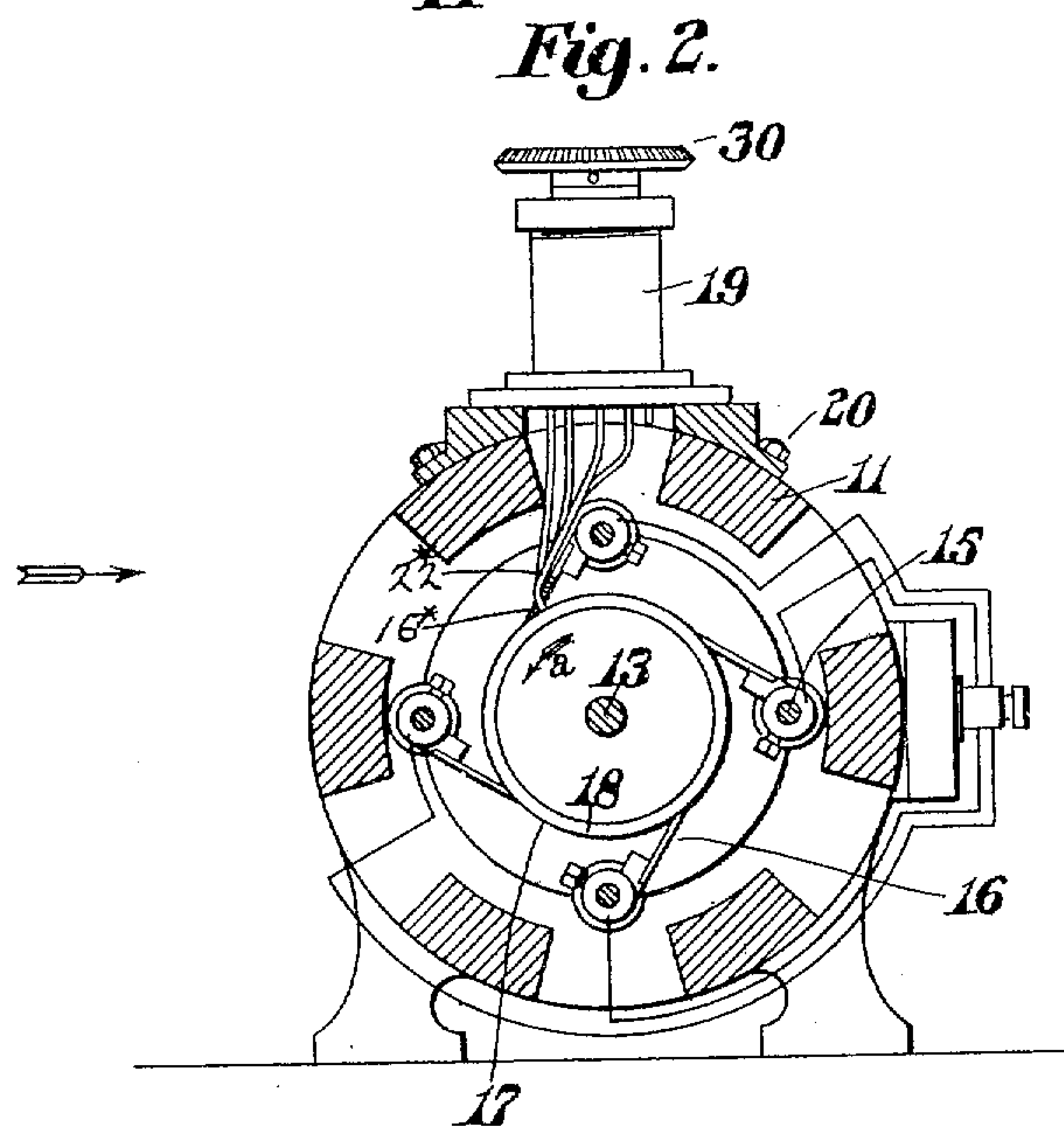
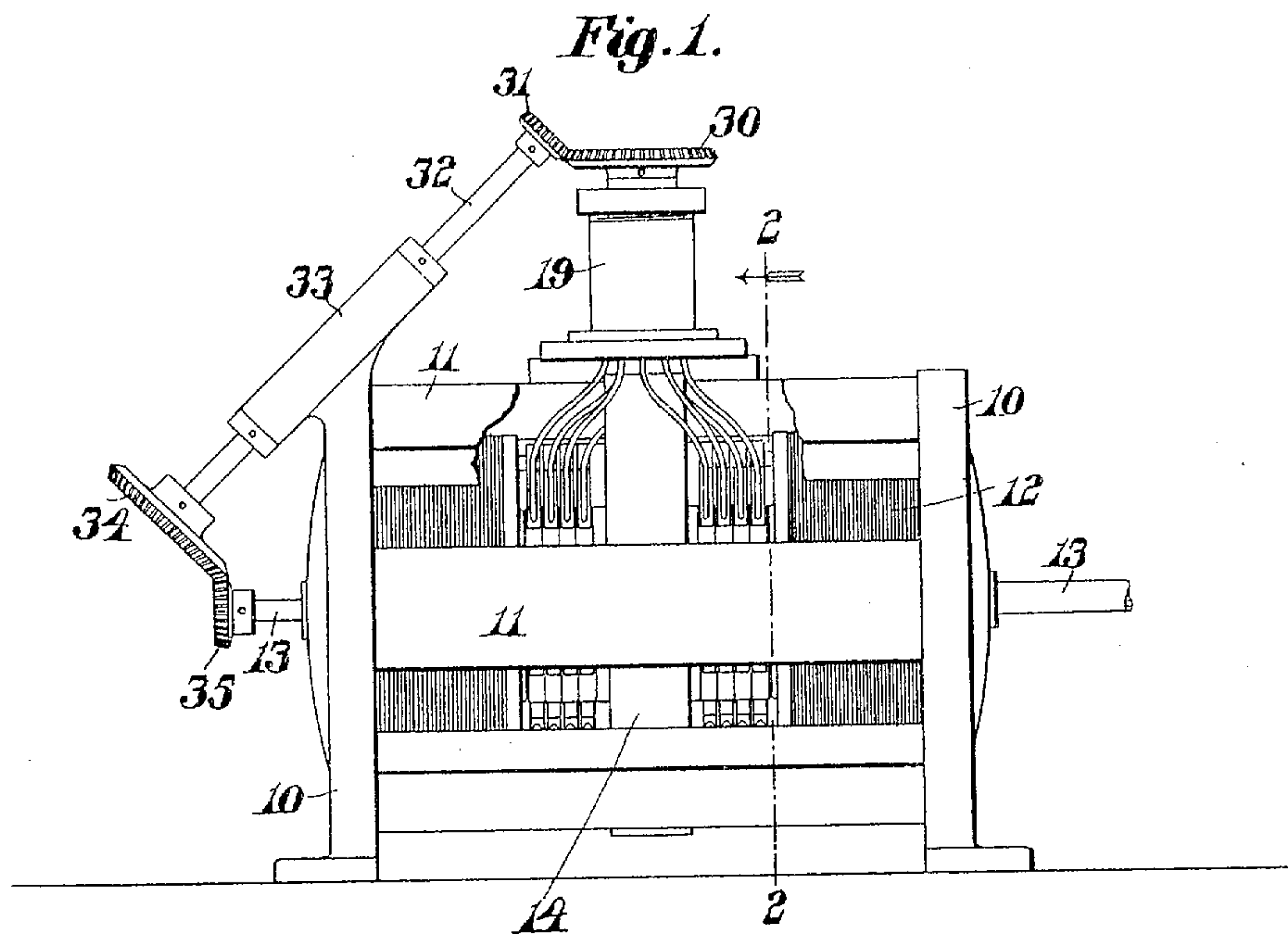


966,840.

Patented Aug. 9, 1910.

2 SHEETS—SHEET 1.



**Witnesses:**

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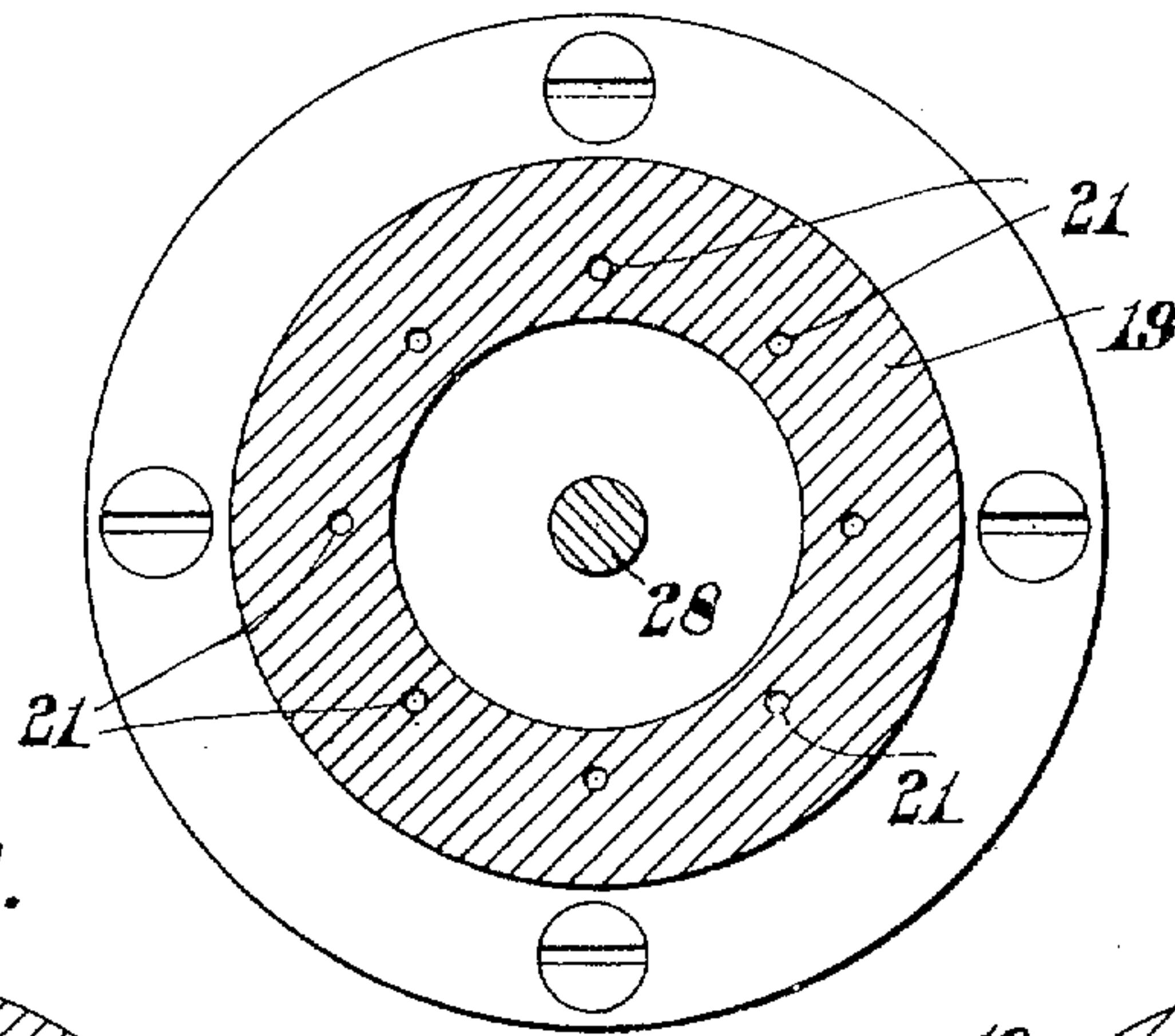
E. C. KETCHUM.  
 AUTOMATIC MERCURY DROPPER.  
 APPLICATION FILED JUNE 25, 1909.

966,840.

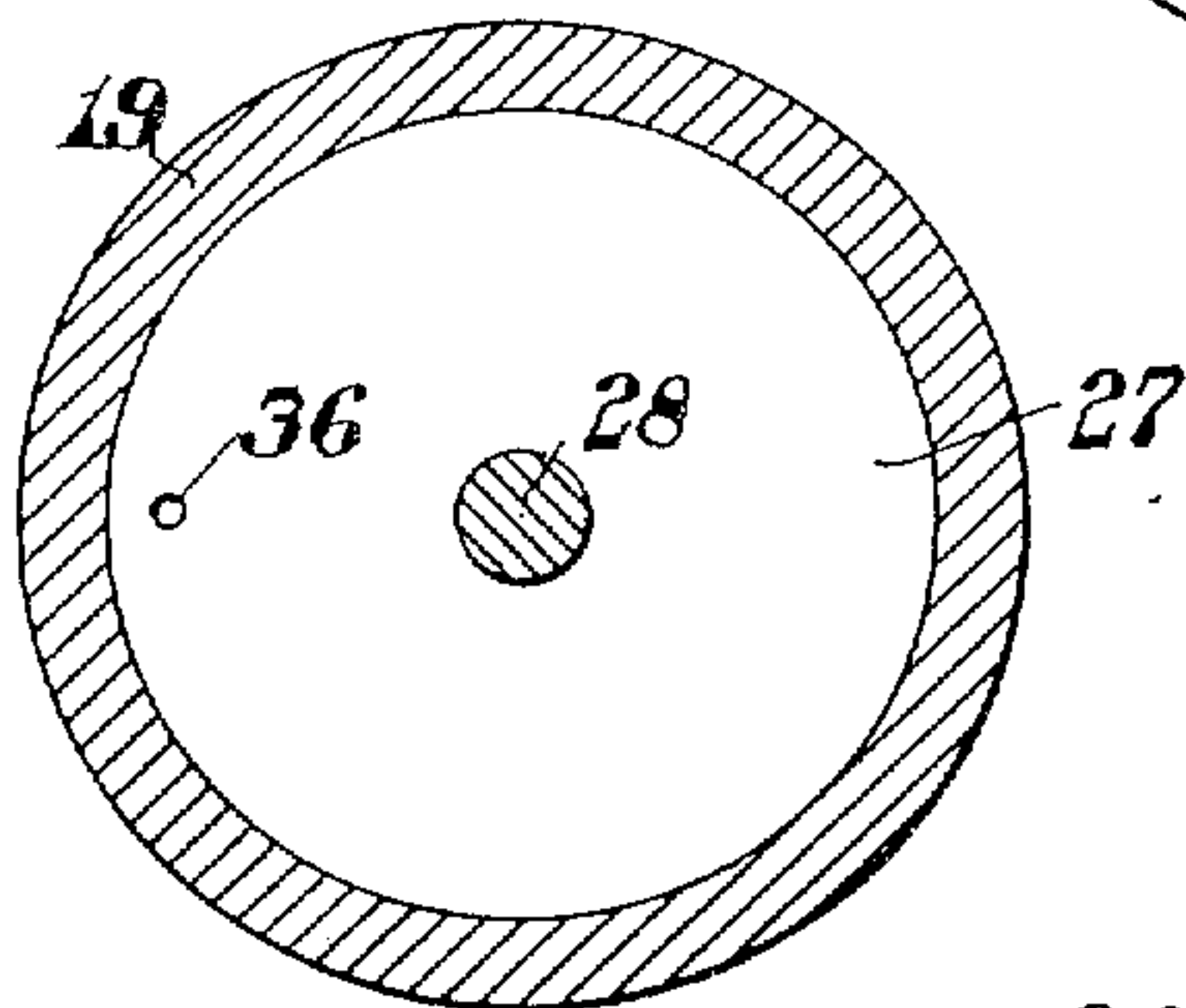
Patented Aug. 9, 1910.

2 SHEETS—SHEET 2.

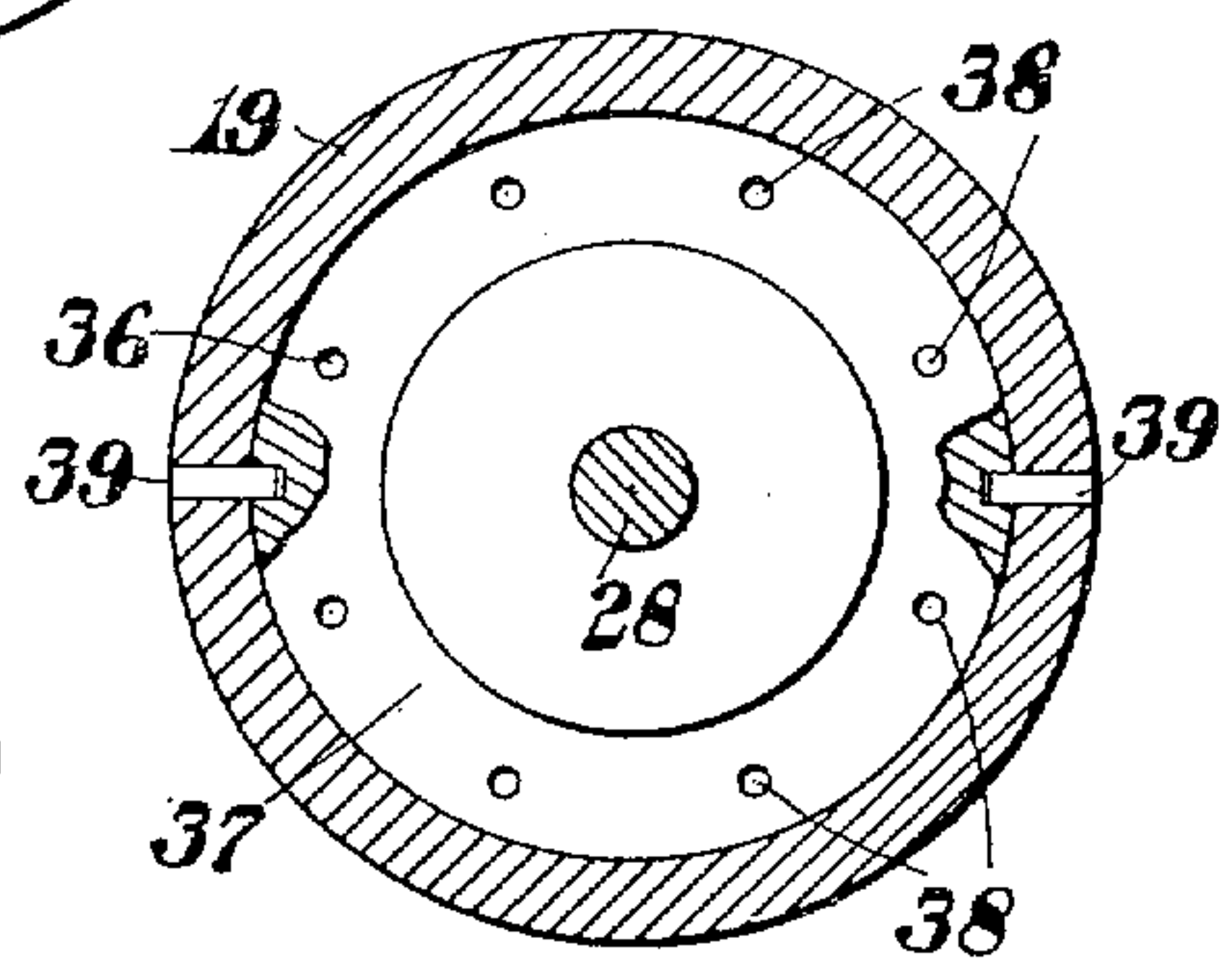
*Fig. 4.*



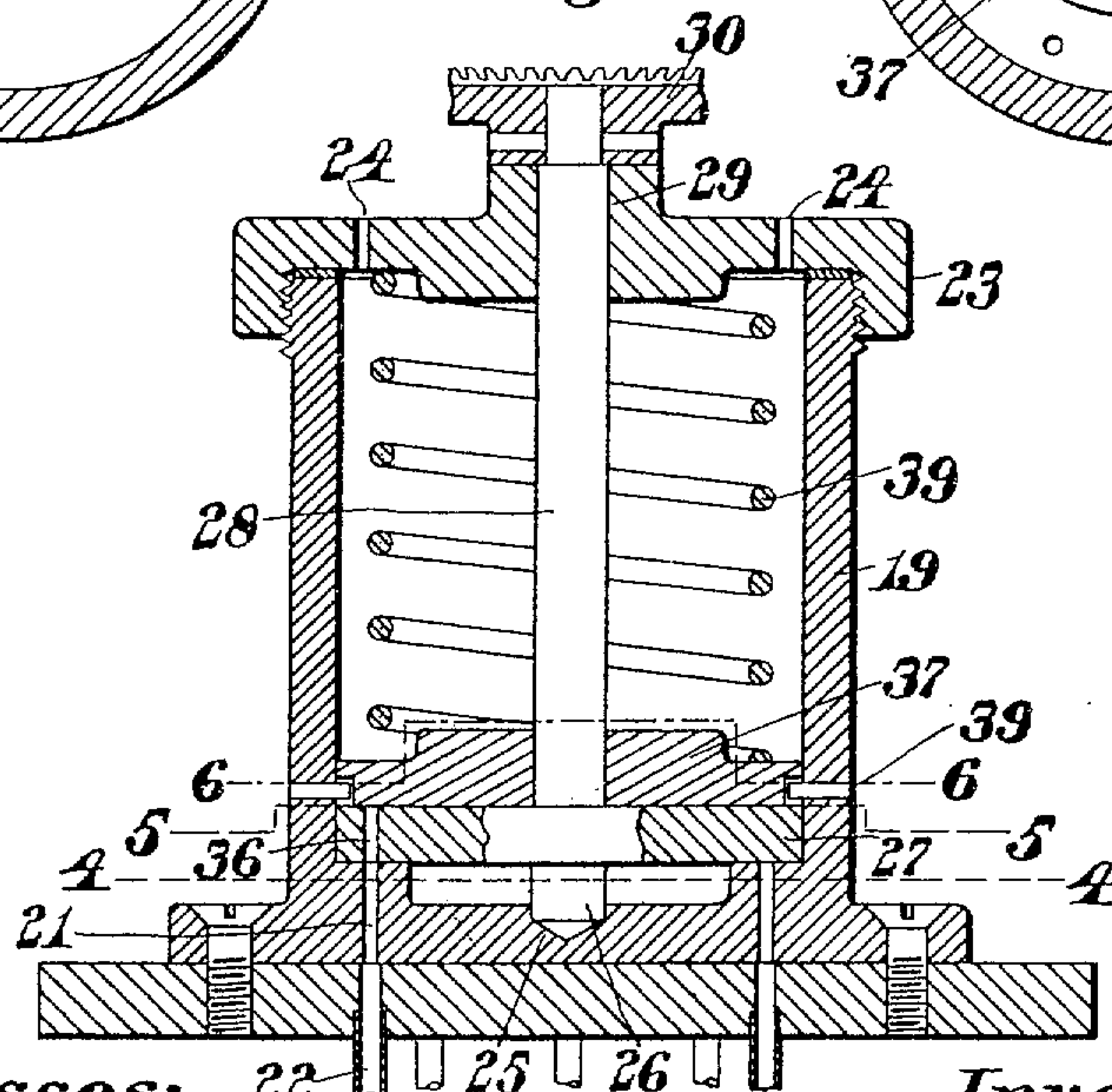
*Fig. 5.*



*Fig. 6.*



*Fig. 3.*



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# UNITED STATES PATENT OFFICE.

ERNEST C. KETCHUM, OF BOSTON, MASSACHUSETTS.

## AUTOMATIC MERCURY-DROPPER.

966,840.

Specification of Letters Patent.

Patented Aug. 9, 1910.

Application filed June 25, 1909. Serial No. 504,936.

*To all whom it may concern:*

Be it known that I, ERNEST C. KETCHUM, a citizen of the United States of America, and a resident of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Automatic Mercury-Droppers, of which the following is a specification.

This invention relates to dynamo electrical machines and has for its object the production of such a machine in which the armature may be driven direct at a high velocity from a high-speed motor without endangering the displacement of any of the elements of the armature.

The particular object of the present invention is to provide a means for delivering the desired quantity of mercury or some similar liquid to the periphery of each of the disks of said armature to insure its proper lubrication.

The invention consists in certain novel features of construction and arrangement of parts which will be readily understood by reference to the description of the drawings and to the claims hereinafter given.

Of the drawings: Figure 1 represents an elevation of a machine embodying the features of this invention. Fig. 2 represents a vertical section of the same, the cutting plane being on line 2—2 on Fig. 1. Fig. 3 represents a vertical section of the liquid-containing receptacle and mechanism contained therein for selecting a desired quantity of mercury for delivery through one of the feed tubes to the armature disks. Fig. 4 represents a horizontal section of the same, the cutting plane being on line 4—4 on Fig. 3. Fig. 5 represents a horizontal section of the same, the cutting plane being on line 5—5 on Fig. 3, and Fig. 6 represents a horizontal section of the same, the cutting plane being on line 6—6 on Fig. 3.

Similar characters designate like parts throughout the several figures of the drawings.

In the drawings, 10 represents end pieces supported by suitable legs and connected together by means of the members 11. Upon each end piece 10 is mounted a field magnet 12 in the center of which revolves a shaft 13 extending through and beyond the ends of the end pieces 10.

Within the confines of the connecting

members 11 and midway between the end pieces 10 is an intermediate member 14 on which is supported a plurality of brush holders 15, each of which is provided with a brush 16 contacting with the periphery of a disk armature 17 revoluble with the shaft 13. Each of the armature disks 17 which are of steel is provided with an annular peripheral band 18 of copper which serves to conduct the current of electricity quickly to and from all portions of the periphery of said disk. This dynamo electrical machine is constructed and operates substantially the same as that shown in a previous patent of mine, numbered 826,668, and issued July 24, 1906, the various disks of the two armatures 17 on either side of the intermediate member 14 being connected in pairs and through the brushes 16 into series, as fully explained in said prior patent. As has been disclosed in said prior patent, it was found to be advisable to provide the periphery of the armature disk, revoluble at such a high speed, with a thin film of amalgam of mercury or similar material. This amalgam acts as a lubricant and prevents undue wear of either the brush 16 or the annular copper ring 18 with which it contacts and even when passing over inequalities in the surface of the ring a perfect connection is assured at all times.

The present invention has for its particular object the provision of a means for supplying this thin film of amalgam of mercury to the periphery of the armature disks 17. In order to accomplish this object a receptacle 19 is secured by means of bolts 20 to the upper connecting members 11, the bottom of said receptacle being provided with a plurality of passages 21 therethrough equidistant from the center of said receptacle, from which passages 21 extend a plurality of tubes 22, one for each disk forming a part of the armature 17. Each of these tubes 22 is so formed as to have its delivery opening adjacent to the periphery of one of the armature disks and to one of the brushes 16 co-acting therewith.

In order to provide a means for depositing the mercury upon the periphery of each disk in the immediate vicinity of the contacting end of the brush 16\*, said brush is provided with an opening therethrough near said contacting end and one of the tubes, as for in-



stance, 22\* (see Fig. 2) is extended there-  
through with its delivery end close to the  
periphery of said disk. As the disk revolves  
in the direction of the arrow "a" on Fig. 2  
of the drawings, any mercury deposited upon  
the periphery of the disk is immediately car-  
ried to the contacting end of the brush 16\*  
and insures an electric contact between said  
brush and disk under all conditions.

The receptacle 19 is provided with a cap  
23 threaded to the upper end thereof and  
having perforations 24 therethrough for the  
admission of the atmosphere to act upon the  
amalgam of mercury or other liquid con-  
tained within the receptacle 19. The base of  
the receptacle 19 is provided with a suit-  
able central bearing 25 for a cylindrical pro-  
jection 26 formed upon a revoluble member  
27 within said receptacle 19 and having a  
stem 28 in axial alinement with said boss 26  
extending through a central bearing 29 in  
the cap 23.

To the upper end of the stem 28 is secured  
a bevel gear 30 which meshes with a bevel  
pinion 31 on a shaft 32 mounted in a suit-  
able bearing formed upon or secured to one  
of the end pieces 10 and having secured to  
its opposite end a bevel gear 34 meshing  
with a bevel pinion 35 secured to and revolu-  
ble with the armature shaft 13. It is obvious  
therefore that the revolution of the shaft 13  
causes a continuous rotation of the member  
27 at a much slower speed. This plate 27  
is provided with a perforation 36 there-  
through which is adapted to momentarily  
register with each of the perforations 21  
leading to the tubes 22 during the revolu-  
tion of said member 27. Above the revolu-  
ble member 27 is placed a non-revoluble plate  
37 provided with a plurality of perforations  
38, said perforations 38 and the perforations  
21 being equal in number. This plate 37 is  
prevented from turning by suitable members  
such as the pins 39 so that the perforations  
38 will be out of alinement with the perfo-  
rations 21 through the bottom of the recep-  
tacle 19.

The perforation 36 in the revoluble mem-  
ber 27 and the perforations 38 are equi-dis-  
tant from the center of the revoluble mem-  
ber 27 so that as this member revolves it  
momentarily registers successively with each  
of the perforations 38. Within the recep-  
tacle 19 between the plate 37 and the cap 23  
is a spiral spring 39 adapted to act upon the  
plate 37 to retain its lower face continually  
in contact with the upper face of the revolu-  
ble member 27, thus preventing any mer-  
cury or other liquid with which the recep-  
tacle 19 is filled from entering between said  
plate 37 and revoluble member 27. The ten-  
sion of the spring 29 may be regulated in an  
obvious manner by adjusting the cap 23  
upon the receptacle 19.

In the operation of the invention the re-

ceptacle 19 is partially filled with mercury  
and when the dynamo is in operation the  
revolution of the shaft 13, through the inter-  
mediate driving mechanism, causes the rota-  
tion of the member 27. As the perforation 36  
passes beneath each perforation 38 the  
portion of mercury or other liquid contained  
within said perforation 38 is permitted to  
pass into the perforation 36 and be con-  
veyed thereby into register with a perfora-  
tion 21 when this portion of the mercury  
will pass from the perforation 36 into the  
perforation 21 and through the tube 22 to  
said armature disks. This delivery of the  
mercury to the disk causes a film thereof to  
be deposited on the copper peripheral band  
of the disk and thereby lubricates the same  
and makes a perfect contact at all times with  
the co-acting brushes. The film of mercury  
is automatically constantly replenished by  
the portion of mercury selected from the  
contents of the receptacle 19 and transferred  
by means of the revoluble plate 27 to one or  
the other of the feed tubes 22 leading to the  
different armature disks.

It is believed that the operation and  
many advantages of the invention will be  
thoroughly understood from the foregoing.

Having thus described my invention, I  
claim:

1. In a dynamo electrical machine, the  
combination of a revoluble member; a brush  
co-acting therewith; a receptacle adapted to  
contain a liquid; a tube therefrom adapted  
to deliver the contents of said receptacle to  
the periphery of said revoluble member; and  
means for intermittently separating a por-  
tion of said liquid from the remainder and  
delivering it to said tube.

2. In a dynamo electrical machine, the  
combination of a revoluble member; a brush  
co-acting therewith; a receptacle adapted to  
contain a liquid; a tube therefrom adapted  
to deliver the contents of said receptacle to  
the periphery of said revoluble member; and  
means within said receptacle for automatic-  
ally feeding separated portions of its con-  
tents to said tube.

3. In a dynamo electrical machine, the  
combination of a revoluble member; a brush  
co-acting therewith; a receptacle adapted to  
contain a liquid; a tube therefrom adapted  
to deliver the contents of said receptacle to  
the periphery of said revoluble member; and  
means within said receptacle for automatic-  
ally separating portions of the contents of  
said receptacle from the remainder and de-  
livering them intermittently to said tube.

4. In a dynamo electrical machine, the  
combination of a revoluble member; a brush  
co-acting therewith; and means for inter-  
mittently feeding to the periphery of said  
revoluble member a liquid lubricant.

5. In a dynamo electrical machine, the  
combination of a revoluble member; a brush



co-acting therewith; and means for intermittently feeding to the periphery of said revoluble member a liquid lubricant substantially at the point of contact therewith of said brush.

6. In a dynamo electrical machine, having an armature and a brush co-acting therewith, the combination of a receptacle adapted to contain a liquid; a tube therefrom adapted to deliver the contents of said receptacle to the periphery of said armature; and means for intermittently separating a portion of said liquid from the remainder and delivering it to said tube.

7. In a dynamo electrical machine, having an armature, an annulus revoluble therewith, and a brush co-acting therewith, the combination of a receptacle adapted to contain a liquid; a tube therefrom adapted to deliver the contents of said receptacle to the periphery of said annulus; and means for intermittently separating a portion of said liquid from the remainder and delivering it to said tube.

8. In a dynamo electrical machine, having an armature and a brush co-acting therewith, the combination of a receptacle adapted to contain a liquid; a tube therefrom adapted to deliver the contents of said receptacle to the periphery of said armature; and revoluble means within said receptacle for separating from said liquid, portions thereof and delivering them to said tube.

9. In a dynamo electrical machine, having an armature and a brush co-acting therewith, the combination of a receptacle adapted to contain a liquid; a tube therefrom passing through the end of said brush adapted to deliver the contents of said receptacle to the periphery of said armature; and means within said receptacle for separating from said liquid portions thereof and delivering them to said tube.

10. In a dynamo electrical machine, having an armature and a brush co-acting therewith, the combination of a receptacle adapted to contain a liquid; a tube therefrom adapted to deliver the contents of said receptacle to the periphery of said armature; and a revoluble member within said receptacle having a perforation therethrough adapted to register with said delivery tube momentarily during each revolution thereof.

11. In a dynamo electrical machine, having an armature and a brush co-acting therewith, the combination of a receptacle adapted to contain a liquid; a tube therefrom adapted to deliver the contents of said receptacle to the periphery of said armature; a revoluble member within said receptacle having a perforation therethrough adapted to register with said delivery tube momentarily during each revolution thereof; and a non-revoluble plate above said revoluble member provided with a perforation out of

register with said delivery tube but adapted to register momentarily with said perforation in said member during its revolution.

12. In a dynamo electrical machine, having an armature and a brush co-acting therewith, the combination of a receptacle adapted to contain a liquid; a tube therefrom adapted to deliver the contents of said receptacle to the periphery of said armature; a revoluble member within said receptacle having a perforation therethrough adapted to register with said delivery tube momentarily during each revolution thereof; a non-revoluble plate above said revoluble member provided with a perforation out of register with said delivery tube but adapted to register momentarily with said perforation in said member during its revolution; and a spring adapted to press said plate into contact with said revoluble member.

13. In a dynamo electrical machine, having an armature and a brush co-acting therewith, the combination of a receptacle adapted to contain a liquid; a tube therefrom adapted to deliver the contents of said receptacle to the periphery of said armature; a revoluble member within said receptacle having a perforation therethrough adapted to register with said delivery tube momentarily during each revolution thereof; a non-revoluble plate above said revoluble member provided with a perforation out of register with said delivery tube but adapted to register momentarily with said perforation in said member during its revolution; a spring adapted to press said plate into contact with said revoluble member; and means for regulating the tension of said spring.

14. In a dynamo electrical machine, having an armature and a brush co-acting therewith, the combination of a receptacle adapted to contain a liquid; a tube therefrom adapted to deliver the contents of said receptacle to the periphery of said armature; a revoluble member within said receptacle having a perforation therethrough adapted to register with said delivery tube momentarily during each revolution thereof; a non-revoluble plate above said revoluble member provided with a perforation out of register with said delivery tube but adapted to register momentarily with said perforation in said member during its revolution; a spring adapted to press said plate into contact with said revoluble member; and means for rotating said member operated by the armature shaft.

15. In a dynamo electrical machine, having an armature and a brush co-acting therewith, the combination of a receptacle adapted to contain a liquid; a tube therefrom adapted to deliver the contents of said receptacle to the periphery of said armature; a revoluble member within said receptacle having a perforation therethrough adapted



to register with said delivery tube momentarily during each revolution thereof; a non-revoluble plate above said revoluble member provided with a perforation out of register with said delivery tube but adapted to register momentarily with said perforation in said member during its revolution; a spring adapted to press said plate into contact with said revoluble member; a gear on the shaft of said revoluble member; a gear on the armature shaft; and mechanism interposed between said gears to cause said member to be rotated by the revolution of said shaft.

16. In a dynamo electrical machine, having an armature composed of a plurality of disks and a brush holder having a plurality of brushes thereon each contacting with a different disk; a receptacle adapted to contain a liquid; a revoluble member within said receptacle provided with a perforation therethrough; and a plurality of tubes from said receptacle each adapted to register successively with said perforation in said member during its rotation and deliver to a different armature disk a portion of the liquid in said receptacle.

17. In a dynamo electrical machine, having an armature composed of a plurality of disks and a brush holder having a plurality of brushes thereon each contacting with a different disk; a receptacle adapted to contain a liquid; a revoluble member within said receptacle provided with a perforation therethrough; a plurality of tubes from said receptacle each adapted to register successively with said perforation in said member during its rotation and deliver to a different armature disk a portion of the liquid in said receptacle; and a non-revoluble plate above and contacting with said revoluble member having perforations therethrough equal to the number of delivery tubes, each of which is adapted to successively register with the perforations in said revoluble member during its rotation.

18. In a dynamo electrical machine, having an armature composed of a plurality of disks and a brush holder having a plurality of brushes thereon each contacting with a different disk; a receptacle adapted to contain a liquid; a revoluble member within said receptacle provided with a perforation therethrough; a plurality of tubes from said receptacle each adapted to register succes-

sively with said perforation in said member during its rotation and deliver to a different armature disk a portion of the liquid in said receptacle; and a non-revoluble plate above and contacting with said revoluble member having perforations therethrough equal to the number of delivery tubes but out of register therewith, each of which is adapted to successively register with the perforations in said revoluble member during its rotation.

19. In a dynamo electrical machine, having an armature composed of a plurality of disks and a brush holder having a plurality of brushes thereon each contacting with a different disk; a receptacle adapted to contain a liquid; a plurality of delivery tubes therefrom each adapted to deliver a portion of said liquid to a different armature disk; and means within said receptacle for selecting equal portions of said liquid and delivering these portions successively to said tubes.

20. In a dynamo electrical machine, having an armature and a brush co-acting therewith; a receptacle adapted to contain a liquid; a tube therefrom adapted to deliver a portion of the liquid to the periphery of said armature; and means within said receptacle for separating a desired quantity of said liquid from the remainder and delivering it to said tube.

21. In a dynamo electrical machine, the combination of a revoluble member; a brush co-acting therewith; a receptacle adapted to contain a liquid; a tube therefrom adapted to deliver the contents of said receptacle to the periphery of said revoluble member; a pressure member within said receptacle adapted to force the liquid into said tube; and means for alternately covering and uncovering the inlet to said tube.

22. In a dynamo electrical machine, the combination of a revoluble member; a brush co-acting therewith; means for intermittently feeding to the periphery of said revoluble member a liquid lubricant; and means for varying the feed with the speed of the revoluble member.

Signed by me at 4 Post Office Sq., Boston, Mass., this 14th day of April, 1909.

ERNEST C. KETCHUM.

Witnesses:

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NATHAN C. LOMBARD.