk and passing through the bearings in the closure-plates, an arm carried by one of said shafts, a bracket pivotally connected to said arm, an eyebolt carried by said bracket, said eyebolt being pivotally secured to the longer pole-piece, a collar and a coil-spring on said eyebolt for forcing the eyebolt in one direction, one of said armature-shafts projecting through its closure-plate, a semaphore-arm mounted on said last-named shaft-section, means mounted within the casing and adapted to be engaged by said shaft-arm as the armature has reached the limit of its movement in each direction to serve as a buffer therefor, circuit-closers mounted within the casing, an arm secured to one of said armature-disks for operating the circuit-closers, each of said circuit-closers comprising a fixedly-held mercury-cup and a pivotally-mounted arm, an adjustable contact-joint carried by each arm, a coil-spring for normally holding the arm with its contact-point out of the mercury-cup and an insulating-base upon which said arm and said mercury-cup are secured, a supplemental roof for said housing and means for securing said housing to a pole.

9. In an apparatus of the character stated, a housing of magnetic metal, a pair of pole-pieces integrally formed therewith within the housing, one of said pole-pieces being of greater length than the other, an energizing-coil mounted on said longer pole-piece, means for holding said coil in place on said longer pole-piece, an energizing-coil for the other pole-piece, said housing having openings in its end walls, closure-plates having bearings and integrally-formed drip-pans, an armature, a disk secured to each end of the armature, short shafts secured to each disk and passing through the bearings in the closure-plates, an arm carried by one of said shafts, a bracket pivotally connected to said arm, an eyebolt carried by said bracket, said eyebolt being pivotally connected to the longer pole-piece, a collar and a coil-spring on said longer pole for forcing the eyebolt in one direction, one of said armature-shafts projecting through its closure-plate, a semaphore-blade mounted on said last-named shaft-section, means mounted within the casing and adapted to be engaged by said shaft-arm as the armature has reached the limit of its movement in each direction to serve as a buffer therefor, circuit-closers mounted within the casing, an arm secured to one of said armature-disks for operating the circuit-closers, each of said circuit-closers comprising a fixedly-held mercury-cup and a pivotally-mounted arm, an adjustable contact-point carried by each arm, a coil-spring for normally holding the arm with its contact-point out of the mercury-cup and an insulating-base upon which said arm and said mercury-cup are secured, a supplemental roof for said housing and means for securing said housing to a pole, said housing including an extension forming a supplemental chamber,

an electric light mounted in said supplemental chamber, said supplemental chamber having apertures in its end walls, tubular members held in said apertures, transparent closure members for the outer ends of said tubular members, said semaphore-blade having a tailpiece, a colored transparent disk carried by said tailpiece for registering with said transparent closer members of one of said tubular members.

10. In an apparatus of the character stated, a housing of magnetic metal, a pair of pole-pieces integrally formed therewith within the housing, one of said pole-pieces being of greater length than the other, an energizing-coil mounted on said longer pole-piece, means for holding said coil in place on said longer pole-piece, an energizing-coil for the other pole-piece, said housing having openings in its end walls, closure-plates for said openings, said closure-plates having bearings and integrally-formed drip-pans, an armature, a disk secured to each end of the armature, short shafts secured to each disk and passing through the bearings in the closure-plates, an arm carried by one of said shafts, a bracket pivotally connected to said arm, an eyebolt carried by said bracket, said eyebolt being pivotally secured to the longer pole-piece, a collar and a coil-spring on said eyebolt, for forcing the eyebolt in one direction, one of said armature-shafts projecting through its closure-plate, a semaphore-blade mounted on said last-named shaft-section, means mounted within the casing, and adapted to be engaged by said shaft-arm as the armature has reached its limit of movement in each direction to serve as a buffer therefor, circuit-closers mounted within the casing, and an arm secured to one of said armature-disks for operating the circuit-closers, each of said housing closer-plates having an aperture, a closure member for said apertures, means for detachably securing said last-named closure-plate members over the closure-plate apertures hermetically substantially as shown and described.

11. In a mechanism of the character stated, a housing, pole-pieces within the housing, energizing-coils carried by said pole-pieces, an armature mounted for rotary movement between the pole-pieces, circuit-closers within the housing, means within the housing for operating said circuit-closers, a semaphore-blade without the housing coöperatively connected to turn with the armature, substantially as shown and described.

12. In a mechanism of the character stated, a housing, pole-pieces within the housing, energizing-coils carried by said pole-pieces, an armature mounted for rotary movement between the pole-pieces, circuit-closers mounted within the housing, means within the housing for operating said circuit-closers, a semaphore-blade without the housing coöperatively connected to turn with the armature, said blade having a tailpiece provided with an indicating-glass, a supplemental housing below the first supplemental housing, a signal-lamp within said supplemental housing, said supplemental housing having apertures adapted to register with the tailpiece-glass when the semaphore is in one position.

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Witnesses:
ALBERT AUGUST ZUEHLKE,
THOMAS B. COLLIER.