

R. S. ROBERTS.
SEMAPHORIC ELECTRIC SIGNAL.

No. 581,430.

Patented Apr. 27, 1897.

Fig. 2.

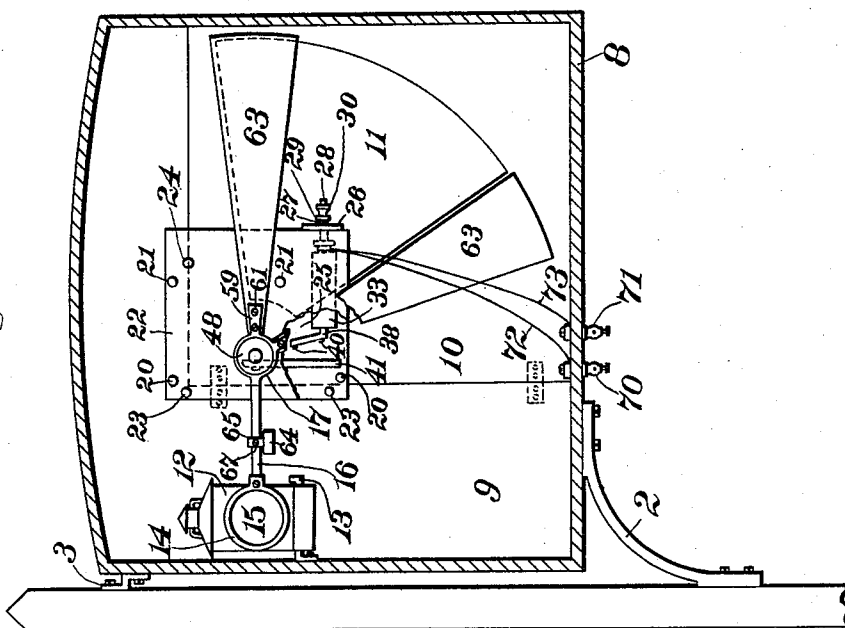
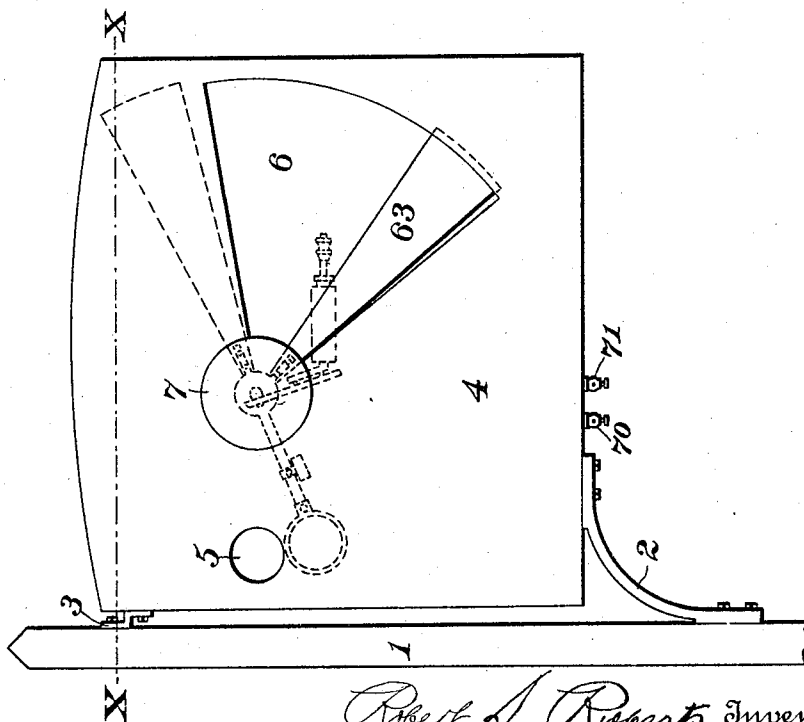


Fig. 1.



Witnesses

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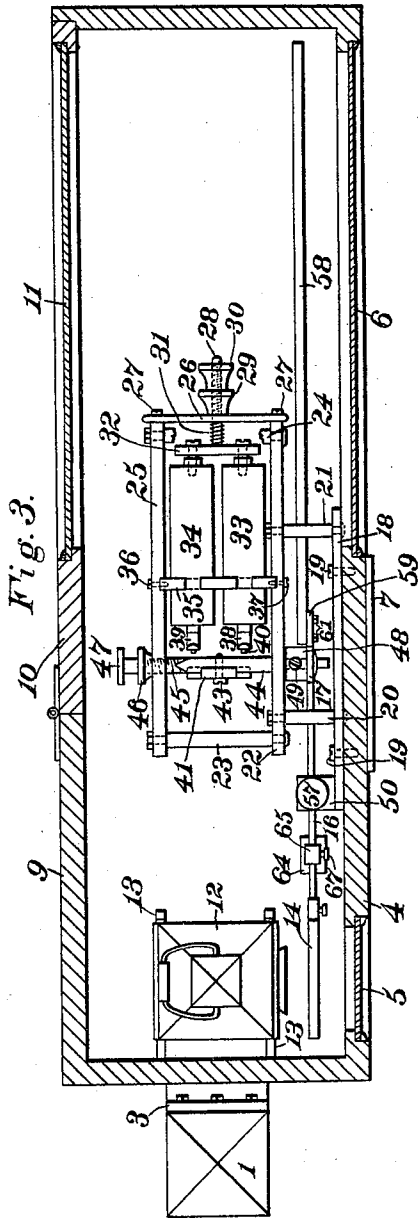


Fig. 3.

Fig. 4.

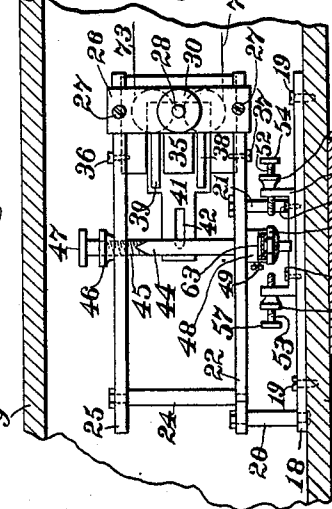
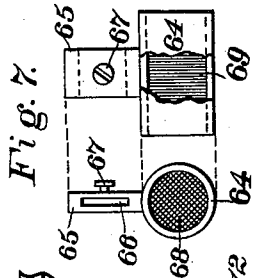
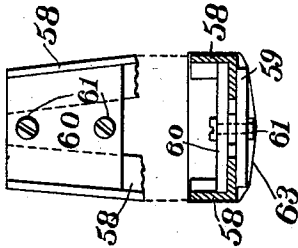
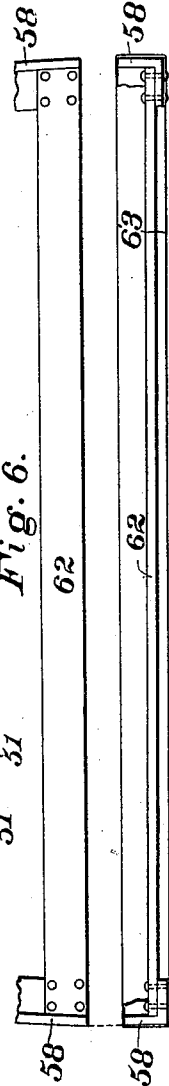


Fig. 6.



Witnesses

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UNITED STATES PATENT OFFICE.

ROBERT S. ROBERTS, OF PHILADELPHIA, PENNSYLVANIA.

SEMAPHORIC ELECTRIC SIGNAL.

SPECIFICATION forming part of Letters Patent No. 581,430, dated April 27, 1897.

Application filed October 16, 1896. Serial No. 609,167. (No model.)

To all whom it may concern:

Be it known that I, ROBERT S. ROBERTS, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Semaphoric Electric Signals; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to semaphoric electric signals, more particularly to semaphores designed to form the visual element in electrically-operated block-signal systems employed upon railways.

One object of my invention is the production, in addition to and in connection with a night-signal, of a semaphoric signal wherein arms constructed with special reference to lightness and strength in proportion to their width and length are required to be moved throughout a comparatively small arc in order to indicate a change of signals, thereby demanding but a minimum of strength in the operating-current, with consequent economy.

Another object of my invention is to provide a signal-box differing in color or shade from the arms of the semaphore, thereby throwing the visible arm into bold relief and enabling its position to be readily and accurately determined at considerable distances, even in mist, rain, or imperfect light, the position of the arm, not its color, conveying the message of the signal.

A further and important object of my invention is to produce a signal in which the index elements fall by their own weight into the positions indicating an obstructed track. Thus should the electrical current employed to operate the signal for any reason fail attention would be at once called to the condition of the apparatus.

By the use of my invention the right of way cannot be incorrectly given to an engineer through any fault developed in the mechanism. Unreliability in this particular has

proven a fruitful source of disappointment, besides calling forth adverse criticism of electrically-actuated block-signal systems generally.

Each constituent element of my invention is described in detail, and its office, together with the mode of operation of the whole, fully explained hereinafter.

Referring to the accompanying drawings, wherein like numbers are employed to designate like parts throughout the several views, Figure 1 represents a front view of the signal-box, showing the circular orifice and sectoral glass-covered opening through the front and disclosing one arm of the semaphore. Fig. 2 represents the signal-box with the front side appearing in the first figure removed, showing the position of the lantern, the door affording access to the box, the electrical connections, and the position of the semaphore brought about by the weight of the parts uninfluenced by the magnet. Fig. 3 represents a top plan of the working parts of my invention, the upper portion of the signal-box having been removed, as upon line X X of the first figure. Fig. 4 represents an end view of the magnets, armature, magnet-supporting frame, and relating parts, showing also the means employed to limit the movement of the semaphoric arms. The scale of drawing in Figs. 3 and 4 has been increased for the sake of clearness of illustration, the same being the case in the figures following. Fig. 5 represents one method of connecting the frames of the arms and the common center plate, to which they converge. Fig. 6 shows two views. The first represents the end of one of the semaphore-frames riveted. The second view represents the slip-cover enveloping the said semaphore-frame. Fig. 7 sets out the construction of the special hygroscopic weight for maintaining the balance of the semaphore during variations of atmospheric humidity.

In the construction of my invention all parts are reduced to their simplest and least costly forms consistent with durability, suitable material being selected for each element in view of its individual requirements.

Considering Fig. 1, numeral 1 designates a post supporting, by means of attachments 2

and 3, a signal-box to guard the working parts from accident and weather, of which 4 marks the front side. Through side 4 extend orifice 5 and the sectoral opening 6, both referred to again. 7 marks a circular piece colored in any manner and usually fixed to project about an inch from the outer face 4 of the box. Its office is to indicate the common meeting-point of the arms and the area of least oscillation.

In Fig. 2, numeral 8 marks the frame of the box; 9, the rear side; 10, the door in the rear side. Door 10 may or may not be provided with a glass-covered sectoral opening 11, similar to opening 6, through which the arms might be seen from the rear. In certain instances I may conclude to construct side 9 with a solid door 10 and to color both appropriately as a background for the semaphore. 12 designates a lantern detachably placed upon a supporting-bracket 13. In front of the eye of the lantern is circular frame 14, filled by a colored transparent disk or lens 15. Frame 14 is detachably joined to or forms an expanded continuation of a bar or lever 16, the remaining extremity of which is fixed to or fashioned into a plate 17, to which are also attached the arms of the semaphore.

Considering Figs. 3 and 4, 18 marks a plate fastened to the inner surface of side 4 by screws 19 19. Studs 20 21, arising from plate 18, support plate 22, which in its turn, by studs 23 24, Fig. 2, carries plate 25. As ordinarily constructed plates 22 25 are duplicates. They may be either continuous sheets of metal or skeletons. Connecting plates 22 25 at one end is a cross-plate 26, fixed in position by screws 27 27, and through a smooth orifice in cross-plate 26 a screw 28, provided on the outside of the cross-plate with adjusting-nut 29 and jam-nut 30, is passed. About screw 28 on the inside of the cross-plate is a coiled spring 31, and the end of the screw is fixed to yoke 32, which joins the cores of an electromagnet. 33 34 mark the casings of the helices, and 35 designates a spectacle-frame through which the casings pass and within which the magnet is longitudinally adjustable. The construction is that commonly used with electromagnets. Frame 35 has its opposite ends located in vertical grooves in plates 22 25 and is fixed in place by screws 36 37, let into the frame through slots in the plates. The slots are not shown, as the construction is of such well-known character. In case of necessity the poles of the magnet could obviously be fixed in a slightly raised or lowered position.

Fig. 2 best presents the shape of the magnetic pole-pieces 38 39, and in the face of each pole-piece are driven non-magnetic pins 40 to prevent actual contact between the plate-armature 41 and the pole-pieces. Pins 40 are interposed to prevent possible residual magnetism of cores and armature from maintain-

ing the contact of those parts after the circuit is broken.

By the means just described a prompt fall of the signal is always effected. Plate-armature 41 possesses a vertical slot 42, through which a screw 43 engages a threaded orifice in a rocking shaft 44. The plate-armature is therefore adjustable vertically. In practice I usually form one end of shaft 44 tapering or conical and support that end by a screw 45, passing through a threaded orifice in plate 25 and having a conical depression in its extremity. Adjusting-nut 46 and jam-nut 47, engaging screw 45 outside of plate 25, effect the longitudinal adjustment of screw and consequently of shaft 44, the remaining end of which passes through a smooth orifice in plate 22 and is therein movably supported. The position of the rocking shaft is chosen with the view of bringing the armature squarely and directly before the pole-pieces, thus requiring a minimum of adjustment. A sleeve 48 is securely and centrally fixed to plate 17 of lever 16, Fig. 2, and a set-screw 49 fastens the sleeve to shaft 44 outside of plate 22.

Some means being found essential to limit the swing of the semaphore, I have provided the device best shown in Fig. 4. A flat bar 50, having its ends bent perpendicularly, is fixed by screws 51 to plate 18 in an advantageous position. Each perpendicular end has a threaded orifice engaging one of screws 52 53, that are provided, respectively, with adjusting and jam nuts 54 55 and 56 57, by which the screws can be adjusted lengthwise, their inner ends acting as stops for the oscillative lever 16.

In the construction of the arms of the semaphore I employ stiff straight strips of metal 58, bent throughout their length in such manner as to present a right-angular cross-section (see Fig. 5) at any point. This special form affords a considerable increase in stiffness. Considering Fig. 2 it will be noticed that plate 17 is provided with two similar radial wedge-shaped extensions each marked 59, one of which is represented in section in Fig. 5. Two plates 60, (one shown in Fig. 5,) having the same size and form as extensions 59, to which they are adapted to be attached by bolts 61, complete the clamps whereby the inner ends of each couple of angle-strips 58 are securely but detachably held. Any other convenient devices may be adopted for securing the inner ends of strips 58, the means set out herein being preferred. At their point of widest separation the ends of the angle-strips are tied together by a flat cross-strip 62, having its ends riveted to them. (See Fig. 6.) In that figure is also shown the end of one of two slip-covers, each marked 63. (Represented also in Figs. 1 and 2.) Slip-covers 63 are made of any available material, usually

cloth of suitable texture and color, to fit the framework of the arms closely. The covers are drawn on over the small ends of the frames and constitute the visible body breadth of the semaphoric arms.

In Figs. 2 and 3 and enlarged detail view, Fig. 7, is represented the weight 64, which is movably fixed upon lever 16 and used to counteract the weight of the arms. Ordinarily the body of the weight consists of a hollow cylinder having a projecting shank 65, that possesses a transverse slot 66, through which lever 16 may be passed. A set-screw 67 of common construction fixes the weight at any point of the lever's length. Weight-cylinder 64 being hollow, as stated, may contain certain lesser weights. Gauze caps 68 68 close the ends of the cylinder, and it is my practice to place therein a quantity of fabric 69 of precisely the same character and equal in amount to that contained in the two slip-covers. This textile portion of the counterweight remains constantly in the cylinder, exposed, through the gauze caps, to the same degrees of humidity as the slip-covers and absorbing from the atmosphere and discharging by evaporation sensibly the same weight of water as the slip-covers. It is thus apparent that whatever may be the state of the weather the amount of current strength called for to move the signal remains practically unchanged and will never fail to perform the work expected from it by reason of the increased weight due to moisture absorbed by the considerable widths of exposed fabric forming the slip-covers.

As a conclusion to the foregoing description the mode of operation may be stated as follows: The operating circuit-wires are attached to binding-posts 70 71 beneath box-frame 8, and conductors 72 73 lead to and from the magnet. When the current is passing, the armature is attracted and the lower of the two arms raised above the adjacent edge of sector 6, and at night a white light shines from orifice 5. If by any means the circuit is broken, the cores are demagnetized and the arms fall to the danger position, the upper arm showing below the adjacent edge of sector 6, and at night a red light shines from orifice 5. Both rise and fall of lever 16 and the arms are limited by screws 52 53, as already explained. (See Fig. 4.) To make the signals visible day or night from both sides along the track would require no changes in the mechanism described. It would be merely necessary to provide a second glazed orifice opposite orifice 5, a second lens 15, attached to lever 16, and a suitably-constructed lantern supported between the lenses.

I reserve the right to modify the particular form and arrangement disclosed hereinabove.

What I claim, and desire to protect by Letters Patent, is—

1. In a semaphoric electric signal the combination of a support, with a signal-box hav-

ing a suitable sectoral opening, a frame supported within said box, an electromagnet adjustably borne by said frame, the helices of said magnet having proper terminals adapted to receive the ends of an electric circuit, a rocking shaft adjustably journaled in said frame, an armature adjustably attached to said rocking shaft and operatively presented to the poles of said magnet, semaphoric arms attached to said rocking shaft, adjustable means for limiting the oscillation of said arms whereby one arm alone is visible through said sectoral opening when said magnet is energized, and another arm alone visible through said sectoral opening when said magnet is demagnetized, substantially as described.

2. In a semaphoric electric signal the combination of a support, with a signal-box having suitable sectoral openings, oppositely located, through its front and rear sides, a frame supported within said box, an electromagnet adjustably borne by said frame, the helices of said magnet having proper terminals adapted to receive the ends of an electric circuit, a rocking shaft adjustably journaled in said frame, an armature adjustably attached to said rocking shaft and operatively presented to the poles of said magnet, semaphoric arms attached to said rocking shaft, adjustable means for limiting the oscillation of said arms whereby one arm alone is visible through said sectoral openings when said magnet is energized, and another arm alone visible through said sectoral openings when said magnet is demagnetized, substantially as described.

3. In a semaphoric electric signal the combination of a support, with a signal-box having a suitable orifice and sectoral opening, a frame supported within said box, an electromagnet adjustably borne by said frame, the helices of said magnet having proper terminals adapted to receive the ends of an electric circuit, a rocking shaft adjustably journaled in said frame, an armature adjustably attached to said rocking shaft and operatively presented to the poles of said magnet, a rod or bar attached to said rocking shaft and having a frame removably fixed at its outer extremity, a transparent disk or lens fixed in said frame, a suitably-supported lantern, semaphoric arms attached to said rocking shaft, adjustable means for limiting the oscillation of said rod and arms whereby one arm alone is visible through said sectoral opening when said magnet is energized, and another arm alone visible through said sectoral opening and said transparent disk brought immediately behind said orifice when said magnet is demagnetized, substantially as described.

4. In a semaphoric electric signal the combination of a support, with a signal-box having a suitable orifice and sectoral openings, oppositely located, through its front and rear sides, a frame supported within said box,

an electromagnet adjustably borne by said frame, the helices of said magnet having proper terminals adapted to receive the ends of an electric circuit, a rocking shaft adjustably journaled in said frame, an armature adjustably attached to said rocking shaft and operatively presented to the poles of said magnet, a rod or bar attached to said rocking shaft and having a frame removably fixed at its outer extremity, a transparent disk or lens fixed in said frame, a weight adjustably fixed upon said rod, a suitably-supported lantern, semaphoric arms attached to said rocking shaft, adjustable means for limiting the oscillation of said rod and arms whereby one arm alone is visible through said sectoral openings when said magnet is energized, and another arm alone visible through said sectoral openings and said transparent disk brought immediately behind said orifice when said magnet is demagnetized, substantially as described.

5. In a semaphoric electric signal the combination of a support, with a signal-box having a suitable orifice and sectoral openings, oppositely located, through its front and rear sides, a frame supported within said box, an electromagnet adjustably borne by said frame, the helices of said magnet having proper terminals adapted to receive the ends of an electric circuit, a rocking shaft journaled in said frame, an armature adjustably attached to said shaft and operatively presented to the poles of said magnet, non-magnetic devices interposed to prevent actual contact between said armature and poles, a rod or bar attached to said rocking shaft and having a frame removably fixed at its outer extremity, a transparent disk or lens fixed in said frame, a weight adjustably fixed upon said rod, a suitably-supported lantern, semaphoric arms attached to said rocking shaft, adjustable means for limiting the oscillation of said rod and arms, said magnet being constructed and arranged to raise the arms when the armature is attracted thereby permitting one arm alone to become visible through said sectoral openings, the arms falling when said magnet is demagnetized exposing another arm alone through said sectoral openings and placing said transparent disk immediately behind said orifice, substantially as described.

6. In a semaphore, a center or meeting plate, in combination with a rod or bar attached to said plate, arms consisting of triangular frames, means for attaching said frames at their apexes to said center plate, slip-covers of suitable shape and fabric adapted to be drawn over said frames, said slip-covers forming the bodies of said semaphoric arms, a weight consisting of a hollow body having gauze or perforated ends and a shank, and means for adjustably fixing said weight upon said rod or bar, said hollow body containing the same amount and kind of fab-

ric as that comprising said slip-covers, substantially as described.

7. In a semaphoric electric signal the combination of a support, with a signal-box having a suitable orifice and sectoral openings, a frame supported within said box, an electromagnet adjustably borne by said frame, the helices of said magnet having proper terminals adapted to receive the ends of an electric circuit, a rocking shaft adjustably journaled in said frame, an armature adjustably attached to said rocking shaft and operatively presented to the poles of said magnet, a center or meeting plate fixed upon said shaft, a rod or bar attached to said plate, said rod having a frame removably fixed at its outer extremity, a transparent disk or lens fixed in said frame, a suitably-supported lantern, arms consisting of triangular frames, means for attaching said frames at their apexes to said center plate, slip-covers of suitable shape, color and fabric adapted to be drawn over said frames, said slip-covers forming the bodies of the semaphoric arms, a weight consisting of a hollow body having gauze or perforated ends and a shank, means for adjustably fixing said weight upon said rod or bar, said hollow body containing material capable of absorbing moisture and discharging it by evaporation, adjustable means for limiting the oscillation of said rod and arms, said magnet being constructed and arranged to raise the arms when the armature is attracted thereby permitting one arm alone to become visible through said sectoral openings, the arms falling when said magnet is demagnetized exposing another arm alone through said sectoral openings and placing said transparent disk immediately behind said orifice, substantially as described.

8. In a semaphoric electric signal the combination of a support, with a signal-box having a suitable door, orifice and sectoral openings, a frame supported within said box, an electromagnet adjustably borne by said frame, the helices of said magnet having proper terminals adapted to receive the ends of an electric circuit, a rocking shaft adjustably journaled in said frame, an armature adjustably attached to said rocking shaft and operatively presented to the poles of said magnet, a center or meeting plate fixed upon said shaft, a rod or bar attached to said plate, said rod having a frame removably fixed at its outer extremity, a transparent disk or lens fixed in said frame, a suitably-supported lantern, arms consisting of triangular frames, means for attaching said frames at their apexes to said center plate, slip-covers of suitable shape, color, and fabric adapted to be drawn over said frames, said slip-covers forming the bodies of the semaphoric arms, a weight consisting of a hollow body having gauze or perforated ends and a shank, and means for adjustably fixing said weight upon

said rod or bar, said hollow body containing
the same amount and kind of fabric as that
comprising said slip-covers, adjustable means
for limiting the oscillation of said rod and
5 arms, said magnet being constructed and ar-
ranged to raise the arms when the armature
is attracted thereby permitting one arm alone
to become visible through said sectoral open-
ings, the arms falling when said magnet is
10 demagnetized exposing another arm alone

through said sectoral openings and placing
said transparent disk immediately behind
said orifice, substantially as described.

In testimony whereof I affix my signature
in presence of two witnesses.

ROBERT S. ROBERTS.

Witnesses:

HUGH V. KENNEY,
ROGER O. ROBERTS.