

(No Model.)

2 Sheets—Sheet 1.

R. M. HUNTER.
ELECTRIC SEARCH LIGHT.

No. 503,602.

Patented Aug. 22, 1893.

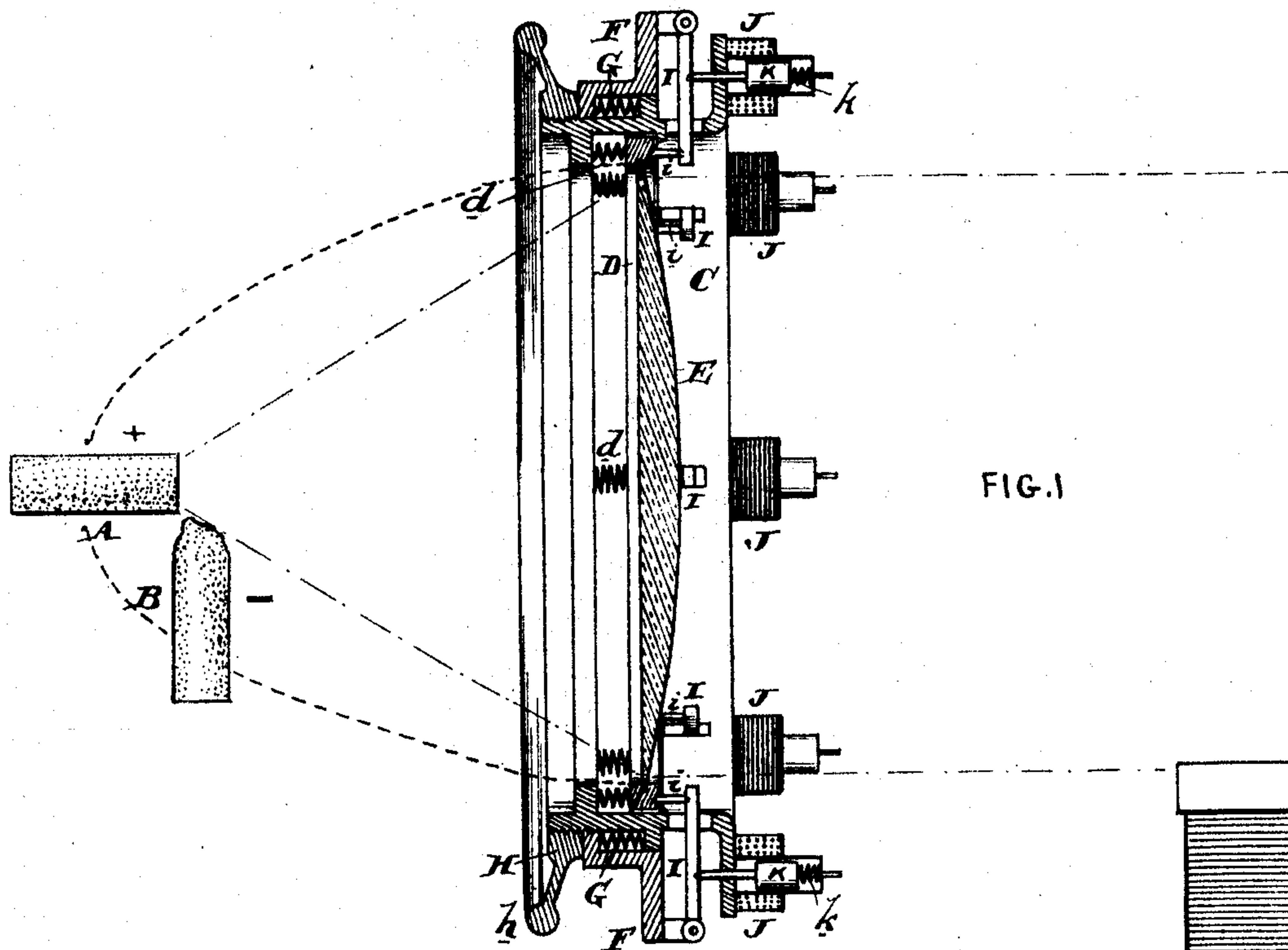


FIG. 1

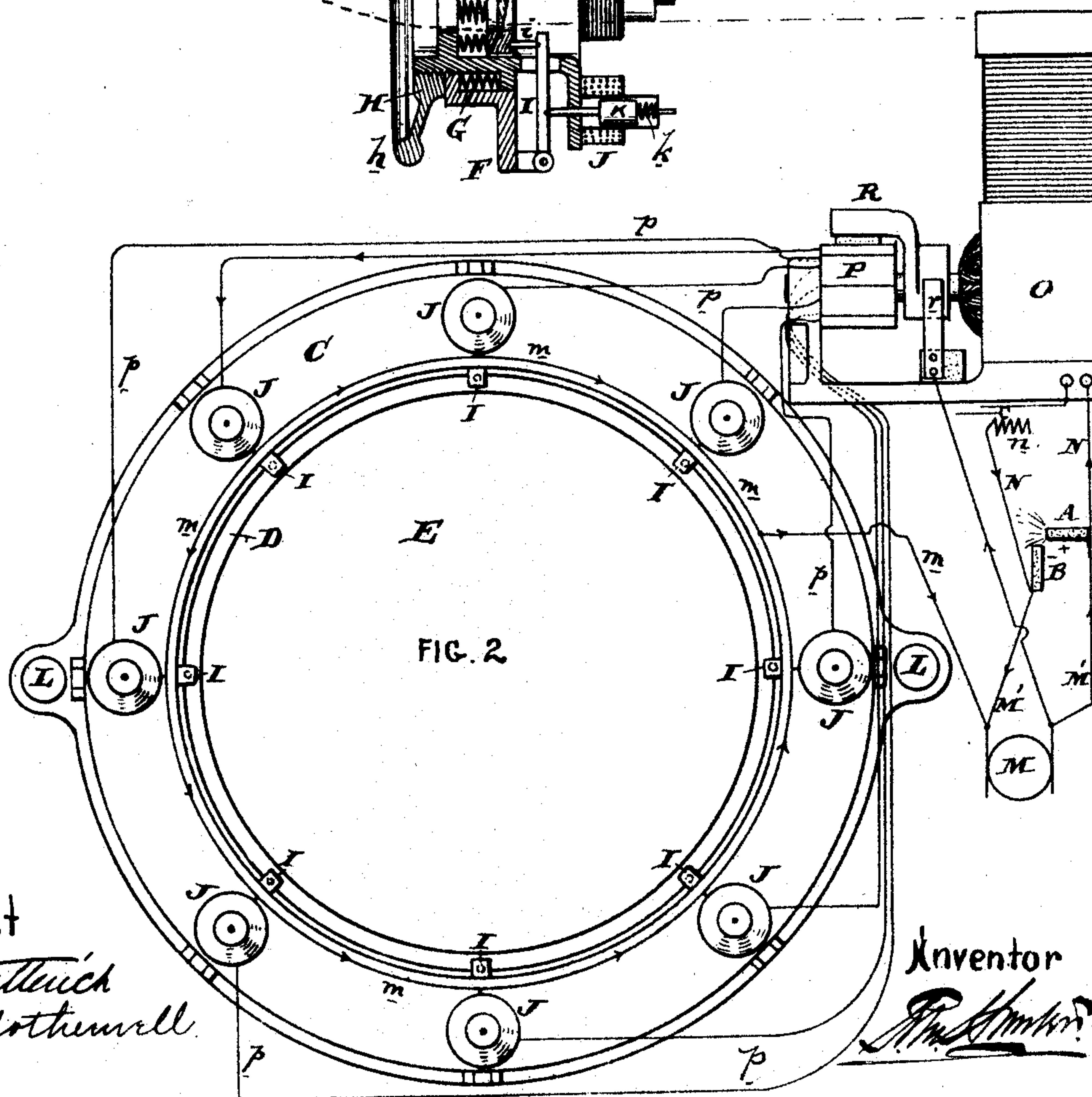


FIG. 2

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J. M. Dittus
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R. M. Hunter

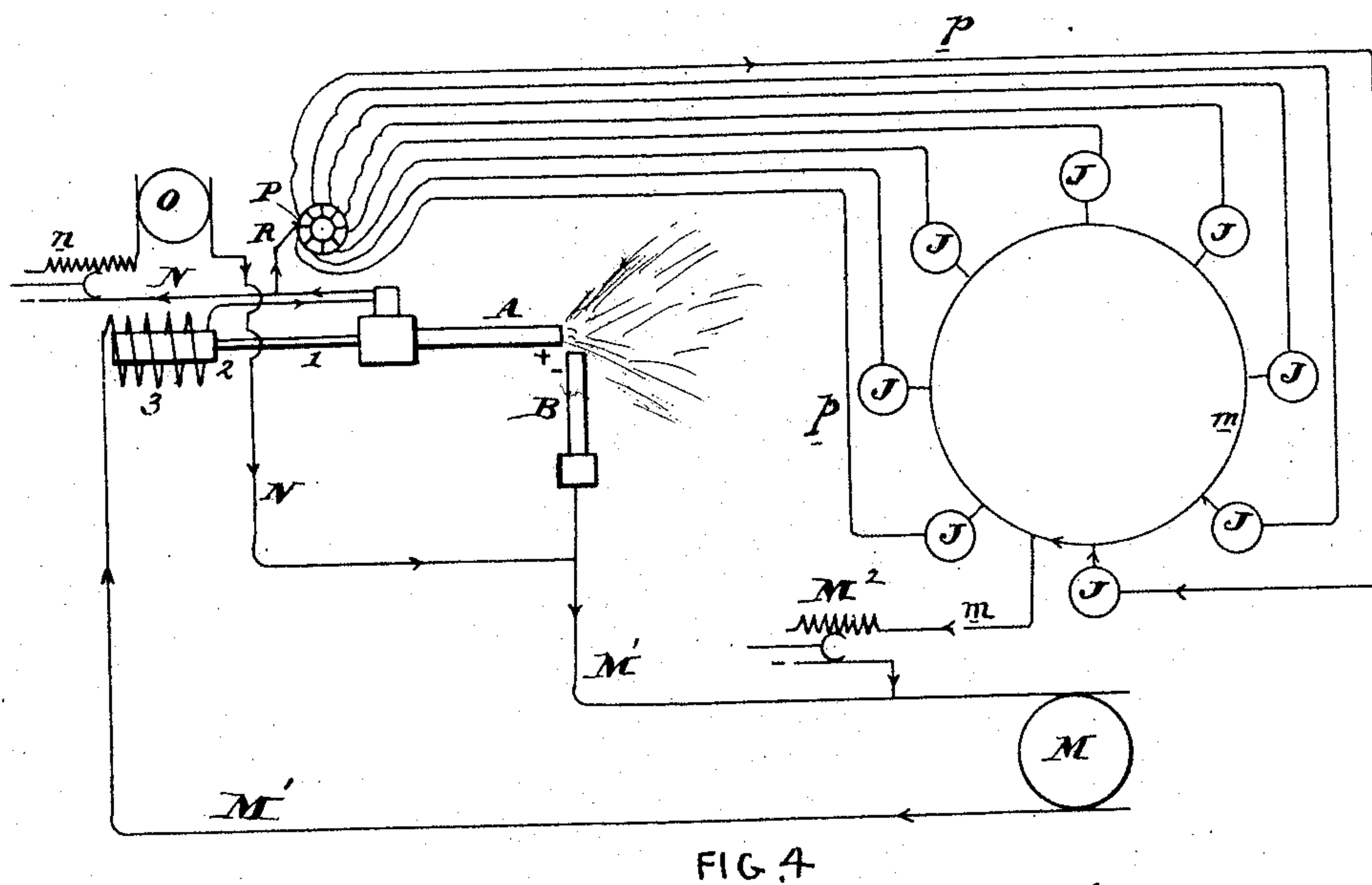
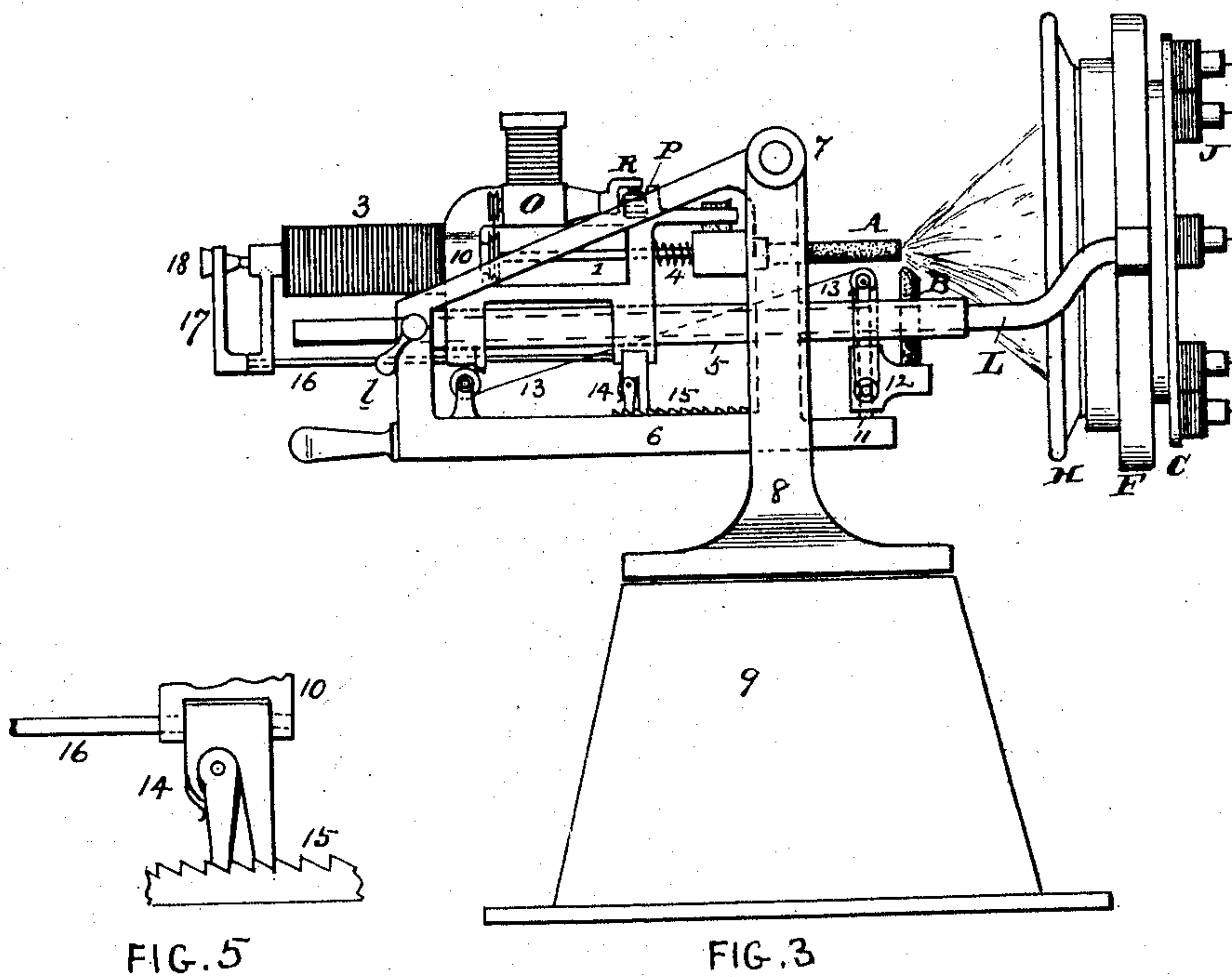
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2 Sheets—Sheet 2.

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ELECTRIC SEARCH LIGHT.

No. 503,602.

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Attest
H. L. Motherwell

Inventor
R. M. Hunter

UNITED STATES PATENT OFFICE.

RUDOLPH M. HUNTER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO
THE THOMSON-HOUSTON ELECTRIC COMPANY, OF CONNECTICUT.

ELECTRIC SEARCH-LIGHT.

SPECIFICATION forming part of Letters Patent No. 503,602, dated August 22, 1893.

Application filed June 19, 1893. Serial No. 478,088. (No model.)

To all whom it may concern:

Be it known that I, RUDOLPH M. HUNTER, of the city and county of Philadelphia, and State of Pennsylvania, have invented an Improvement in Electric Search-Lights, of which the following is a specification.

My invention has reference to electric search lights, and consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings which form a part thereof.

This application, Case No. 254, relates to certain improvements in search lights of the character set out in Letters Patent No. 495,461, dated April 11, 1893, and also to improvements set out in my application, Serial No. 473,597, filed May 9, 1893, and more particularly comprehends certain improvements in the means for vibrating the beam of light which has been projected and concentrated upon a distant object.

Broadly considered, it is immaterial to my invention what means are employed for generating the intense beam of light, or what the particular character of lens for concentrating and projecting the beam of light may be, as my invention is equally applicable to a case where the light is produced from other means than an electric current, though it is particularly adapted to an electric lamp since the means for operating the vibrator is electric and would derive its power from the same source as the lamp.

My improvement consists essentially in flexibly supporting the means for projecting the rays of light in one direction to form a beam and combining therewith electro-magnetic devices adapted to cause the said projecting devices to wobble or vibrate, and thereby cause the beam of light to be vibrated horizontally, or both horizontally and vertically. The vibration of the means for projecting the rays of light would be very slight as it is arranged immediately at the lamp, whereas the beam of light projected upon the distant object is many miles distant, and therefore a small movement of the vibrator would produce an extended movement of the beam of light upon the object illuminated. My preferred form of projector is a condenser lens of any suitable construction and this I

support flexibly at a distance in front of the arc, which distance may be varied by suitable adjusting devices to concentrate the beam of light upon objects at different distances, and this condenser lens I cause to wobble or vibrate by means of electro magnets arranged in a suitable manner relatively to the condenser lens and so energized by an electric current as to cause different electro magnets to come into play at different times. The same motor which I employ to rotate the positive carbon in the manner set out in my application, Serial No. 473,597, hereinbefore referred to, I also employ to operate the commutating device for causing proper vibration of the beam of light, though it is evident that separate means may be employed for this purpose. I also provide suitable hand adjusted devices for varying the extent of the movement of the condenser lens or projecting device under the action of the electro magnetic devices whereby the beam of light may be vibrated to a greater or less extent as desired according as to the extent of the object to be illuminated.

My improvements also relate to certain details of construction of the lamp proper, more particularly contemplating devices for feeding the carbons relatively to each other for the purpose of maintaining an arc at a definite position and in the focus of the condensing lens or other means of concentrating the rays of light.

These various improvements will be better understood by reference to the accompanying drawings, in which—

Figure 1 is a sectional elevation through my improved vibrator showing its position relative to the carbons. Fig. 2 is a front elevation thereof showing the electrical connections with the arc and the motor. Fig. 3 is a side elevation of a complete search light with the surrounding casing removed. Fig. 4 is a diagrammatic view illustrating the various circuits of the lamp complete; and Fig. 5 is an elevation of a detail illustrating the feeding devices.

A is the positive carbon and B the negative carbon between which the arc is maintained. The positive carbon is held in a suitable clamp upon a horizontally rotating shaft 1,

having a core 2 adapted to be drawn into a solenoid 3 against the action of a spring 4.

The negative carbon B is supported in a vertically movable carriage clamp 12 movable upon vertical guides 11 and adapted to be moved vertically by means of a lifting cord 13 and a moving carriage 10, so that the carbon B moves toward the carbon A at one half the velocity that the carbon A moves toward the carbon B. This proportion may be varied, if desired, by simply varying the relative diameters of the carbons A and B. The carriage 10 supports the shaft 1, the solenoid 3, and the electric motor O for rotating the shaft 1, and is movable horizontally upon the guides 5 carried in a frame 6. The frame 6 is pivoted upon a transverse axis 7, upon the support 8, movable about the vertical axis upon the base or pedestal 9. By this means the lamp proper has a universal movement upon its pedestal in the well known manner.

The carriage 10 has one end of the cord 13 secured to it, the said cord then passing about a pulley at the rear of the machine, then upward over a pulley at the top of the guide 11, thence downward under a pulley upon the carriage 12, and thence upward to the top of the guide 11, where it is secured. This means causes the carriage 12 to move at a definite speed vertically, relatively to a horizontal movement of the carriage 10. The general principle of construction and operation of these parts is very similar to what is set out in my application, Serial No. 473,597, before referred to.

The rear end of the rod 1 is provided with a cone 18 which operates against the arm 17 secured to a rock shaft 16, which rocks a tripping device 14, which works in connection with a rack 15 upon a frame 6 and causes an intermittent feeding of the carriage 10 to the extent of one tooth of the rack 15 for each full movement of the shaft 1 and its core 2 relatively to the solenoid 3, operating substantially in the manner of the well known Remington type writer in feeding its paper carriage upon the main frame carrying the type bars. The feeding action only takes place when the core 2 is moved as far to the right in the solenoid as it can and when it is necessary to feed the carbons toward each other. The feeding action of the carriage 10 is therefore intermittent, but the action of the solenoid 3 and its core 2 is sufficiently great to cause the proper regulation between the carbons to insure the constancy of the arc and maintain a substantially uniform light.

L is a frame extending through the guides 5 and is adjustably clamped by a clamp *l* in any position desired, so as to adjust the condensing lens E nearer or farther relatively to the arc. Upon the ends of the frame L is a circular frame *f*. Arranged within this circular frame *f* is a tubular frame C which is adjustable longitudinally therein in one direction by springs G, and in the other direction by a nut H having a hand wheel *h*. Flexibly

supported within the tubular frame C is an annular ring D preferably resting upon springs *d*, said annular ring carrying the condenser lens E or a reflector indicated in dotted lines in Fig. 1.

J are solenoids arranged about the condenser lens and supported by the tubular frame C. There may be any number of these solenoids desired. Each solenoid is provided with a movable core K adapted to catch a lever I pivoted to the frame F at one end, and connecting at the other end with the annular ring D by a pin connection *i*. A spring *k* is employed to keep the core K in connection upon the pivoted arm I. If the parts *i*, I and K are hinged together, the spring *k* might be dispensed with.

It will be observed that if the solenoid energizes the core K, the corresponding part of the annular ring D will be forced in, compressing the small spring *d* and thereby pull the condensing lens E. This action can be made to take place in sections about the condenser lens by energizing the solenoids successively and thereby causing the condenser lens or concentrating device to wobble or vibrate. By turning the hand operated nut H, the frame C may be moved upon the frame F to a greater or less extent, and as the pivots of the levers I are fixed, this will have the tendency to alter the throw of the solenoids and vary the extent of wobble or vibration of the annular ring D and the device is thereby adjustable during this operation so as to vary the extent of movement of the beam of light over the object to be illuminated.

It is quite evident that the various details herein disclosed may be more or less modified, if desired, as the general principle would be the same and would be included in my invention broadly considered.

O is an electric motor and is carried upon the carriage 10 and by suitable power devices is made to rotate the rod 1 carrying the positive carbon A, in the manner set out and claimed in my application, Serial No. 473,597. The shaft of the electric motor is provided with a portion R receiving current from a contact *r*. The brush passes over the fixed commutator P, the sections of which are connected respectively with the several solenoids J by conductors *p*. All of the other terminals of the solenoids are connected by a common return circuit *m*. The circuit leading to the solenoids is in parallel with the circuit M' which includes the carbons A and B and the solenoid 3.

M is a source of electric energy of any suitable description.

N is the motor circuit for supplying current to the electric motor O and connecting it in parallel with the arc and with the solenoids J. The motor may be regulated as to its speed by a regulator *n* of any suitable description and this regulator may also be employed to cut the motor out of circuit when it is desired to stop the vibration of the beam

of light or to stop the rotation of the carbon A. It is quite evident that by throwing the belt between the motor O and shaft 1, the motor may be employed to rotate only the commutator R.

A resistance changer M^2 may be employed to control the power supply to the solenoids J so as to vary their operation as desired. This controller M^2 may also be provided with means to interrupt the circuit for the purpose of throwing the solenoids out of action and permitting the search light to be used in the ordinary way. In this case it would be customary to adjust the lens E to separate the rays of light to cover a larger area.

The various details may be greatly modified without departing from the principles of my invention, and therefore I do not limit myself to the specific mechanical structures illustrated.

What I claim as new, and desire to secure by Letters Patent, is—

1. In an electric search light, the combination of an electric lamp adapted to maintain an arc, means to concentrate and direct the rays of light from the arc, and electro magnetic devices thrown into action successively to cause the means for concentrating and directing the rays of light to wobble or vibrate.

2. In an electric search light, the combination of an electric lamp adapted to maintain an arc, means to concentrate and direct the rays of light from the arc, electro magnetic devices thrown into action successively to cause the means for concentrating and directing the rays of light to wobble or vibrate, and means controlled by the hand to vary the extent of the wobble or vibration.

3. In an electric search light, the combination of an electric lamp adapted to maintain an arc, means to concentrate and direct the rays of light from the arc, electro magnetic devices thrown into action successively to cause the means for concentrating and directing the rays of light to wobble or vibrate, means controlled by the hand to vary the extent of the wobble or vibration, and a common support for the electric lamp proper and the means for concentrating and directing the rays of light.

4. In an electric search light, the combination of an electric lamp adapted to maintain an arc, means to concentrate and direct the rays of light from the arc, electro magnetic devices thrown into action successively to cause the means for concentrating and directing the rays of light to wobble or vibrate, means controlled by the hand to vary the extent of the wobble or vibration, an electric motor, and a commutating device operated by the electric motor for throwing electric magnetic devices at intervals into circuit with a source of electrical energy.

5. In an electric search light, the combination of an electric lamp adapted to maintain an arc, means to concentrate and direct the rays of light from the arc, electro magnetic

devices thrown into action successively, to cause the means for concentrating and directing the rays of light to wobble or vibrate, means controlled by the hand to vary the extent of the wobble or vibration, an electric motor, a commutating device operated by the electric motor for throwing electric magnetic devices at intervals into circuit with a source of electrical energy, and power devices operated by the electric motor for rotating the positive carbon of the electric lamp simultaneously with the position of the commutating device.

6. In an electric search light, the combination of a lamp for producing an intense light adapted to maintain an arc, means to concentrate and direct the rays of light from the arc, and electro magnetic devices thrown into action successively to cause the means for concentrating and directing the rays of light to wobble or vibrate.

7. In an electric search light, the combination of a lamp for producing an intense light adapted to maintain an arc, means to concentrate and direct the rays of light from the arc, electro magnetic devices thrown into action successively to cause the means for concentrating and directing the rays of light to wobble or vibrate, and means controlled by the hand to vary the extent of the wobble or vibration.

8. In an electric search light, the combination of a lamp for producing an intense light adapted to maintain an arc, means to concentrate and direct the rays of light from the arc, electro magnetic devices thrown into action successively to cause the means for concentrating and directing the rays of light to wobble or vibrate, means controlled by the hand to vary the extent of the wobble or vibration, and a common support for the electric lamp proper and the means for concentrating and directing the rays of light.

9. In an electric search light, the combination of a lamp for producing an intense light adapted to maintain an arc, means to concentrate and direct the rays of light from the arc, electro magnetic devices thrown into action successively to cause the means for concentrating and directing the rays of light to wobble or vibrate, means controlled by the hand to vary the extent of the wobble or vibration, an electric motor, and a commutating device operated by the electric motor for throwing electric magnetic devices at intervals into circuit with a source of electrical energy.

10. The combination of a lamp and frame connected to the lamp and condenser or equivalent, concentrating devices for concentrating and directing the rays of light from the lamp, an elastic or spring support for the condenser or concentrating devices, a series of electro magnets arranged upon the frame and about the condenser or concentrating devices, mechanical connections between the armatures of the electro magnets and the condenser or concentrating devices, and a source

of electrical energy, and suitable commutating devices for energizing the electro magnets for the purpose of making them operate to cause the condenser or concentrating devices to wobble or vibrate.

11. The combination of a lamp and frame connected to the lamp and condenser or equivalent, concentrating devices for concentrating and directing the rays of light from the lamp, an elastic or spring support for the condenser or concentrating devices, a series of electro magnets arranged upon the frame and about the condenser or concentrating devices, mechanical connections between the armatures of the electro magnets and the condenser or concentrating devices, a source of electrical energy and suitable commutating devices for energizing the electro magnets for the purpose of making them operate to cause the condenser or concentrating devices to wobble or vibrate, and means to adjust the condenser or concentrating devices relatively to the lamp.

12. The combination of a lamp and frame connected to the lamp and condenser or equivalent, concentrating devices for concentrating and directing the rays of light from the lamp, an elastic or spring support for the condenser or concentrating devices, a series of electro magnets arranged upon the frame and about the condenser or concentrating devices, mechanical connections between the armatures of the electro magnets and the condenser or concentrating devices, a source of electrical energy and suitable commutating devices for energizing the electro magnets for the purpose of making them operate to cause the condenser or concentrating devices to wobble or vibrate, and adjusting devices adapted to be controlled by the hand for operating the extent of the movement of the condenser or concentrating devices.

13. In a search light, the combination of the lamp with a condenser or concentrating devices consisting of a frame, an annular ring flexibly supported thereby, a condenser or concentrating device for the rays of light carried by the annular ring, a series of electro magnets supported on the circular frame and arranged about the condenser or concentrating devices, and mechanical connections between the armatures of said electro magnets and the annular ring carrying the condenser or concentrating devices, and means to energize the electro magnets at different times to cause the annular ring to be vibrated.

14. In a search light, the combination of the lamp with a condenser or concentrating devices consisting of a frame, an annular ring flexibly supported thereby, a condenser or concentrating device for the rays of light carried by the annular ring, a series of electro magnets supported on the circular frame and arranged about the condenser or concentrating devices, mechanical connections between the armature of said electro magnets and the annular ring carrying the condenser or con-

centrating devices, means to energize the electro magnets at different times to cause the annular ring to be vibrated, a supporting frame for the circular, and hand operated devices for moving the circular frame and the annular ring bodily upon the supporting frame for the purpose of varying the extent of action of the several electro magnets.

15. In an electric lamp, the combination of two carbon holders adapted to keep their carbons at an angle to each other, a common supporting frame provided with guides for the two carbon holders, a connection between the two carbon holders consisting of a cord and pulleys substantially as set out, and means to keep one of the carbon holder supports longitudinally upon its guides.

16. In an electric lamp, the combination of two carbon holders adapted to keep their carbons at an angle to each other, a common supporting frame provided with guides for the two carbon holders, a connection between the two carbon holders consisting of a cord and pulleys substantially as set out, means to keep one of the carbon holder supports longitudinally upon its guides, a solenoid and core for moving one of the carbons relatively to the other for maintaining the brilliancy of the arc, and a connecting device between the core or its support and the feeding devices whereby the movement of the core or its support automatically operates the feeding devices at intervals to compensate for consumption of the carbons.

17. In an electric search light, the combination of a lamp for producing an intense light adapted to maintain an arc, means to concentrate and direct the rays of light from the arc, electro magnetic devices thrown into action successively to cause the means for concentrating and directing the rays of light to wobble or vibrate, and hand controlled devices for throwing the electro magnetic devices into or out of action.

18. In an electric search light, the combination of a lamp for producing an intense light adapted to maintain an arc, means to concentrate and direct the rays of light from the arc, electro magnetic devices thrown into action successively to cause the means for concentrating and directing the rays of light to wobble or vibrate, means controlled by the hand to vary the extent of the wobble or vibration, and hand controlled devices for throwing the electro magnetic devices into or out of action.

19. In an electric search light, the combination of a lamp for producing an intense light adapted to maintain an arc, means to concentrate and direct the rays of light from the arc, electro magnetic devices thrown into action successively to cause the means for concentrating and directing the rays of light to wobble or vibrate, means controlled by the hand to vary the extent of the wobble or vibration, a common support for the electric lamp proper and the means for concentrating and directing the rays of light, and hand controlled de-

vices for throwing the electro magnetic devices into or out of action.

20. In an electric search light, the combination of a lamp for producing an intense light
5 adapted to maintain an arc, means to concentrate and direct the rays of light from the arc, electro magnetic devices thrown into action successively to cause the means for concentrating and directing the rays of light to wab-
10 ble or vibrate, means controlled by the hand to vary the extent of the wobble or vibration, an electric motor for throwing electric magnetic devices at intervals into circuit with a source of electrical energy, and hand con-
15 trolled devices for throwing the electro magnetic devices into or out of action.

21. In an electric search light, the combination of a lamp for producing an intense light
20 adapted to maintain an arc, means to concentrate and direct the rays of light from the arc, electro magnetic devices thrown into action successively to cause the means for concentrating and directing the rays of light to wab-
25 ble or vibrate, and hand controlled devices for varying the power of the electro magnetic devices.

22. In an electric search light, the combination of a lamp for producing an intense light
30 adapted to maintain an arc, means to concentrate and direct the rays of light from the arc, electro magnetic devices thrown into action successively to cause the means for concentrating and directing the rays of light to wab-
35 ble or vibrate, means controlled by the hand to vary the extent of the wobble or vibration and hand controlled devices for varying the power of the electro magnetic devices.

23. In an electric search light, the combination of a lamp for producing an intense light
40 adapted to maintain an arc, means to concentrate and direct the rays of light from the arc, electro magnetic devices thrown into action successively to cause the means for concentrating and directing the rays of light to wab-
45 ble or vibrate, means controlled by the hand to vary the extent of the wobble or vibration, a common support for the electric lamp proper and the means for concentrating and directing the rays of light, hand controlled devices
50 for varying the power of the electro magnetic devices.

24. In an electric search light, the combination of a lamp for producing an intense light
55 adapted to maintain an arc, means to concentrate and direct the rays of light from the arc, electro magnetic devices thrown into action successively to cause the means for concentrating and directing the rays of light to wab-
60 ble or vibrate, means controlled by the hand to vary the extent of the wobble or vibration, an electric motor for throwing electric magnetic devices at intervals into circuit with a source of electrical energy, hand controlled
65 devices for throwing the electro magnetic devices into or out of action, and hand controlled devices for varying the power of the electro magnetic devices.

In testimony of which invention I have hereunto set my hand.

R. M. HUNTER.

Witnesses:

ERNEST HOWARD HUNTER,
C. M. DIETTERICH.