

(No Model.)

3 Sheets—Sheet 1.

E. A. EDWARDS.
ELECTRIC HEADLIGHT.

No. 505,351.

Patented Sept. 19, 1893.

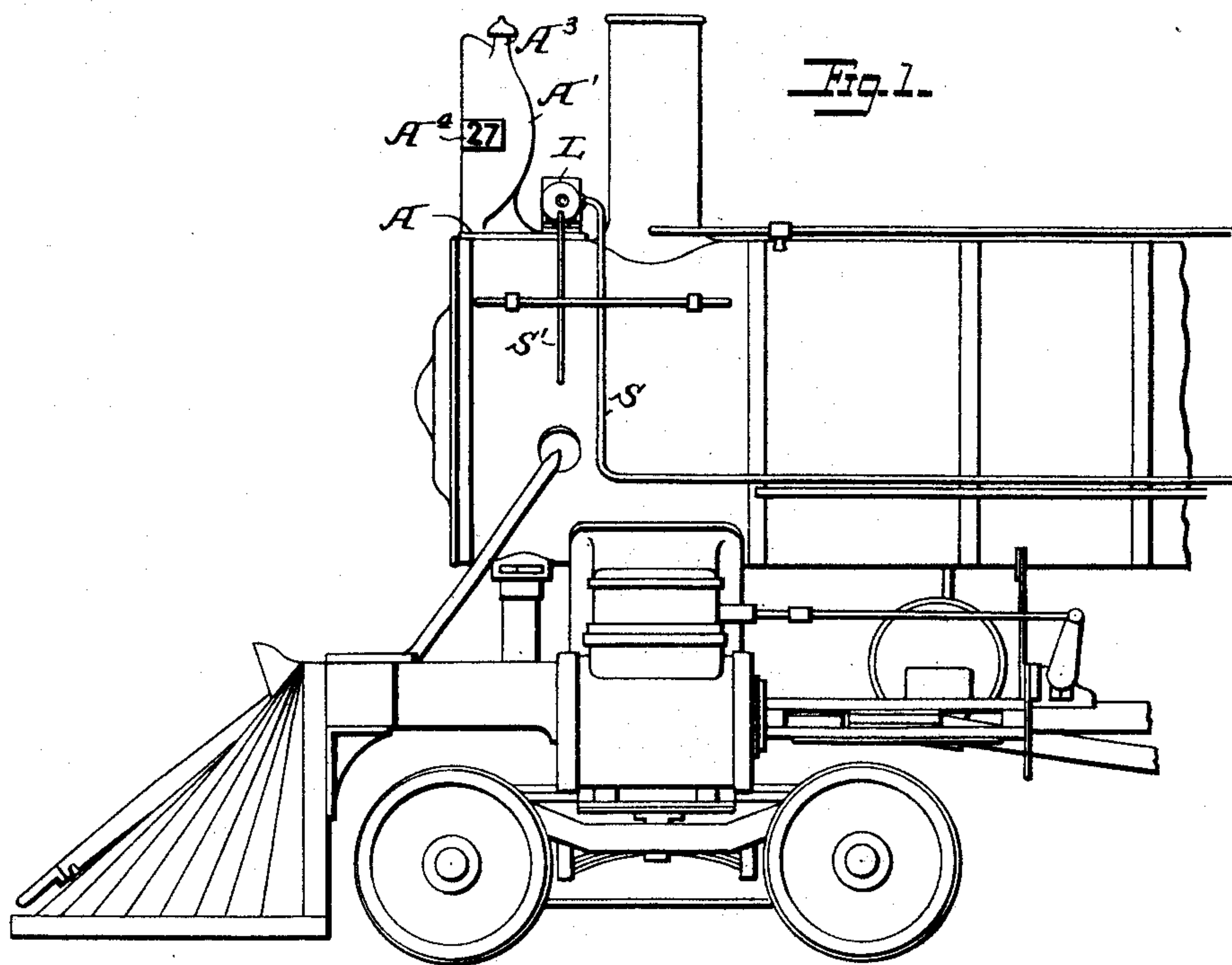


Fig. 5.

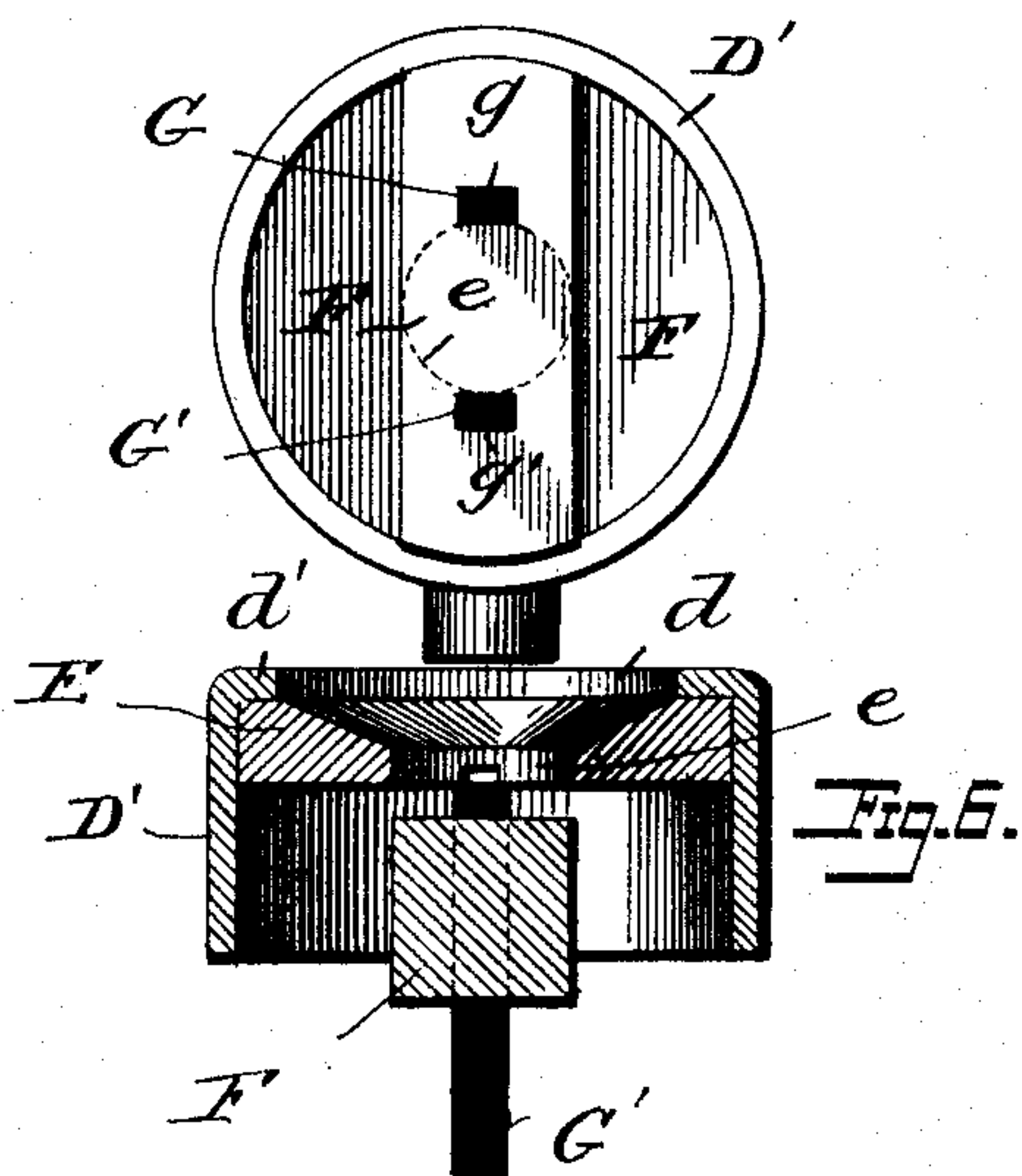
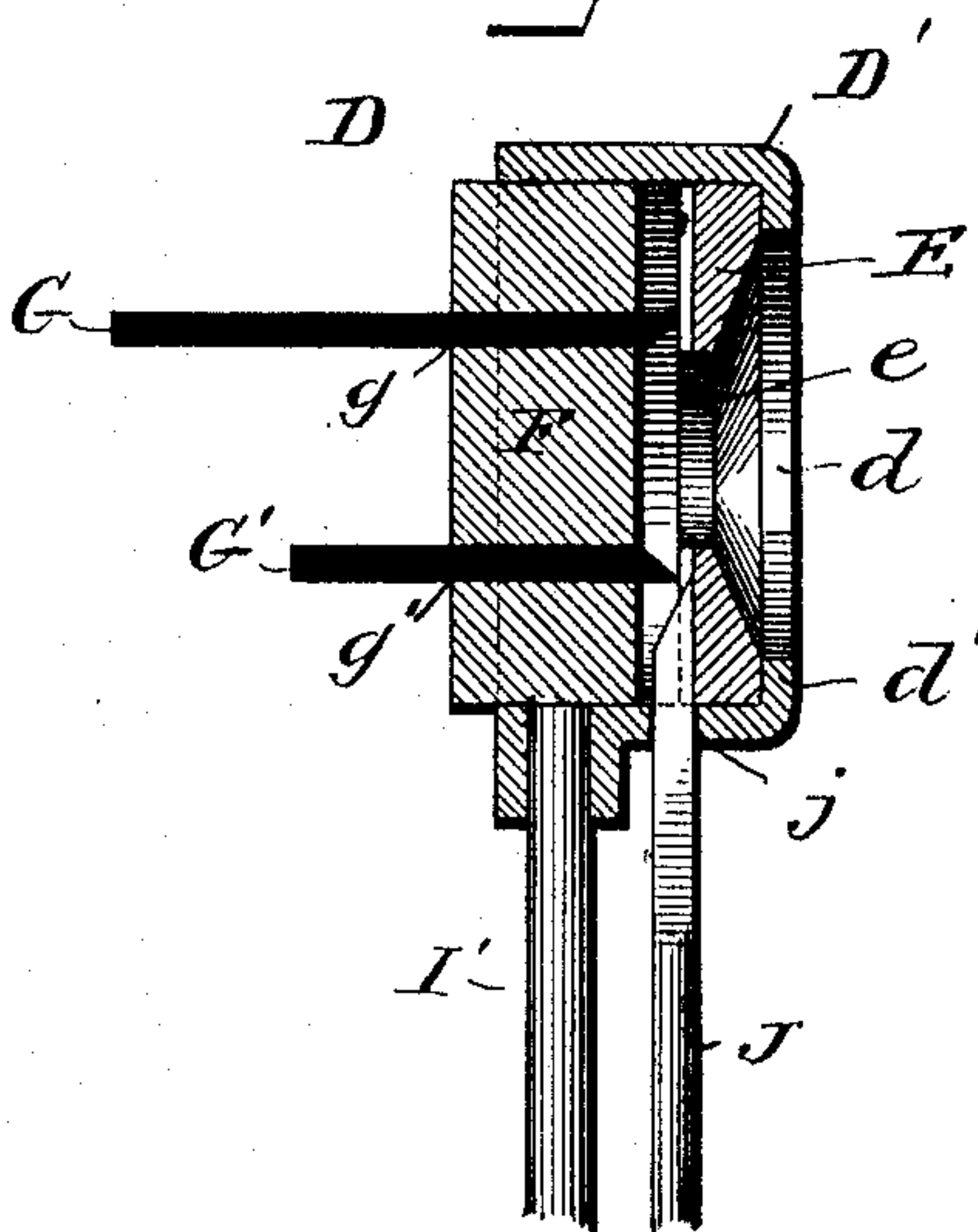


Fig. 4.



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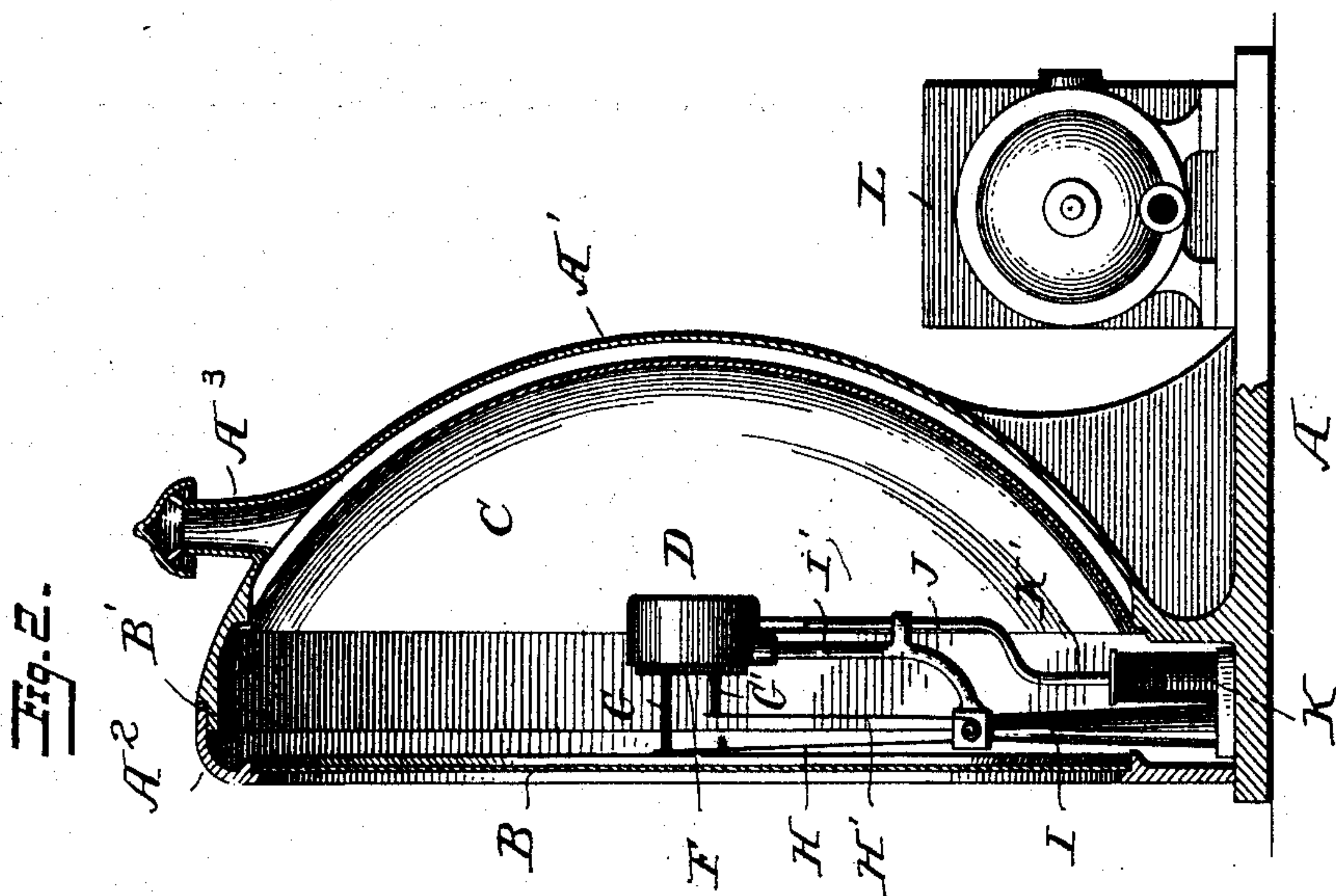
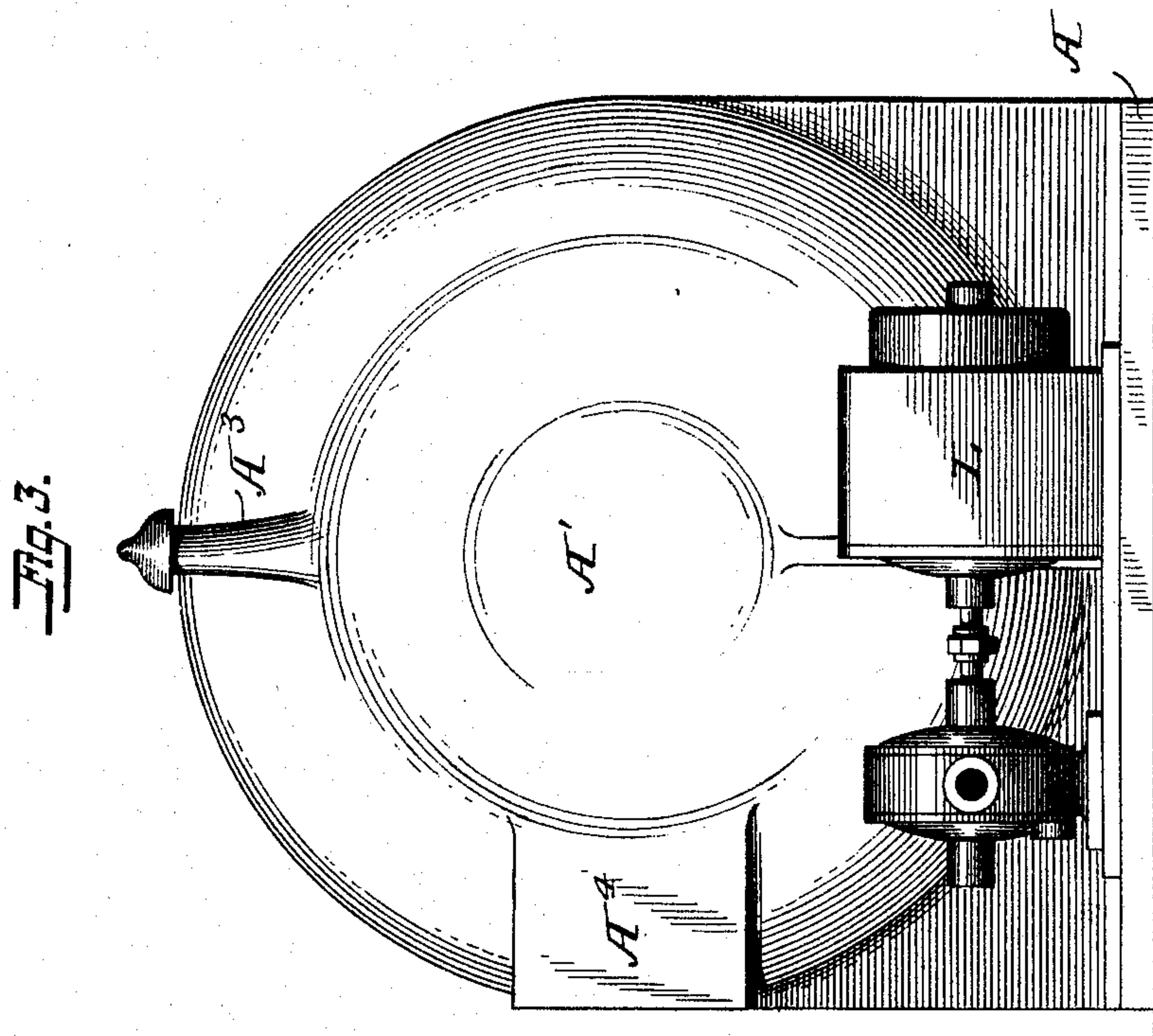
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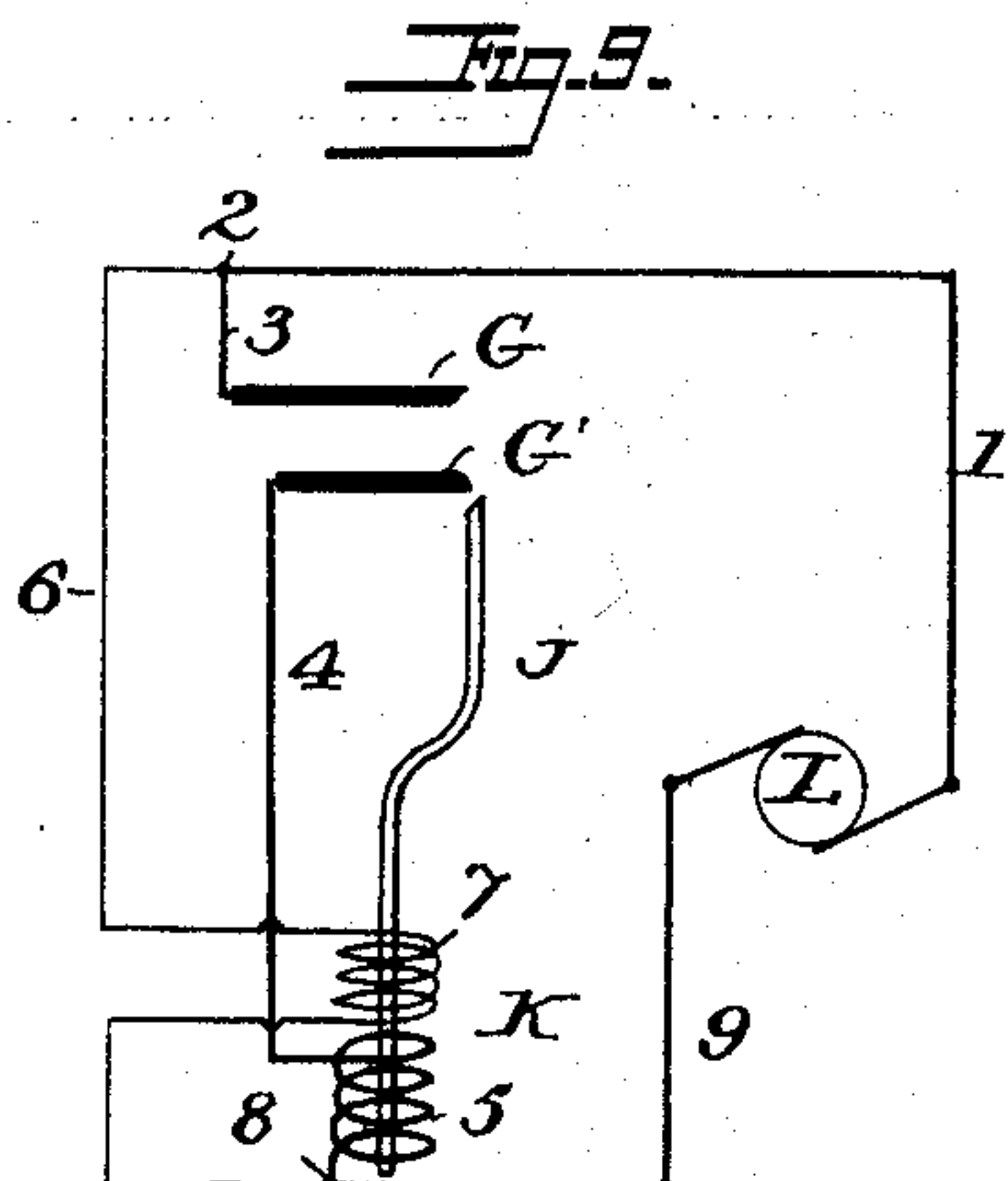
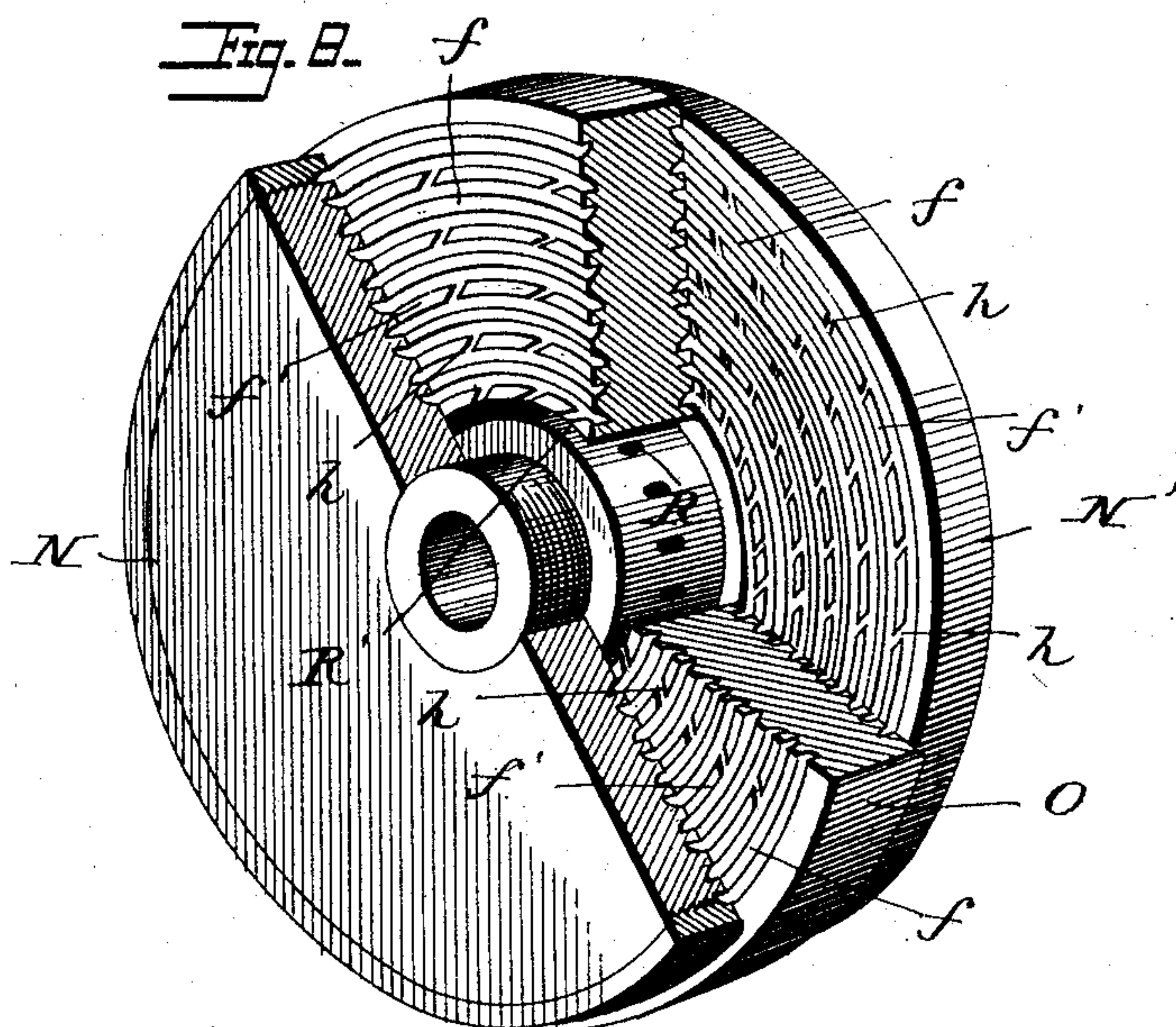
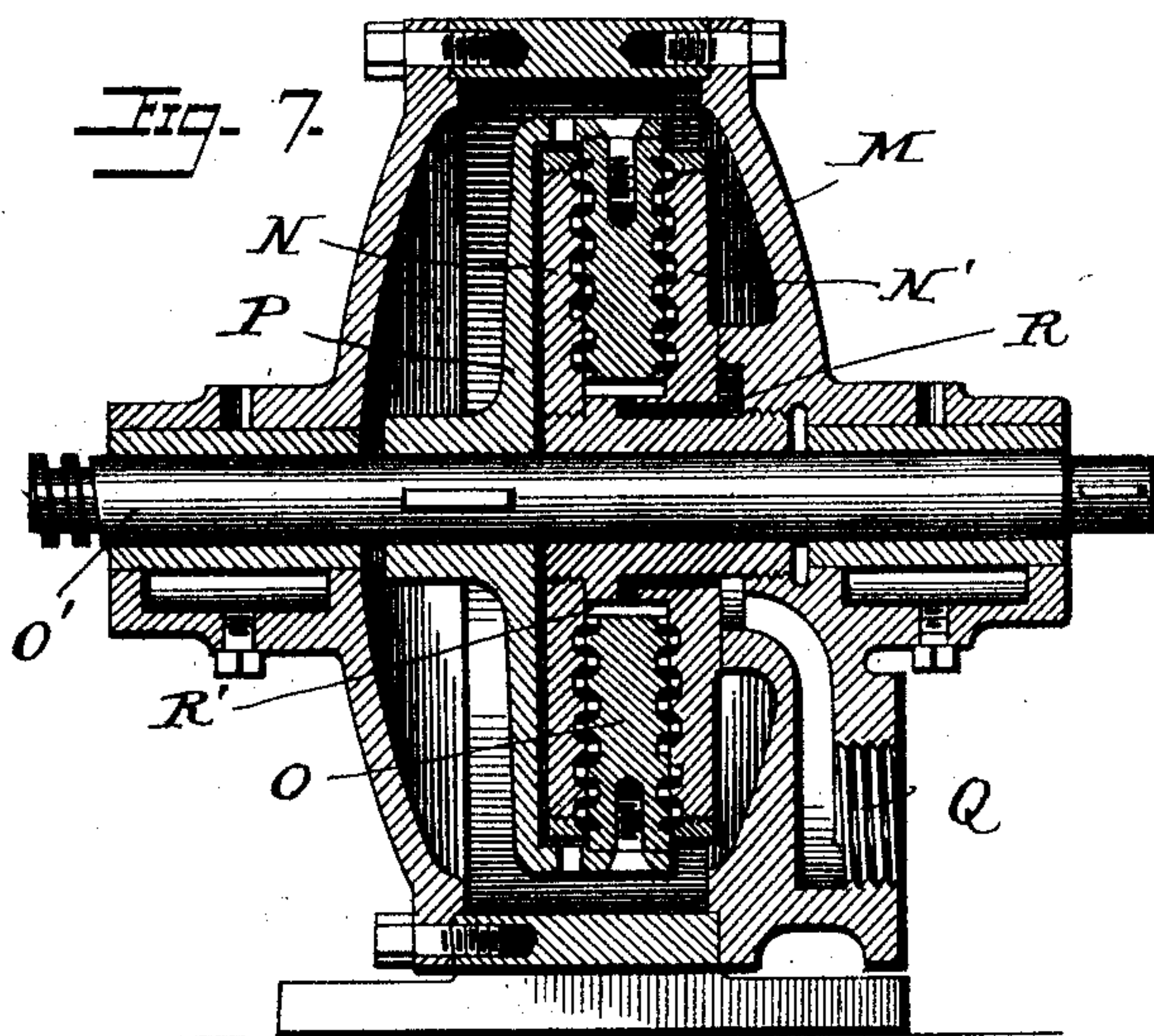
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UNITED STATES PATENT OFFICE.

EDGAR A. EDWARDS, OF CINCINNATI, OHIO.

ELECTRIC HEADLIGHT.

SPECIFICATION forming part of Letters Patent No. 505,351, dated September 19, 1893.

Application filed August 15, 1893. Serial No. 483,205. (No model.)

To all whom it may concern:

Be it known that I, EDGAR A. EDWARDS, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Electric Headlighting, of which the following is a specification.

My invention relates to electric head-lighting, and it has for its object to improve and simplify the construction, arrangement and operation thereof, and to these ends my invention consists in the various features substantially as hereinafter more particularly set forth.

In the accompanying drawings, wherein I have shown the preferred embodiment of my invention and sufficient to explain the principles thereof, Figure 1, is a side view of a portion of a locomotive, showing the arrangement thereon of my improved electric head-lighting apparatus. Fig. 2, is a partial longitudinal, vertical section, showing the head-light and the preferred manner of mounting the motor and electric generator. Fig. 3, is a rear view of the same, part of the reflector and frame being broken away to show the relative position of the electric lamp. Fig. 4, is an enlarged sectional view of the lamp. Fig. 5, is a rear view of the lamp. Fig. 6, is a horizontal section thereof. Fig. 7, is a longitudinal, vertical section of the motor. Fig. 8, is an enlarged perspective view, showing the grooved plates and rotating wheel of the motor; and Fig. 9, is a diagram of the circuits.

It is one of the principal objects of my present invention to provide a complete system and apparatus for electric head-light purposes, and without reciting the requirements of such an apparatus, which are well known to those skilled in the art, it is one of the principal objects of the present invention to provide an exceedingly simple, cheap and effective lamp, which is capable of withstanding the shocks and jars incident to its location, and to operate steadily and effectively under those conditions, to provide a generator capable of furnishing a proper current of electricity to said lamp, to provide a motor which shall also be capable of withstanding the shocks and jars incident to its operation, and especially to be efficient in utilizing steam or other motor fluid, and to apply the

power generated by the motor in a direct manner to the generator, and finally to so construct and arrange the lamp, generator, motor, and the necessary connections that the whole arrangement shall be compact, simple, cheap, effective, and not liable to get out of order, and capable of use in connection with locomotives as ordinarily constructed.

With this general statement of some of the objects of my invention, I will now proceed to describe in detail the embodiments thereof, which I have shown in the drawings, pointing out more specifically other features of my invention.

The head-light, as before intimated, is adapted to furnish an exceedingly steady and brilliant light, and at the same time to be simple in construction and occupy comparatively little space. In order to accomplish these results, I provide a suitable base A, preferably of metal, and formed or connected therewith is a vertically extending frame A', preferably made of cast material and having a configuration conforming substantially with the outer periphery of the reflector. This frame is substantially circular in its forward edge, as at A², and is provided with suitable means to support the usual glass or goggle B, which is preferably hinged to one side, and fits over a reduced edge or lip B' of the frame, in the usual way.

I make a substantial improvement in the reflector C. Usually in this class of devices it consists of a relatively very deep reflector, having a parabolic interior configuration in order to collect all the rays, or as many as possible, of the lamp, which is usually placed in the focus, or substantially so, thereof, and to reflect and project them in substantially parallel lines in front. This construction is awkward and cumbersome, and moreover, there is always a loss of a large proportion of the light rays, somewhere in the neighborhood say, of thirty per cent. (30%), which do not fall upon the surface of the reflector, and are not, therefore, projected in a manner to be of use for the purposes intended. I make a relatively shallow reflector C, the interior of which is, as usual, made to conform to the parabolic curve, but the edges of which do not extend practically beyond a plane passing through the focal point of the reflector.

It will thus be seen that I not only greatly reduce the size of the reflector, making a much more convenient lamp, but also save a very material amount in the cost thereof, and by forming the supporting frame of substantially the configuration of the reflector, I am also enabled to save material in its construction, to make substantial support for the reflector, and improve the appearance thereof.

The reflector and frame may be provided with a ventilating opening A^3 at the top, and it may also be provided with the side extensions A^4 , in order to receive the number or other indicator of the locomotive.

In order to best utilize the simple construction of reflector above set forth, it is desirable to provide a lamp which shall direct its light rays substantially all in one general direction, so that they will be properly reflected and projected in parallel lines, as above indicated, and in order to best accomplish these results, I have provided an improved electric lamp which not only operates successfully in this connection, but which is exceedingly simple in construction, constant in operation, and capable of withstanding the disturbances due to its position, without danger of getting out of adjustment.

The lamp D, consists essentially of a cylindrical case D' , which may be of any proper material, having a large central opening d , and preferably a flange d' , and mounted within this case is an annular or ring-shaped piece E, which may be of granite or similar refractory material, arranged therein and having an opening e , the front edges of which are preferably beveled. Of course, it will be understood that the case may be of other shape than cylindrical, and the block may correspond therewith, but I prefer the form shown, for obvious reasons. Arranged in the rear of this piece is another body or piece F, also of refractory material, preferably of marble, or compressed magnesia, or similar refractory material capable of becoming highly incandescent from the heat of the electric arc, and this block or piece may be of any proper shape and may, as indicated, practically fill the rear portion of the case D' , or it may extend only between the carbons G, G' and other material or means may be provided for supporting it and holding it in place. This body F, is arranged to occupy a position between the carbons, as above indicated, and may be grooved, as shown at g , g' , to permit the carbons G, G' to be inserted therein. The carbons consist of simple rods or bars suitably supported with relation to the incandescent material F, and they are provided with means for feeding them to compensate for their destruction in use, and while various means may be employed for this purpose, I have shown simple springs H, H' mounted on a standard I, which standard also has an arm or support I', on which the case D' is mounted. These springs may serve as conductors for the carbons, being suitably insu-

lated. A lamp of this construction will, as is well known, project practically all of its light rays to one side, and by arranging it in the focus of the shallow reflector before described, practically all of the light rays will be reflected and projected in horizontal or parallel lines in front of the reflector, and little or no light rays are lost. Moreover, I have found that a lamp of this construction, in which the refractory body becomes incandescent, the rays have a peculiar color, due to the incandescent material, which is decidedly preferable in electric head-lighting over the ordinary violet rays of the ordinary arc light, as the material gives a sort of orange tinge to the rays, which is much more useful in penetrating fogs, smoke and the like. From this it will be seen that not only is the above described lamp exceedingly simple, and cheap in construction, but it is obvious that it will withstand the shocks and jars to which it is subjected without derangement, and the light produced thereby is not only better in quality, but a much larger quantity is utilized for the purposes desired.

It is well known that lamps of this character require some means of lighting or connecting the carbons or electrodes to establish the arc, and in order to accomplish this, I provide a re-lighter J, comprising a rod preferably of copper, but it may be of any other proper conducting material, which is arranged to slide through an opening j in the case and proper grooves or slots in the refractory material, so that it can connect the ends of the carbons to complete the electric circuit there-through, and be withdrawn from one, maintaining its contact with the other, and thereby establishing the arc. This rod may be operated in any proper way, but I have shown a differential solenoid K, preferably arranged within the lamp and connected in the circuit in the manner hereinafter set forth, and arranged through the medium of the core K' connected to the rod J, to move for the purposes indicated. It will thus be seen that the head-light so far described, is exceedingly compact, simple of construction, and possesses advantages which render it efficient and practical for the purposes intended, and it now remains to describe the means for furnishing the lamp with the proper current in the most economical and advantageous manner.

In operating an electric head-light it is, of course, desirable that the means for furnishing the electric current to the lamp should be simple, compact and free from disturbances under the conditions in which it is to be used, and in view of the large number of locomotives already in use, it is also desirable to have these parts so arranged that they can be readily applied to existing locomotives, as well as supplied to new ones, and I have shown in the accompanying drawings, the preferred arrangement, in which there is mounted adjacent to the head-light and preferably upon the base thereof, a generator and motor for driving

the same. The generator L, is herein shown in a conventional way, as in the present instance I have not made any special improvements therein, but can use in connection with my system various generators, either magneto electric or dynamo electric, the essential qualification being that the generator shall be compact and capable of running at an exceedingly high rate of speed without injury, so that the requisite current can be produced in connection with a motor of the type hereinafter described, in the most efficient and practical manner, and I do not deem it necessary to further describe the generator, except to say that it is driven by direct connection with the motor. In order to operate the generator thus generally described, to the best advantage, I connect therewith a steam motor operating by impact or reaction, or both impact and reaction, of streams of steam, and an exceedingly useful embodiment of this principle for this particular purpose is shown in my patent No. 485,536, dated November 1, 1892. Such a motor is capable of running at an exceedingly high rate of speed, and maintaining such speed under all conditions, and it has been found exceedingly efficient, especially in motors of comparatively small dimensions, as in a system of electric head-lighting, where it is desirable, of course, to utilize the steam to the greatest efficiency, and to produce the greatest amount of electricity in proportion to the steam used, and this is accomplished by the use of an exceedingly small motor adapted to run at a very high speed, and connecting it directly to the armature of the generator. While the motor is specifically described in the patent referred to, it is proper to state that it comprises a suitable casing M, in which are mounted two plates N, N', the adjacent faces of which plates are provided with series of annular recesses or grooves, and supporting between the faces of the plates a propeller wheel O, suitably mounted on the shaft O', and provided on its outer faces with grooves or recesses which correspond with the grooves in the fixed plates. In the construction shown, the propeller wheel O is mounted on a carrier P, fixed to the shaft O', and a suitable steam inlet Q, is provided in the case, with steam passages R leading to the steam space R' within the wheel O, so that the steam therefrom passes outward toward the periphery of the wheel, by means of the grooves in the adjacent faces of the plates and wheel. It will be seen that the grooves in the wheel and plates correspond in position and are at the same radial distance from their axes, and there are a series of complete rings *f* and segmental rings *f'*, in each face, the segmental rings having angular grooves *h*, and from this arrangement of the rings and grooves it will be seen that the steam finds a passage from the steam-chest to the exhaust chamber at the periphery of the wheel, the steam passing first

by a series of angular grooves to the first circular groove in the wheel, impinging upon the curved sides of the ring, and being deflected into the first circular groove of the adjacent plate, and then impinging upon the curved sides of this groove, and being deflected through the first series of angular grooves in the plates, which are formed at an angle opposite to the angle of the grooves in the wheels, and from which it passes to the next circular groove in the plate, and so on being deflected and reflected, causing the wheel to rotate by the impact and reaction of the various streams of steam in their passage from the center outward. It is not deemed necessary to describe the details of such a motor, as they are well understood by those skilled in the art, and are fully set forth in the patent referred to, and this is taken as a type of motor rather than as an exclusive form, but it has been demonstrated that a motor of this type when connected directly to the armature shaft of the generator and rotated at an exceedingly high rate of speed, is by far the most effective means of producing the desired current, far exceeding any reciprocatory or so-called rotary engine with which I am acquainted. Moreover, there are numerous advantages inherent to the use of a motor of this class for this purpose, in that, owing to the exceedingly high speed of rotation, it is less subject to disturbance by the motion of the locomotive on which it is carried, and especially by reason of the fact that an exceedingly small and compact motor will produce the necessary and desired efficiency of steam, and be capable of operating steadily and effectively under the disadvantageous conditions to which it is exposed. It needs no argument to convince those skilled in the art that by combining a small motor of this character with a generator and operating them both at an exceeding high rate of speed, say for instance, twenty-five thousand (25,000) revolutions a minute, not only is there great economy of steam, but also economy of space, regularity of operation, and the highest efficiency of the generator, (especially one of small dimensions,) is attained.

In order to operate the relighting device, different means may be employed, but preferably the device is operated automatically by electrical means, as indicated, and I have shown in Fig. 9, one arrangement which I have found satisfactory, in which the current from the generator L, passes by the conductor 1, (one), to the point 2, where it divides, the main current passing through the conductor 3, to the carbons G, G', and thence by the conductor 4, through the coarse coils 5, of the solenoid K, while a shunt of relatively high resistance extends from the point 2, by the conductor 6, to and including the fine wire coils 7, of the solenoid, the shunt uniting with the main line at 8, and thence by the conductor 9, returning to the generator. With this ar-

rangement it will be seen that as soon as the
 generator (which is preferably shunt wound)
 starts, the circuit will be established through
 the high resistance coils only of the solenoid,
 5 and this will cause the relighter attached to
 the core of the solenoid, to move to close the
 circuit between the carbons. As soon as this
 occurs, the main line is closed, and the cur-
 rent, or at least the greater proportion there-
 10 of, will flow through the carbons, the relighter,
 and the coarse coils of the solenoid, and this
 will withdraw the relighter and establish the
 arc between the carbons and the relighter will
 be maintained in this position as long as the
 15 lamp operates regularly.

It is evident that other arrangements of
 circuits can be provided in accordance with
 the electrical conditions, to perform these
 functions in substantially the same way, but
 20 this arrangement is exceedingly simple and
 effective, and especially so with a shunt
 wound generator.

The steam for the motor may be supplied
 in any desirable manner from the locomotive
 25 steam boiler, and I have indicated a pipe S,
 connected to the case of the motor, and to
 some portion of the boiler, preferably the
 steam-dome (not shown herein), and there is
 an exhaust pipe S', connected to the smoke-
 30 box of the locomotive, and while these are
 convenient connections, of course, any other
 desired connections may be made.

The combination of a head-light embody-
 ing the general features of construction set
 35 forth, with a small generator, and an exceed-
 ingly small motor, operating on the princi-
 ples set forth and rotating at an exceedingly
 high rate of speed, has demonstrated practi-
 cally its great utility, and practically solved
 40 the problem of electric headlighting, as it pre-
 sents a combination of parts co-operating to-
 gether not only to produce the highest effi-
 ciency, and other desirable qualities of opera-
 tion, but to be capable of withstanding the
 45 extraordinary disturbances to which electric
 head-lights are necessarily exposed.

I am aware that it has been proposed to
 operate a generator for electric head-light
 purposes by means of a special engine con-
 50 nected thereto, such for instance, as a recip-
 rocatory engine or a rotary engine, and I do
 not claim any such construction, but I limit
 my invention to the use of a motor operating
 on the impact, or impact and reaction sys-
 55 tem, connected to the generator, and operat-
 ing at an exceedingly high rate of speed, as
 I have found in practice that the ordinary
 rotary engine or reciprocating engine is im-
 practicable for headlight purposes, and it is
 60 only when a motor of the character described
 and operated in the manner set forth, is ar-
 ranged substantially as described, that a

practical electric head-light apparatus can
 be provided.

What I claim is—

1. In an electric head light, the combina-
 tion with the reflector, and supporting case
 therefor, the case conforming substantially
 to the contour of the reflector and the edge
 of which practically co-incides with a plane
 70 passing through the focus of the reflector, of
 an electric lamp arranged in the focus there-
 of, the said lamp comprising a case having
 carbons parallel to each other and to the axis
 of the reflector, an incandescent material ar-
 75 ranged between the carbons, substantially as
 described.

2. In an electric head light, the combina-
 tion with a reflector of a lamp arranged in
 the focus thereof, the said lamp comprising
 80 a case having carbons arranged parallel to
 each other and to the axis of the reflector and
 an incandescent material between the car-
 bons and arranged to throw the light rays all
 substantially in one direction, substantially
 85 as described.

3. In an electric lamp, the combination
 with a case, of the parallel carbons, the in-
 candescent material between the carbons, a
 relighter for the carbons, and a differential
 90 solenoid connected to the lighter for auto-
 matically establishing the arc, substantially
 as described.

4. In an electric head-light, the combina-
 tion with a reflector, of an electric lamp
 95 mounted in the focus thereof, the said lamp
 being supported on a standard and being pro-
 vided with parallel carbons and having a
 block of incandescent material between the
 carbons, a relighter for the carbons, and a
 100 differential solenoid, the core of which is con-
 nected to the lighter, substantially as de-
 scribed.

5. In an electric head-light, the combina-
 tion with a base, of a casing formed integral
 therewith, and conforming substantially in
 105 contour to the reflector carried thereby, the
 base having an extension, and a generator
 and motor mounted on said extension, sub-
 stantially as described.

6. The combination with a locomotive, of
 motor having a wheel adapted to be driven
 by steam impact, steam connections between
 the motor and the locomotive, a generator
 connected to the motor, and electric lighting
 115 devices connected to the generator, substan-
 tially as described.

In testimony whereof I have signed my name
 to this specification in the presence of two sub-
 scribing witnesses.

EDGAR A. EDWARDS.

Witnesses:

F. L. FREEMAN,

E. E. ELLIS.