

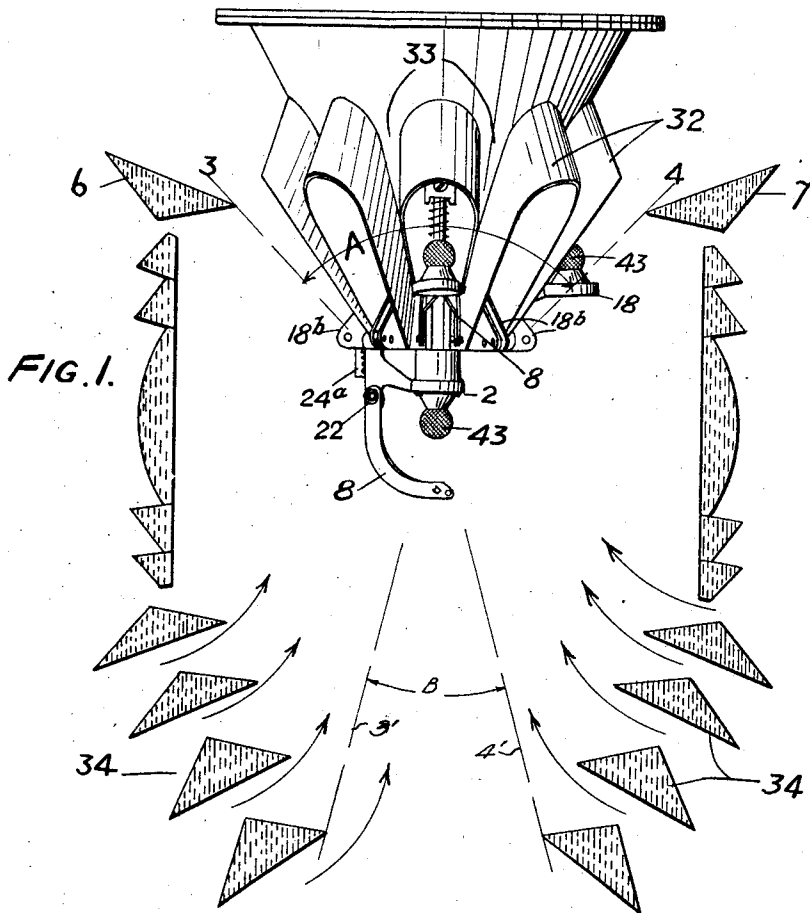
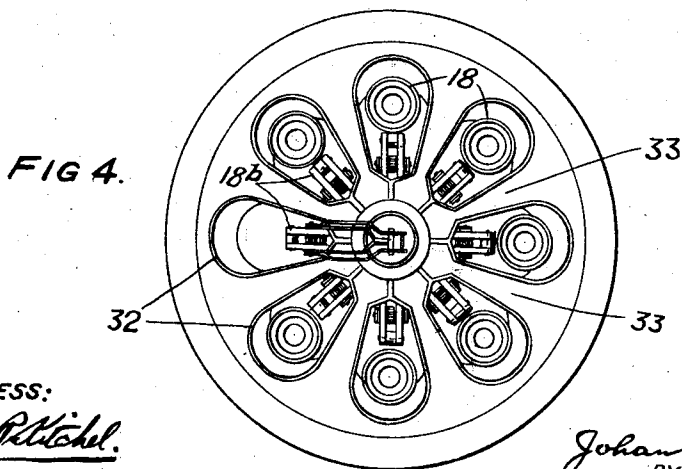
May 21, 1929.

J. H. F. SPIEGELBERG

1,713,985

GAS ILLUMINATED SIGNAL APPARATUS WITH AUTOMATIC MANTLE RENEWAL

Original Filed June 29, 1925 7 Sheets-Sheet 1



WITNESS:

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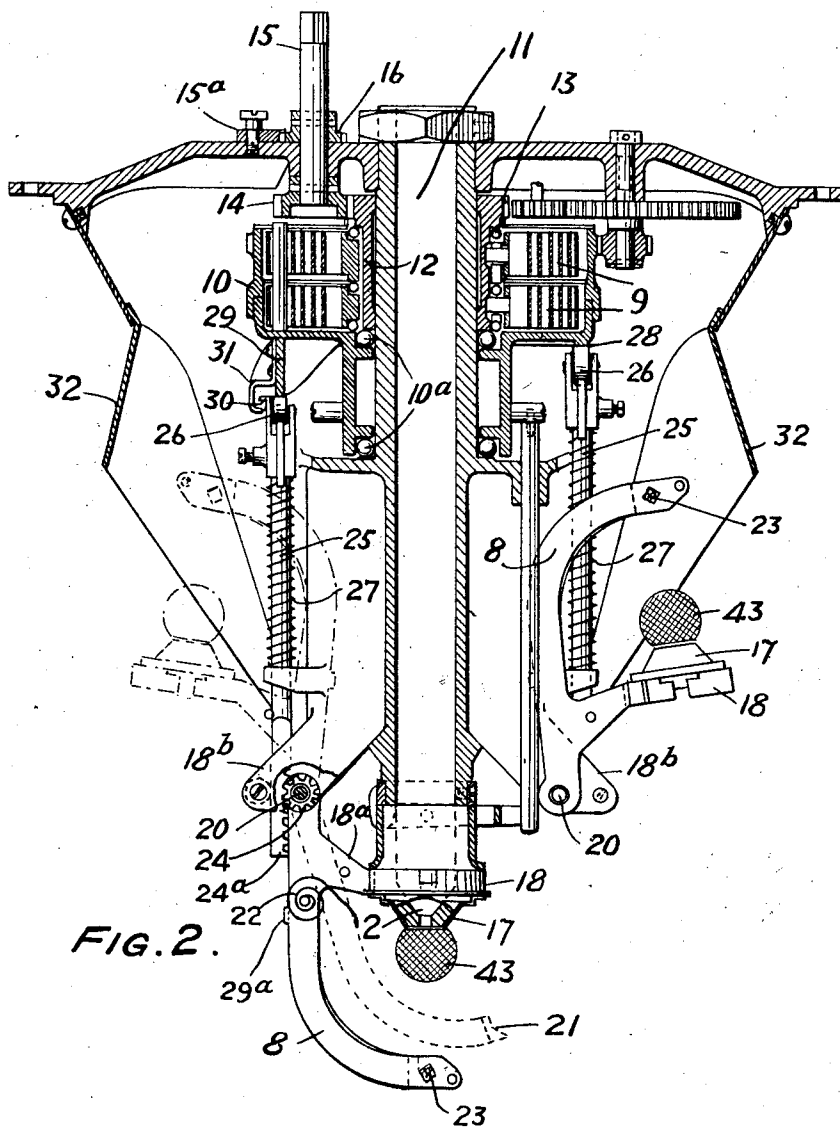
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1,713,985

GAS ILLUMINATED SIGNAL APPARATUS WITH AUTOMATIC MANTLE RENEWAL

Original Filed June 29, 1925 7 Sheets-Sheet 2



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GAS ILLUMINATED SIGNAL APPARATUS WITH AUTOMATIC MANTLE RENEWAL

Original Filed June 29, 1925 7 Sheets-Sheet 3

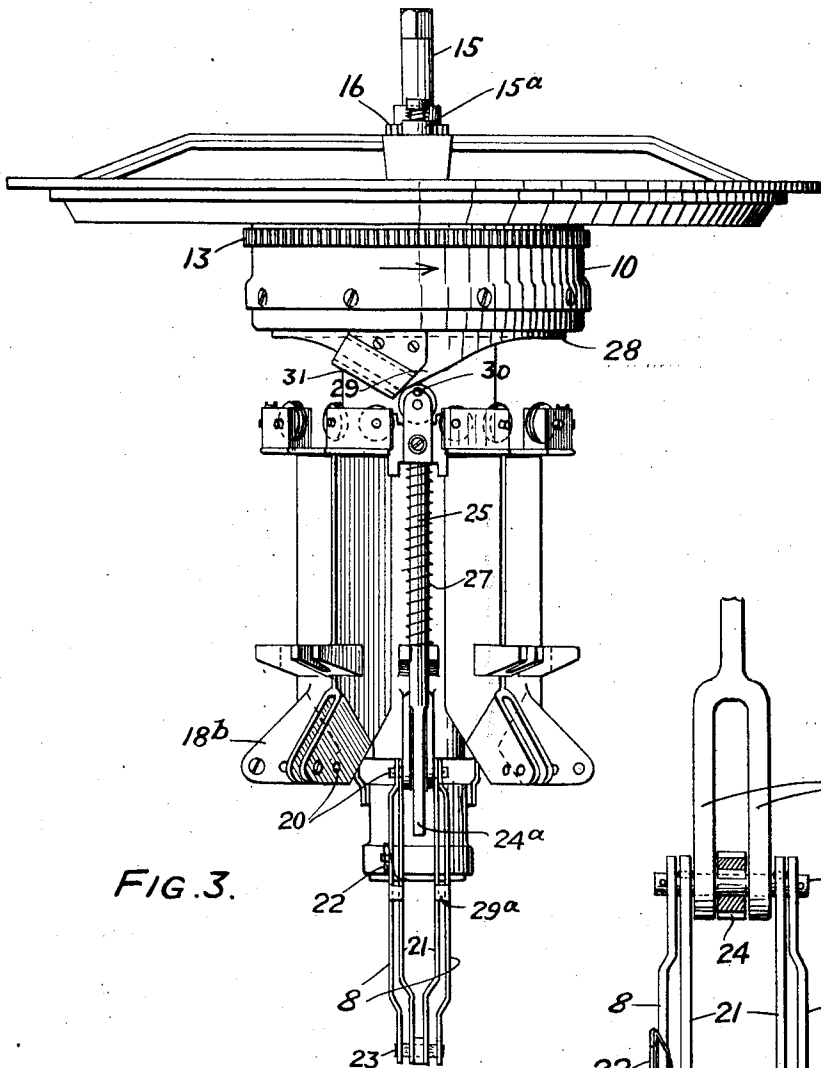


FIG. 3.

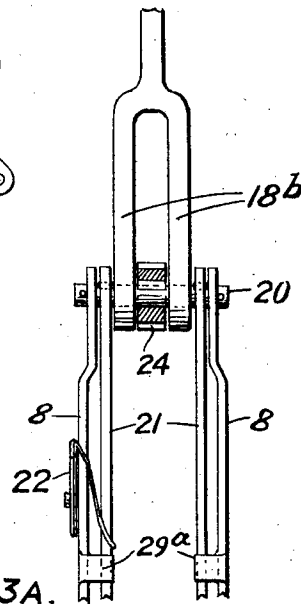


FIG. 3A.

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1,713,985

GAS ILLUMINATED SIGNAL APPARATUS WITH AUTOMATIC MANTLE RENEWAL

Original Filed June 29, 1925 7 Sheets-Sheet 4

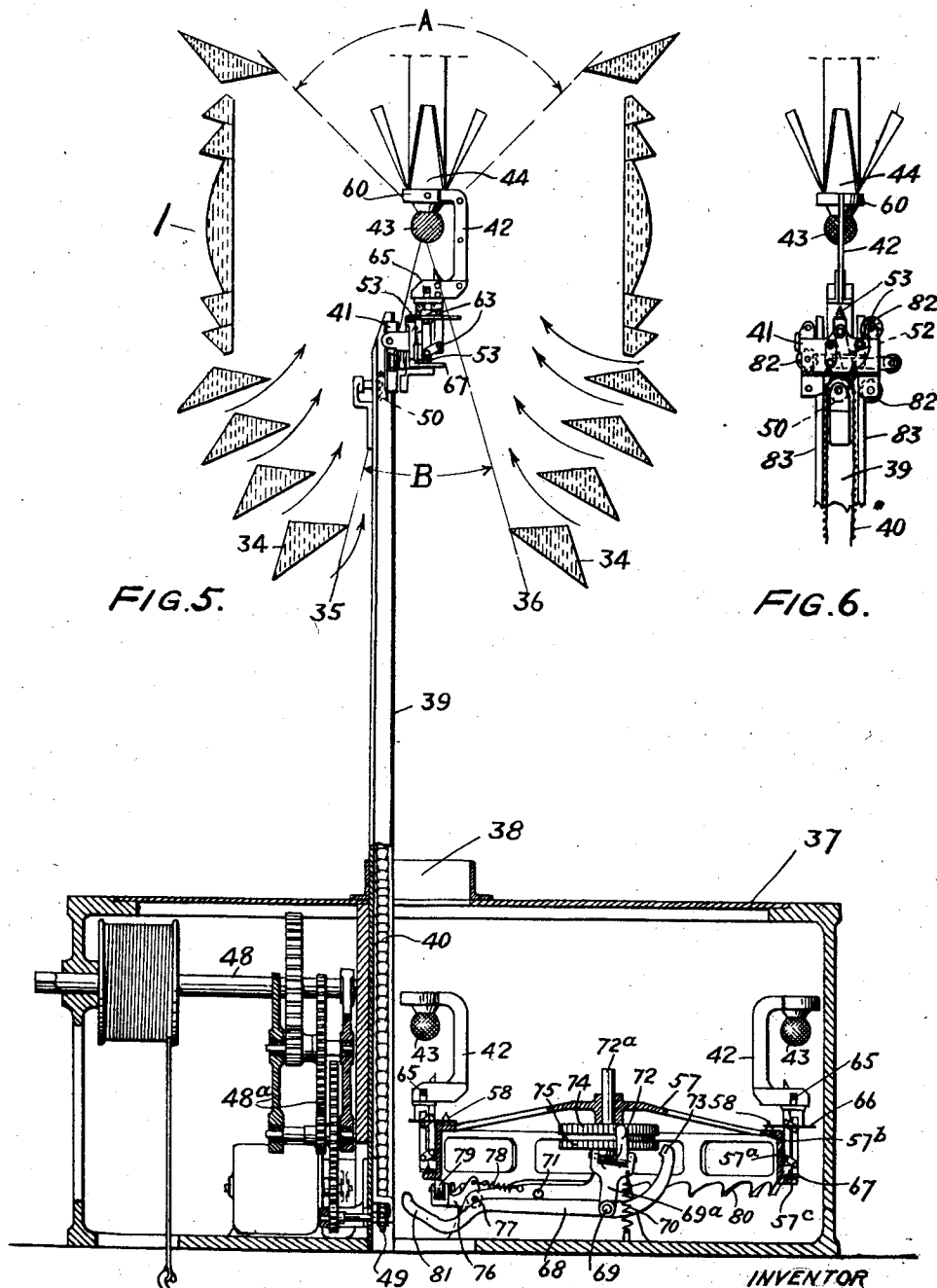


FIG. 5.

FIG. 6.

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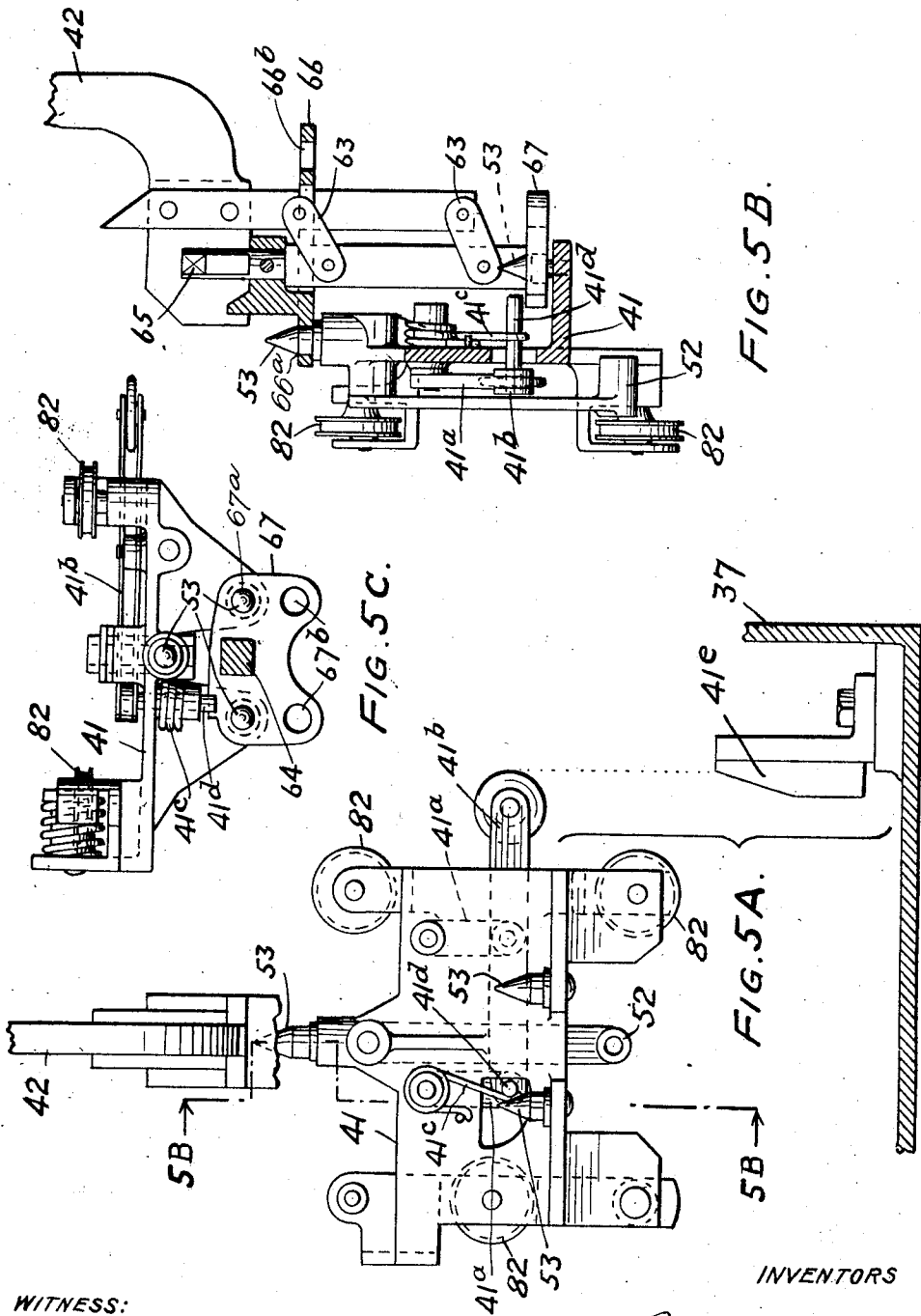
May 21, 1929.

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1,713,985

GAS ILLUMINATED SIGNAL APPARATUS WITH AUTOMATIC MANTLE RENEWAL

Original Filed June 29, 1925 7 Sheets-Sheet 5



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GAS ILLUMINATED SIGNAL APPARATUS WITH AUTOMATIC MANTLE RENEWAL

Original Filed June 29, 1925 7 Sheets-Sheet 6

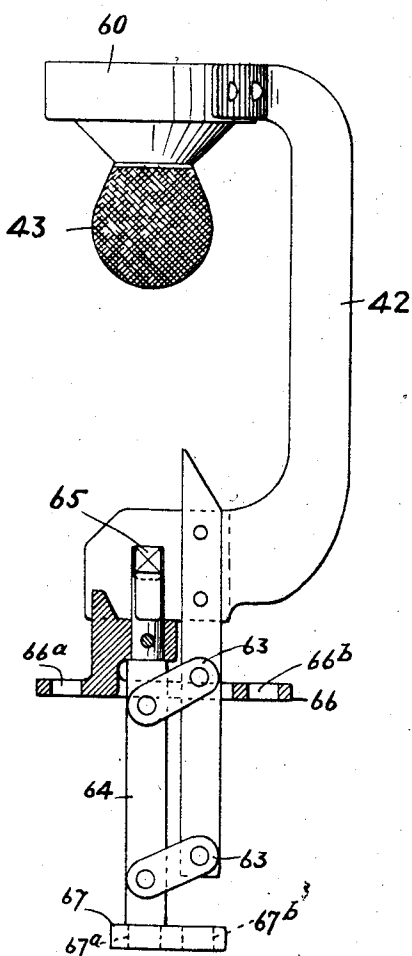


FIG. 6.A.

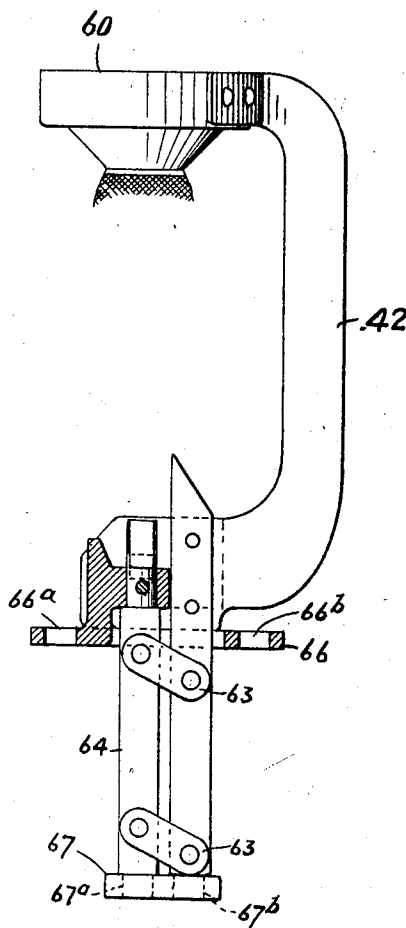


FIG. 6.B.

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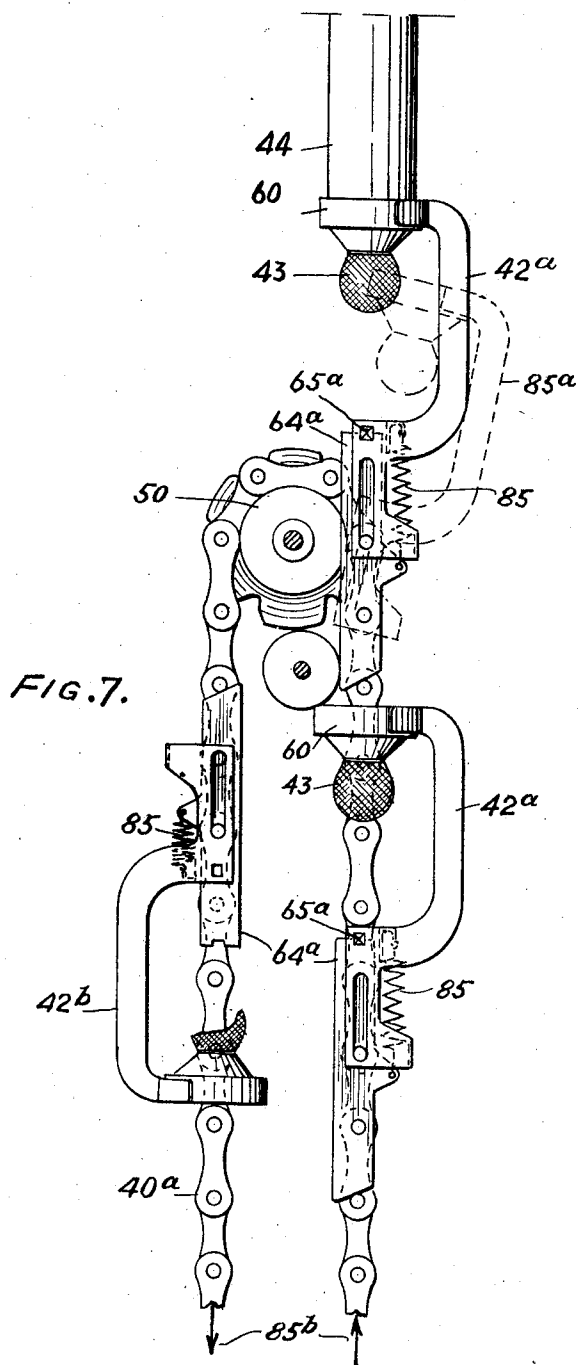
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GAS ILLUMINATED SIGNAL APPARATUS WITH AUTOMATIC MANTLE RENEWAL

Original Filed June 29, 1925 7 Sheets-Sheet 7



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UNITED STATES PATENT OFFICE.

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GAS-ILLUMINATED SIGNAL APPARATUS WITH AUTOMATIC MANTLE RENEWAL.

Application filed June 29, 1925, Serial No. 40,187, and in Sweden July 1, 1924. Renewed November 14, 1928.

In conjunction with lens or reflector apparatus or the like, for light signalling purposes gas incandescent light is now frequently employed; for instance, an acetylene gas burner with an incandescent mantle provides a suitable illuminant. With such apparatus, in order that the signal light may not be permanently extinguished when a mantle is damaged or falls to pieces, it is essential to provide means for automatically replacing a damaged mantle by a new one. For this purpose heretofore a construction has been used in which, through the influence of the narrow flame resulting from disruption of the incandescent mantle, a device has been released which would act automatically to cause a reserve mantle to take up the position previously occupied by the destroyed mantle. The practice has been and is to dispose a plurality of incandescent mantles on holders arranged to be brought in due order of succession into operative relation with respect to the burner. These mantle holders are situated near the burner, which in a lens signal apparatus is disposed in the interior of the lens system. The necessity for providing a sufficient number of reserve mantles to meet all emergencies has resulted in the number first used, usually four, being now, in some cases, increased up to as many as twenty-four. In the constructions as heretofore employed these mantle holders have intercepted part of the light emanating from the light source and have prevented it from traversing the lens system and while, in the case of four mantle holders, the amount of light intercepted was and is not sufficient to reduce the luminosity of the signal appreciably yet with an increased number of mantle holders the loss becomes serious.

The present invention has for its general object to provide a signal apparatus of the character above indicated in which the mantle holders, in any desired number, are supported in such manner and in such relation to the light source that the rays of light from said source are not prevented from traversing the lens system. For the attainment of its object the invention comprises the improved construction of mantle changing devices hereinafter described.

In the accompanying drawings:—

Fig. 1 is a view showing the lenses of the lens system in vertical section, and partially

showing in side elevation the mechanism for automatically substituting a new mantle for a destroyed mantle and also showing the relation of said mechanism to the light source and to the lens system;

Fig. 2 is a view in central vertical section of the mechanism shown in Fig. 1 including a gas supply pipe, a burner, a mantle upon the burner and means for exchanging a new mantle for a destroyed mantle upon the burner;

Fig. 3 is a view in side elevation looking from the left toward the right in Fig. 2, parts of the structure shown in Fig. 2 being omitted;

Fig. 3^A is a view partly in section and partly in side elevation showing more in detail the construction of a portion of the means for substituting a new mantle for a destroyed mantle, the parts shown being enlarged as compared with the previous figures of the drawings;

Fig. 4 is a bottom plan view of the mantle exchanging mechanism shown in Fig. 1;

Fig. 5 is a view partly in vertical section and partly in side elevation of a modified construction of apparatus embodying the invention which is adapted to operate automatically to exchange a new mantle for a destroyed mantle;

Fig. 5^A is a view in front elevation showing the carriage structure of Fig. 5 enlarged and also showing a portion of the mantle holder, the other portion of the said mantle holder being broken away;

Fig. 5^B is a vertical sectional view taken along the line 5B—5B of Fig. 5^A; and

Fig. 5^C is a top plan view of the carriage structure shown in Fig. 5^B and also showing a portion of the mantle holding or carrying means partially in plan and in cross-section;

Fig. 6 is a view in front elevation of the burner and mantle of Fig. 5 and the upper portion of the mantle exchange mechanism immediately associated with the burner, looking from the right toward the left in Fig. 5, a portion of the mantle holder being removed or broken away so as to show more clearly other portions of the exchange mechanism;

Fig. 6^A is a view partly in vertical section and partly in side elevation of the mantle holding structure, one part of said structure being in elevated position;

Fig. 6^B is a view similar to that shown in Fig. 6^A with the said part of the mantle holding structure in lowered position; and

Fig. 7 is a view in side elevation of a modified construction of the means shown in Figs. 5 and 6 for transporting the reserve incandescent mantles to the burner and exchanging the same for destroyed mantles.

In the different embodiments of the invention illustrated in the drawings the lens system is designated 1, the upper prisms 6 and 7, the lower prisms 34, and the incandescent mantles 43 in operative relation to the burners.

Referring now to Figs. 1 to 4 it will be noted that the rays of light which emanate from the incandescent mantle 43, in position upon the burner 2, strike the lens system and are refracted by it. The rays as refracted are in the usual form of a bundle of substantially parallel rays. The dash lines 3, 4 indicate the conical limitation of the uppermost rays of light which strike the uppermost prisms 6, 7 while the dash lines 3' and 4' indicate the conical limitation of the lowermost rays which strike the lowermost prisms 34 and it is evident that the rays from the mantle 43, which fall inside the angles A and B, are not refracted by the lens system.

According to the constructional form of the invention shown in Figs. 1 to 4, the holders 8 of the reserve mantles are disposed in the conical space defined by the angle A, so that only the holder 8 of the particular mantle 43, which happens to be in the operative position at the time can intercept light intended to be refracted by the lens system 1.

The mantle changing apparatus especially constructed for this purpose is illustrated more clearly and in greater detail in Figs. 2, 3, 3^A and 4.

The mantle changer is located at the top of the lens apparatus and is secured to the cover thereof (not shown). The gas supply pipe 11 and burner 2 at the lower end thereof occupy a central position in the device. As shown in Fig. 4, the mantle holders 8 are disposed radially in relation to the central gas supply pipe 11, the arrangement being such that the holders cause their reserve mantles to move in due order into operative position with respect to the burner, when a previously operative mantle breaks.

The motor device of the mantle changer consists of two band springs 9 with one end of each fastened to a casing 10 rotatably mounted on anti-friction bearings 10^a and with the other end of each fastened to a sleeve 12 rotatably mounted upon the stationary gas supply pipe 11. The rotatable sleeve 12 is provided with a gear wheel 13 which is in engagement or mesh with a smaller gear wheel 14. By means of a spindle 15 to the lower end of which the smaller gear wheel 14 is secured the springs 9 may be wound up, as in a

watch. The return or unwinding movement of the springs is prevented by the engagement of a spring-pressed pawl 15^a with a ratchet wheel 16 which permits rotation of said spindle 15 in a direction to place the springs 9 under tension, but prevents rotation in the opposite direction.

The mantles are mounted on conical rings 17 which are adapted to be detachably secured to rings 18 which are mounted upon arms 18^a of holders 8. The mantle holders 8 are pivotally or rotatably supported on shafts 20 rotatably mounted upon brackets 18^b projecting from the support of the mantle changer or changing mechanism. Levers 21 are rigidly or fixedly secured to the shafts 20. These levers are located inside of and are of substantially the same shape as the holders 8. The holders 8 and levers 21 are connected by spiral springs 22 which tend to cause pivotal movement of the said holders and levers relatively to each other in opposite directions about the axes of the shafts 20 to effect separation thereof. As long as the mantle 43 which is in use upon a burner is undamaged relative rotation or pivotal movement of the lever 21 and holder 8 for such mantle is prevented by a pin 23 upon the mantle holder 8 which engages the outer free end of the said lever 21. The pins for connecting the outer swinging ends of the levers 21 and mantle holders 8 are made of wood or other material adapted to be destroyed or severed by the influence of the narrow flame which occurs or which is formed upon the breaking of a mantle. Pinions or gear wheels 24 are also mounted upon and rigidly secured to the shafts 20 between the opposite sides of the upper end portions of the levers 21. The pinion 24, lever 21 and shaft 20 for each burner being rigidly secured or connected they move or rotate together as a single or integral unit. These pinions are in engagement with the lower toothed end portions 24^a of vertical rack bars 25 upon the upper ends of which rollers 26 are mounted. Springs 27 coiled about the bars 25 tend to cause upward movement thereof so that said rollers 26 are pressed against an annular track 28 upon the casing 10. Part of the said track is in the form of a cam 29 (see Fig. 3). The operation of the apparatus as shown in Figs. 1 to 4 of the drawings may be described as follows:

When a mantle which is in use upon a burner breaks the said burner emits a narrow flame which strikes the wooden pin 23 and causes the same to ignite and burn severing the connection between the lever 21 and the holder 8 of that particular mantle 43 so that the said lever 21 and the holder associated therewith are freed from each other and can be moved relatively to each other under the influence of the coiled spring 22. Upon such occurrence the lever 21 assumes substantially the position indicated in dotted lines

in Fig. 2 of the drawings. Movement into such position is occasioned by the downward movement of the rack bar 25 associated with such lever under the influence of the cam 29 5 actuated by the springs 9. It will be understood that the power or strength of such springs is sufficient to overcome the spring 27 associated with such rack bar and tending to hold the same in elevated position. So long 10 as the mantle upon a burner remains undamaged the rack bar 25 associated with the holder for such mantle occupies a position such that the roller 26 abuts against the cam 29 a little in advance of its peak which prevents 15 the casing 10 from rotating. When the pin 23 is severed by the flame produced upon the breaking or disintegration of a mantle 43 allowing the gear 24 and lever 21 rigidly secured thereto to rotate relatively to the mantle holder 8 the rack bar 25 is permitted to 20 move downward under the influence of the springs 9 so that the casing 10 is released and begins to rotate under the influence of said springs. After the peak of the cam 29 has 25 passed the roller 26 the rack bar 25 is caused to move upwardly by the spring 27 and by reason of the engagement of the rack bar with the pinion or gear wheel 24 causes movement of the lever 21 in a direction away from the 30 burner 2 into an upwardly extending position out of the paths of the rays of light which pass through the system of lenses and prisms. In its backward movement the opposite sides of the lever 21 engage with projections 29^a 35 which extend inwardly from the opposite sides of the mantle carrier 8 and cause movement of the latter backward therewith away from the burner 2. The roller 26 is held pressed against the cam 29 by the spring 27 40 and the upward movement of the rack bar 25 is further positively insured by the entry of a pin 30 thereon into a channel-shaped upwardly inclined guide 31 fixed to the cam 29. The casing 10 continues to rotate so that the 45 cam 29 is moved into contact with the roller of the next adjacent mantle holder 8 whereby the rack bar 25 associated with said holder is caused to descend. By reason of the connection between the said rack bar and the 50 lever 21, and between the latter and the mantle holder associated therewith as heretofore described such descending movement causes pivotal descending and inward movement of the said lever and the holder 8 which 55 movement continues until the conical ring 17 contacts with the burner 2. This proceeding is repeated in due and consecutive order, until all the mantles have been put into use and destroyed.

The reserve mantles 43 are surrounded respectively by hoods or shades 32, so arranged 60 relatively to each other that a passage 33 is left between each adjacent pair of hoods. These passages 33 serve to lead off the gases of combustion from the burner, while the said 65 hoods 32 protect the reserve or spare mantles and prevent contact of the said gases therewith. The currents through these passages induce into the lens system from the exterior thereof currents of cold air which enter 70 through the spaces between the lower prisms 34 of the lens apparatus (as indicated by arrows in Fig. 1). Thus an effective cooling of the combustion gases and thereby a further protection of the incandescent bodies 43 is 75 obtained. Said hoods 32 also serve as a protection against dust and insects.

In the construction shown in Figs. 5 to 6^b the spare or reserve mantles and the mechanism by which they are successively brought 80 into play are located beneath the lens system 1 and are therefore entirely out of the way of the rays of light from the active mantle. The mantle holders and the supporting members therefor are disposed underneath the 85 burner and wholly or mainly within the angle B between the dash lines 35 and 36 which indicate the conical limitation of the rays which proceed downward from the burner to be refracted by the lowest prisms 34 in the lens 90 system. Thus in the device shown in Figs. 5 and 6 as in the device shown in Figs. 1, 2, 3 and 4, the holders for the spare or reserve mantles do not intercept such rays of light 95 from the burner, as are intended to be refracted by the lens system, whereby the object of the invention is attained.

The construction of apparatus for exchanging the mantles as shown in Figs. 5 to 6^b will now be described. 100

The mantle changing apparatus is inclosed in a casing 37 under the lens apparatus, which casing is closed with the exception of an opening 38 which constitutes a passage for an upright standard 39 which carries an endless 105 chain 40 and a carriage 41, which transports the mantle holders 42 and the reserve mantles 43 in due order up to the burner 44, whenever a mantle is broken. The driving device for the said chain 40 consists of a weight 47^a or 110 other suitable means which acts on a shaft 48 to rotate the same. Transmission gearing 48^a connects the said shaft with the lower of two sprocket wheels 49 and 50 upon which the said chain is supported. Upon rotation 115 of the shaft 48 the transmission gearing 48^a is actuated and causes rotation of the wheel 49 to cause movement of the sprocket 40. The two chain wheels 49 and 50 are both supported on the standard 39. 120

The chain 40 is coupled to the carriage 41 by means of a link 52, the lower end of which is pivoted to a chain link and the upper end of which is pivotally connected to the carriage. In order to give the carriage a truly 125 rectilinear movement it is provided with wheels 82 which contact with and travel upon guides 83 upon the standard 39.

The carriage 41 is provided with three projections 53 which are adapted to engage holes 130

correspondingly located in the mantle holder whereby the latter is adapted to be transported or carried to and from a burner. The mantle holder is adapted to be locked to the

5 said carriage in order to prevent the holder from being released before the said locking device is released.

The locking means is illustrated more clearly in Figs. 5^A, 5^B and 5^C in which the

10 carriage mechanism including the locking means is illustrated, on a larger scale. The locking means comprises a bar 41^b which is supported upon the depending swinging links 41^a which are suspended in parallel relation

15 to each other. The bar 41^b is held in the position shown in the drawing by means of a spring 41^c in which position a locking bolt or pin 41^d on one of the links projects forwardly over a foot piece or platform 67 of the mantle

20 holder which will be hereinafter referred to in detail.

The mantle holders are supported in adjacent relation to each other in a circle upon a rotatable table or support 57. This table is

25 provided upon its outer edge with a rim-like portion 57^a. Said rim-like portion is provided upon its upper edge with an inwardly extending flange 57^b and upon its lower edge with an outwardly extending flange 57^c.

30 Each of these flanges is provided with projections 58 circularly arranged and so placed or related that two projections on the lower flange 57^c and one projection on the upper flange 57^b are adapted to engage the holders

35 42 or parts carried by said holders as will be hereinafter described. The positions of the projections 58 correspond to the positions of the projections 53 of the carriage 41.

Each of the holders 42 comprises a portion

40 which is of bow-shape formation. Such bow-shaped portion is provided at its top with a ring 60 which is adapted to carry a mantle 43. Each of the said bow-shaped portions is coupled or connected to a standard 64

45 by means of links 63 and is held or retained in elevated or raised position with respect to such standard by means of a pin 65 of wood or other material which is adapted to be destroyed or severed by the action thereon of

50 the narrow flame which is emitted or which occurs on the breaking or disintegration of a mantle 43. The standard 64 is provided near its upper end with a transversely extending plate or table 66 provided with holes 66^a and

55 66^b with which the upper pins or projections 53 upon the carriage 41 and the pins or projections 58 upon the flange 57^b respectively are adapted to engage. The said standard 64 is also provided near its lower end with a

60 transversely extending plate or platform 67 provided with holes 67^a and 67^b with which the lower pins 53 upon the carriage 41 and the pins 58 upon the lower flange 57^c respectively are adapted to engage.

65 It is by means of the engagement of these

pins 53 and 58 with the openings as described that the holders 42 are supported upon the carriage 41 and upon the turn table 57 respectively.

When a holder 42 is provided with a new

70 mantle and is ready to be put into use and during the period or time in which it is in use the bow-shaped portion of the holder structure is held in elevated position with respect to the standard 64 by means of a pin

75 65 as already described. The position of the sprocket or chain wheel 50 supported at or near the upper end of the standard 39 is such that the distance between the conveyer chain, as it passes over the said wheel, and the burner

80 44 is less than the height of the ring 60 above such link, consequently when a holder provided with a new or reserve mantle is mounted upon the carriage 41 the ring 60 strikes

85 the burner 44 and prevents the passage of the link to which the carriage is connected over the sprocket wheel until the bow-shaped portion of the mantle holder shall have been released by the destruction of the pin 65.

90 This occurs upon the breaking or disintegration of a mantle 43. Upon the destruction or severing of a pin 65 the bow-shaped mantle holder 42, under the influence of gravity, descends so as to permit the holder to pass underneath the burner and thereby permit the

95 weight 47^a to effect movement of the chain 40 to return the holder carrying the destroyed mantle to the turn table 57. In order to release the foot piece 67 from the locking bolt 41^d to permit the mantle holder to be de-

100 posited upon the turn table 57 I have provided a member 41^e, having an inclined or cam surface as shown in Fig. 5^A, which projects upwardly from the bottom of the casing 37.

105 When the carriage 41 in its movement downwardly is near its lowest position the outer end of the bar 41^b engages the inclined or cam surface upon the member 41^e which causes movement of the said bar in a direction away from the said member to cause the locking

110 bolt or pin 41^d to release the platform or foot piece 67. The said platform or foot piece having been released the mantle holder is then free to be deposited upon the turn table 57. After such holder is deposited upon the

115 turn table the chain continues its movement and mechanism is actuated to cause the movement of the turn table or rotatable support 57 to carry a new or reserve mantle holder and mantle into position to be engaged by the pins

120 53 upon the carriage 41. The carriage is then conveyed upwardly until the ring 60 of such new mantle holder contacts with the burner 44. The chain and the carriage are held in this position by the burner until the

125 new mantle is broken or disintegrates whereupon the pin 65 is destroyed or severed and the operation is repeated.

For the purpose of effecting operation of the turn table or rotatable supporting mem-

130

ber 57 the lower sprocket wheel 49 is located at a point below the said turn table so that after the holder which carries the broken mantle is deposited upon the projections 58 upon the flanges 57^b and 57^c the carriage continues its downward movement upon the chain and contacts with mechanism to effect rotation of the said turn table 57 to carry a new holder into position.

Upon its further downward movement the carriage contacts with the outer free end of an arm 68 pivoted at 69 and causes pivotal movement thereof about said pivot. The said arm is provided with a rigid upwardly extending projection or member 69^a which in turn is provided upon its upper end with a spring pressed pawl 72 which is adapted to engage a ratchet wheel 74 having connection with the turn table 57 which latter is rotatably mounted upon a vertical shaft 72^a. The lever 68 is held in position against a pin 71, with its outer free end 81 lifted, by means of a coiled spring 70 having connection at its upper end with the upper portion of the projecting member 69^a previously referred to. The lever 68 is pivoted on the pivot 69 at a point intermediate its ends and the rear or inner end portion of said lever extends upwardly and terminates in a portion 73 which is adapted to engage the ratchet wheel 75 having rigid connection with the ratchet wheel 74. The engagement of the end portion 73 of the lever 68 with the ratchet wheel 75 limits or stops the rotation of the ratchet wheel 74 so as to prevent the table 57 from moving beyond the distance necessary to transfer or transport a new holder 42 into position to be engaged by the projections 53 upon the carriage 41 as the latter is carried upwardly upon the chain 40.

It will be understood that the teeth of the ratchet wheel 75 are inclined in a direction opposite to that of the teeth in the wheel 74 and also that the end 73 of the lever 68 engages the ratchet wheel 75 when the outer end portion of said lever has been pressed down by the carriage 41 to its fullest extent.

A locking arm 76 is pivoted at 77 and by means of a spring 78 is held in position such that a roller 79 upon the outer end thereof is adapted to engage the notch or gap between any two teeth 80 arranged in a circle at the lower edge of the rim-like portion 57^a of the turn table or rotatable support 57.

When the carriage 41 has deposited a holder 42 with the destroyed mantle thereon upon the turn table or rotatable support 57 it strikes the free end 81 of the ratchet lever 68 and presses it downwardly, as already stated, so that the spring pressed pawl 72 which is in engagement with the ratchet wheel 74 rotates the latter one tooth forward. The ratchet wheel 75 and the turn table 57 are rotated therewith in a clockwise direction looking from above. By the movement

of the turn table with its teeth 80, formed like saw teeth as stated, the roller 79 is pressed downward so that the spring 78 is stretched and placed under tension. The distance through which the ratchet 74 is rotated by the pawl 72 at each actuation of the latter is sufficient to cause the inclined portion of a tooth 80 to travel over the roller 79 and depress the same. Immediately the peak or point of a tooth 80 has passed over the roller 79 the latter under the influence of the spring 78 is snapped or moved quickly into the next notch or gap. By this means the turn table 57 is stopped or located in such position that a new holder is positioned directly above the carriage 41 which has been carried downwardly by the chain 39 as previously described. As the carriage ascends upon the chain 39 the projections 53 thereon previously referred to engage the holes 66^a and 67^a provided in the plates 66 and 67 previously referred to.

In the construction as shown in Fig. 7 a chain 40^a is employed similar to the chain shown in Figs. 5 and 6. The said chain 40^a is supported upon the sprocket wheels identical with the sprocket wheels 49 and 50 shown in Figs. 5 and 6, only the sprocket wheel 50 being shown.

The mantle holders 42^a of this construction with their mantles 43 are secured upon the chain 40^a at equal intervals or distances apart.

The holders 42^a are coupled by means of pin and slot connections with standards 64^a. By means of pins 65^a of wood or other suitable material adapted to be destroyed or severed by the action of a narrow flame thereon the holders are adapted to be held in elevated or extended position with respect to the standards 64^a. Springs 85 tend to cause movement of the holders 42^a from their elevated position (in which they are held by the pins 65^a) into collapsed position as indicated by the dotted lines at 85^a. This occurs when a pin 65^a has been destroyed or severed. After such occurrence the chain 40^a can then continue its movement in the direction of the arrows at 85^b so that the collapsed holders are carried into position as indicated at 42^b. As a collapsed holder is carried forward to the position 42^b the next holder 42^a is carried into position as shown in full lines in said Fig. 7 so that the mantle is brought into operative relation to the burner 44.

It will be seen that by my invention I have provided means whereby reserve mantles and mantle holders may be supported in such position that they do not interfere with the passage of the light rays from the light source to the lens system and also have provided means whereby the reserve mantle holders may be transported into position to place or position the reserve mantles in operative relation to the burners of the signaling mechanism.

It will also be understood that my invention is susceptible of embodiment in other forms of construction than those illustrated in the drawings and that the broad idea or conception of my invention is to provide means whereby the reserve holders with reserve mantles mounted thereon may be supported in positions such that they will not interfere with the passage of the rays of light from the light source to the lens system, and also to provide means whereby reserve holders with new mantles thereon may be transported into position as needed to place such new mantles in operative relation to the burners of the apparatus.

In the several forms of construction the lenses and the prisms employed may be regarded as constituting the optical system of the apparatus.

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

1. In light signaling means of the character described, the combination of an optical system, a burner located interiorly of the said system, a plurality of holders for incandescent mantles, a plurality of levers respectively associated with the said holders, pivots upon which one end of each of said holders and levers is mounted, the said pivots being mounted upon stationary supports, means for securing the outer free ends of the said holders and levers together, means tending to cause the said respective holders and levers to move in opposite directions to effect separation thereof, means operating to hold one of the said holders and the lever associated therewith in position such that the mantle carried upon the said holder is held in operative relation to the said burner, means operating to hold the remaining holders and the mantles carried thereby out of operative relation to the said burner and out of the paths of the rays of light which emanate from the incandescent mantle associated with the said burner and which pass through the optical system, and means operating upon the rupturing of the mantle associated with the said burner to cause pivotal movement of the holder for said burner into inoperative position and for simultaneously causing movement of one of the other holders to effect transfer of a new mantle into operative relation to the said burner.

2. In light signaling means of the character described, the combination of a burner, pivotal holders for supporting mantles which are adapted to become incandescent upon the application of the flame of said burner thereto, pivots upon which one end of each of said holders is mounted, which pivots are mounted upon stationary supports, levers mounted upon said pivots, which levers and holders are movable relatively to each other, means tending to cause separation of the said holders

and levers, means for uniting the outer swinging ends of said holders and levers, which means is adapted to be severed by the application of heat thereto, means for effecting pivotal movement of the respective holders and levers to transfer the mantles carried thereby into and out of operative relation to the said burner, the said means upon the puncturing of a mantle associated with the said burner and upon the severing of the said holder and lever together acting to cause pivotal movement of the said holder and lever to transfer the punctured mantle into inoperative position with respect to the burner and to simultaneously transfer the holder of a new mantle and the lever associated therewith into position to support the said new mantle in operative relation to the said burner.

3. In light signaling means of the character described, the combination of a gas supply pipe terminating in a burner and being provided near said burner with outwardly extending projections provided with pivots, a revoluble member mounted upon said pipe a distance from the said projections, said member being provided with a cam, means tending to cause revolution of said member in one direction, mantle holders mounted upon the said pivots, levers also mounted upon said pivots, one lever being associated with each mantle holder, means for securing the outer swinging ends of said holders and levers together, said means being severable by the application of the flame of said burner thereto, means tending to cause relative pivotal movement between the holders and levers mounted upon the respective pivots, which means becomes operative upon the severing of the said severable means, gears mounted upon the said pivots, rack bars supported upon the said pipe in substantial parallel relation thereto, the racks of said bars being in engagement with the said gears, yielding means operating to hold the said rack bars in their uppermost position, the upper ends of said bars being adapted to contact with the said cam, rotation of the said cam being prevented by contact therewith of the upper end of the rack bar which is in engagement with the gear mounted upon the pivot of the holder of the mantle which is in operative relation to the said burner, the said bar being adapted to yield upon severing of the connection between the said holder and its associated lever to permit revolution of the said revoluble member to effect transfer of the mantle previously associated with the said burner into inoperative position and the simultaneous transfer of a new mantle into operative relation to the said burner.

4. In light signaling means of the character described, the combination of a gas supply pipe terminating in a burner, said pipe

being provided with projections upon which pivots are mounted, said pivots being mounted about the axis of the said pipe near the burner end thereof, a revoluble member mounted upon the said pipe, means tending to cause revolution of said member in one direction, incandescent mantle holders mounted upon said pivots, gears mounted upon said pivots, means whereby upon rotation of said gears pivotal movement of the said holders is effected, rack bars supported in parallel relation to the said pipe, the rack portions of the said bars being in engagement with the said gears, and a cam upon said revoluble member, which cam is adapted to contact with the upper ends of the said rack bars and effect movement thereof to cause pivotal movement of the said holders to carry the said mantles into and out of operative relation with respect to the said burner.

5. In light signaling means of the character described, the combination of a burner, a lever pivoted at one end and provided with a mantle at its outer free end which mantle is adapted to be applied to said burner, a rotatable cam member, a slidably supported bar having one end in contact with said cam member whereby rotation of the latter is adapted to cause longitudinal movements of said bar, and means interposed between said bar and said lever whereby movement of said bar in one direction causes movement of said lever toward said burner to apply the said mantle thereto and in the opposite direction causes movement of said lever away from said burner.

6. In light signaling means of the character described, the combination of a burner, a lever pivoted at one end and provided with a mantle at its outer free end which mantle is adapted to be applied to said burner, a gear having operative connection with said lever, a slidably supported bar having rack teeth at its lower end portion which are in engagement with the said gear and the opposite end of which bar is in contact with the said cam member whereby rotation of the latter is adapted to cause longitudinal movements of said rack bar to effect oscillatory movements of the said gears to cause movements of the said lever toward and from the said burner.

7. In light signaling means of the character described, the combination of a burner, a plurality of pivots mounted upon stationary supports at points in a circle surrounding the axis of the burner, levers each of which is pivoted at one end to one of said pivots, gears mounted on said pivots and having operative connection with the said levers, a rotatable cam member, slidably supported bars having rack portions the teeth of which are in engagement respectively with the said gears, yielding means associated with each of said bars for holding one end thereof against the said cam member whereby rotation of the lat-

ter operates to cause oscillatory movements of the said gears to cause movements of the said lever toward and from said burner.

8. In light signaling means of the character described, the combination of a burner, a plurality of pivots mounted in stationary supports located at points in a circle surrounding and concentric with the axis of the said burner, levers pivotally supported upon said pivots, the said levers respectively supporting at their outer free ends mantles which are adapted to be applied to the said burner, slidably supported bars, yielding means for holding one end of each of said bars against said cam member whereby upon rotation of said cam member the said bars are caused to move longitudinally, and means interposed between the said bars and the pivotally supported ends of the respective levers whereby upon movement of the said bars longitudinal pivotal movement of the said levers is effected to cause swinging movement of the outer free ends thereof toward and from the said burner.

9. In light signaling means of the character described, the combination of an optical system with incandescent mantles one of which mantles is adapted to be active and the others of which are in reserve, means adapted to exchange a reserve mantle for an active mantle when the latter becomes broken, and means for supporting the reserve mantles and their holders substantially outside of the paths of those rays radiating from the light source which are destined to impinge upon the optical system of the apparatus.

10. In light signaling means of the character described, the combination of an optical system with a burner located interiorly of the said system, a plurality of incandescent mantles, means for holding one of said mantles in co-operative relation with respect to said burner, means for holding the remainder of said mantles in reserve and in positions outside the paths of the light rays emanating from the light source in a direction to impinge upon the optical system, and means for substituting a reserve mantle for the mantle co-operating with the said burner when the latter becomes broken.

11. In light signaling means of the character described, the combination of an optical system, a stationary burner located interiorly of the system, a plurality of mantles, means for movably supporting the said mantles, the said supporting means and the said mantles being located in positions outside the paths of those rays of light emanating from the light source which radiate in a direction to impinge upon the said optical system, means for moving one of said mantles into and holding the same in operative relation with respect to the said burner, and means operating upon the rupturing of a mantle which is located in operative relation to said

burner to transfer it into position out of such operative relation and out of the paths of the rays of light which radiate in directions to impinge upon the said optical system and for transferring the next adjoining mantle into operative relation to the said burner.

12. In light signaling means of the character described the combination of an optical system, a burner located interiorly of the said system, a plurality of mantles which are adapted to become incandescent when heated by the flame of said burner, pivoted arms to which the said mantles are directly connected and by which they are supported, stationary supports for said arms, and means for effecting pivotal movements of said arms to transfer the mantles carried by the respective arms into and out of operative position with respect to the said burner.

13. In light signaling means of the character described, the combination of a burner, arms to which incandescent mantles are adapted to be directly connected and by which said mantles are supported, pivots to which one end of each of said arms is connected, said pivots being located in a circle around the axis of said burner, stationary supports for the said pivots, and means which operates upon the puncturing of a mantle which is supported in co-operative relation to the said burner to effect pivotal movement of the arm supporting said mantle to transfer the latter away from the said burner and to effect pivotal movement of another arm to transfer the mantle mounted thereon into operative relation to the said burner.

14. In light signaling means, the combination of a burner, optical lens apparatus surrounding said burner and being open at its upper and lower ends, the rays of light which radiate from the flame of said burner in directions toward the upper and lower ends of the said apparatus and which are tangent to the inner edges of the apparatus surrounding the openings at its upper and lower ends defining conical spaces, the rays of light from the flame of said burner between the said conical spaces impinging upon the lenses of said apparatus, a plurality of mantles for the said burner one of which is active and the

others of which are held in reserve, means for supporting the said mantles, the said supporting means and the said reserve mantles being located within one of the said conical spaces, and means for substituting a reserve mantle for an active mantle in the event that the latter becomes broken.

15. In light signaling means, the combination of a burner, optical apparatus surrounding the said burner, the rays of light which radiate from the said burner and are directed toward the extreme upper and lower portions of the said apparatus defining a pair of angles, a plurality of mantles for the said burner one of which is active and the others of which are held in reserve, means for supporting said mantles, means for substituting a reserve mantle for the active mantle in the event that the latter is broken, the said means and reserve mantles being located normally within the region defined by one of the said angles.

16. In light signaling means of the character described, the combination of a burner, optical lens apparatus surrounding the said burner and being open at its upper and lower ends, the rays of light which radiate from the said burner toward the upper and lower portions of the said apparatus and which are tangent to the inner edges of the apparatus surrounding the openings at the upper and lower ends thereof defining upper and lower conical spaces the light rays radiating from the said burner which are located between the said conical spaces impinging upon the lenses of said optical apparatus, a plurality of mantles for the said burner one of which is active and the others of which are held in reserve, pivoted levers and supports therefor for supporting the said mantles, the said supports, the reserve mantles and the pivoted levers upon which the latter are mounted being located in one of the said conical spaces whereby the rays of light which radiate from the said burner in directions to impinge upon the said optical apparatus are permitted to impinge upon the same.

In testimony that I claim the foregoing as my invention, I have hereunto signed my name this 9th day of June, A. D. 1925.

JOHAN HILMER FRITIOF SPIEGELBERG.