No. 620,130. Patented Feb. 28, 1899.

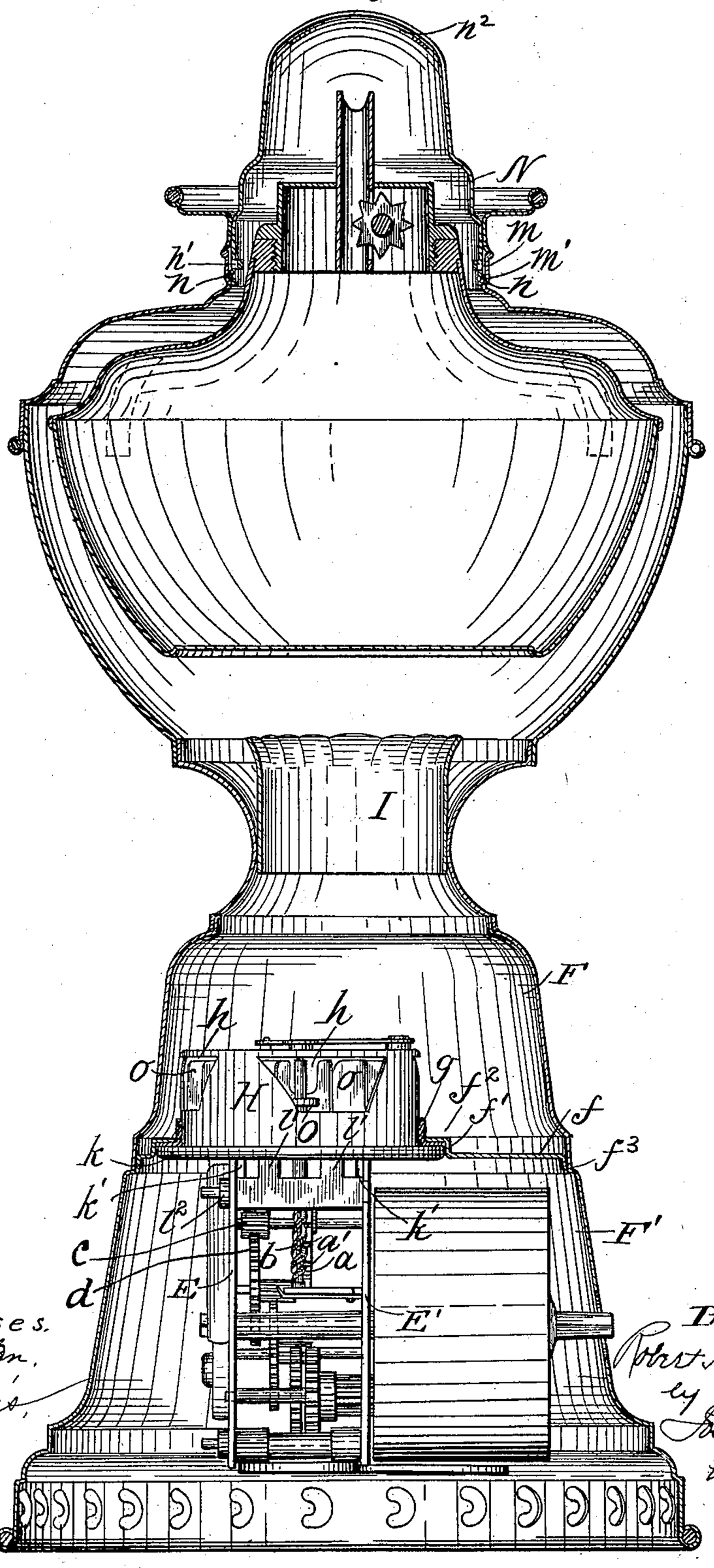
R. HITCHCOCK.

FORCED DRAFT LAMP.

(Application filed Sept. 24, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



Witnesses.
W. R. Edson.
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his Attys.

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(No Model.) 3 Sheets—Sheet 2.

Fig. 3.

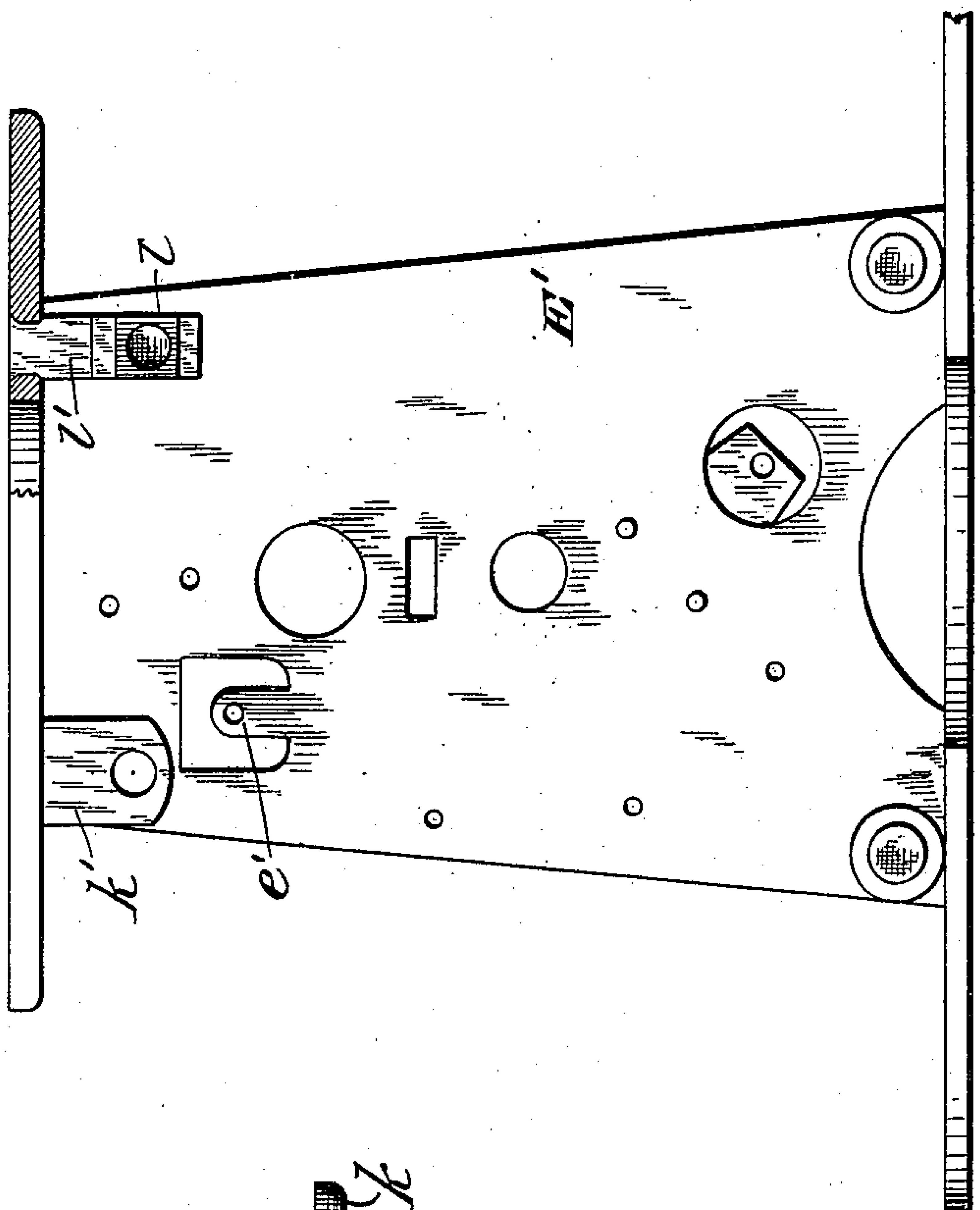
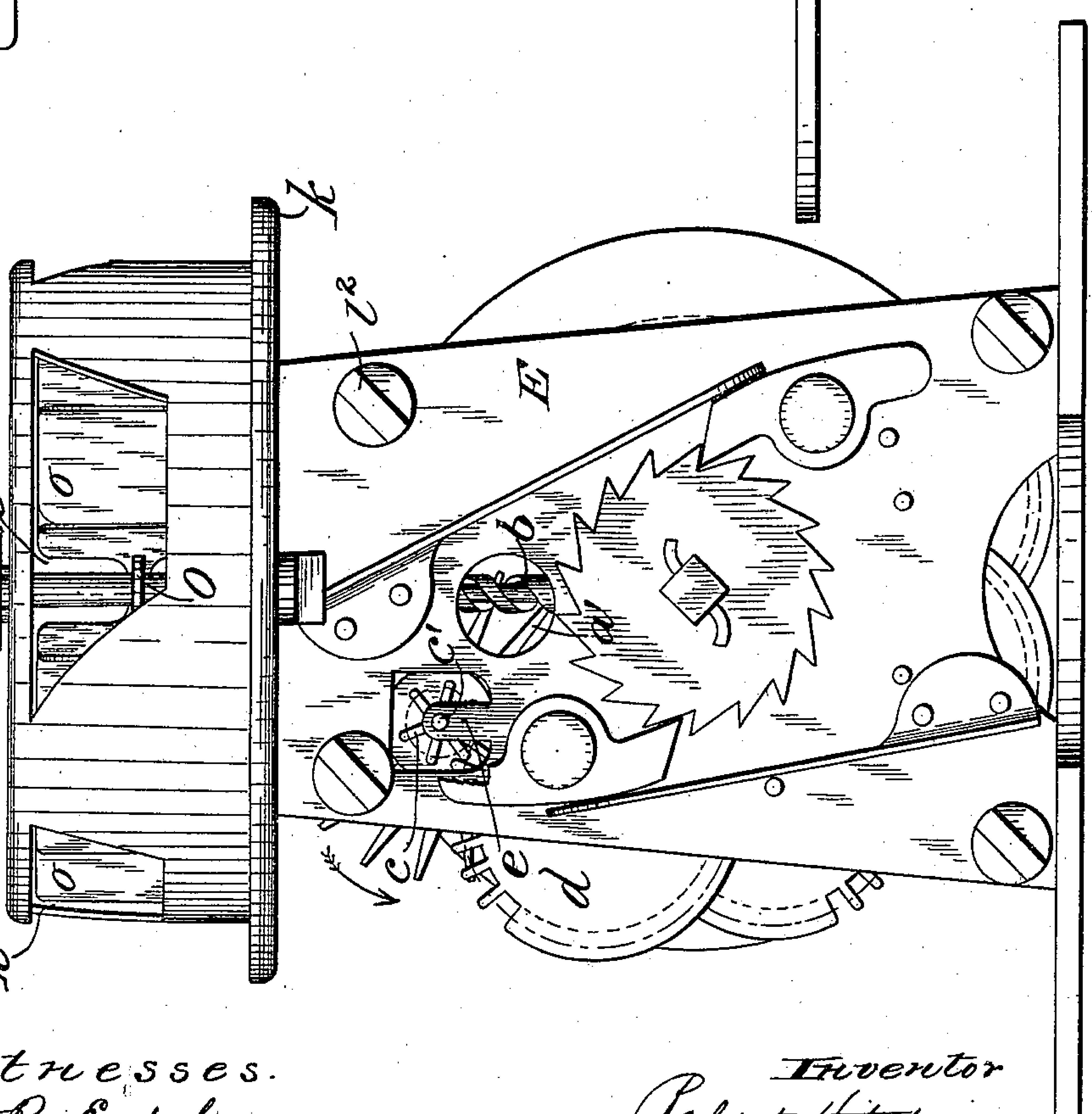


Fig. 2.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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Fig. 6.

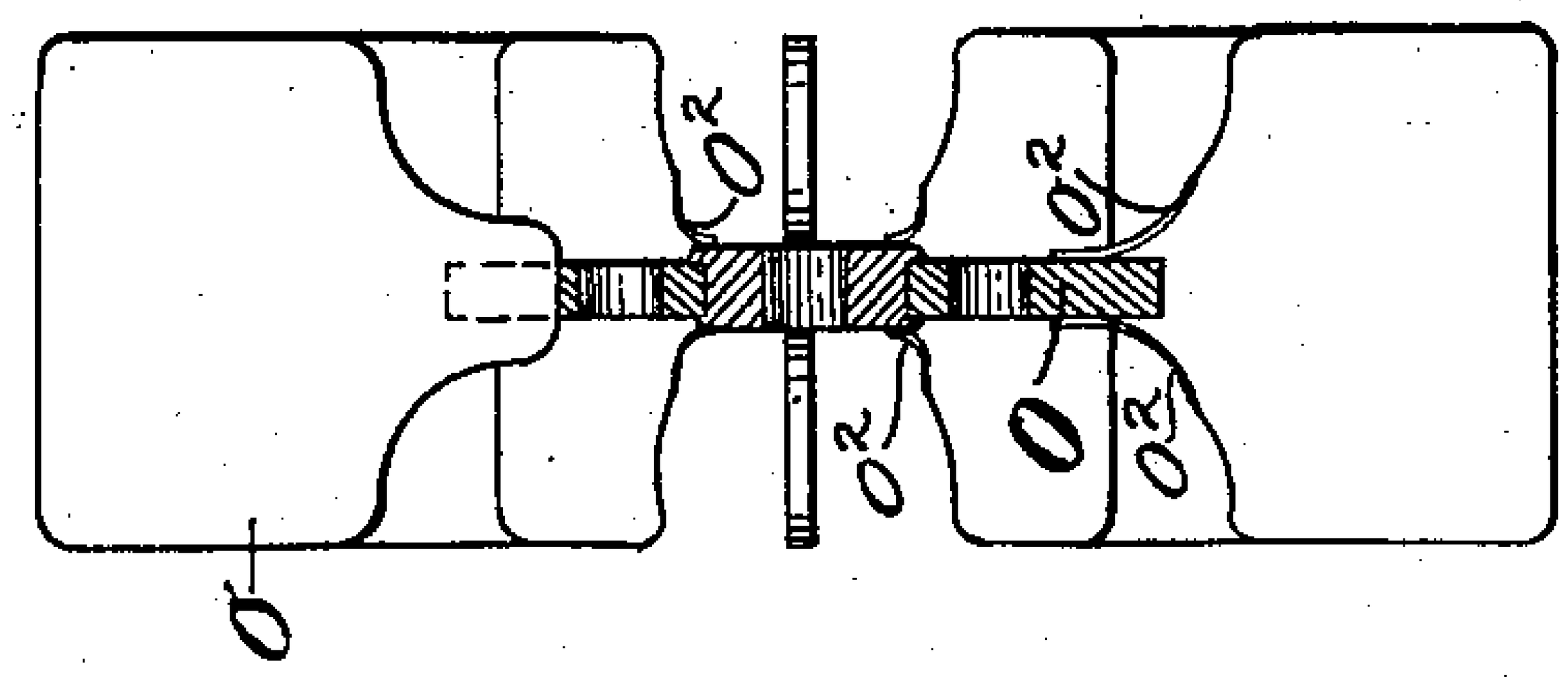


Fig. 4.

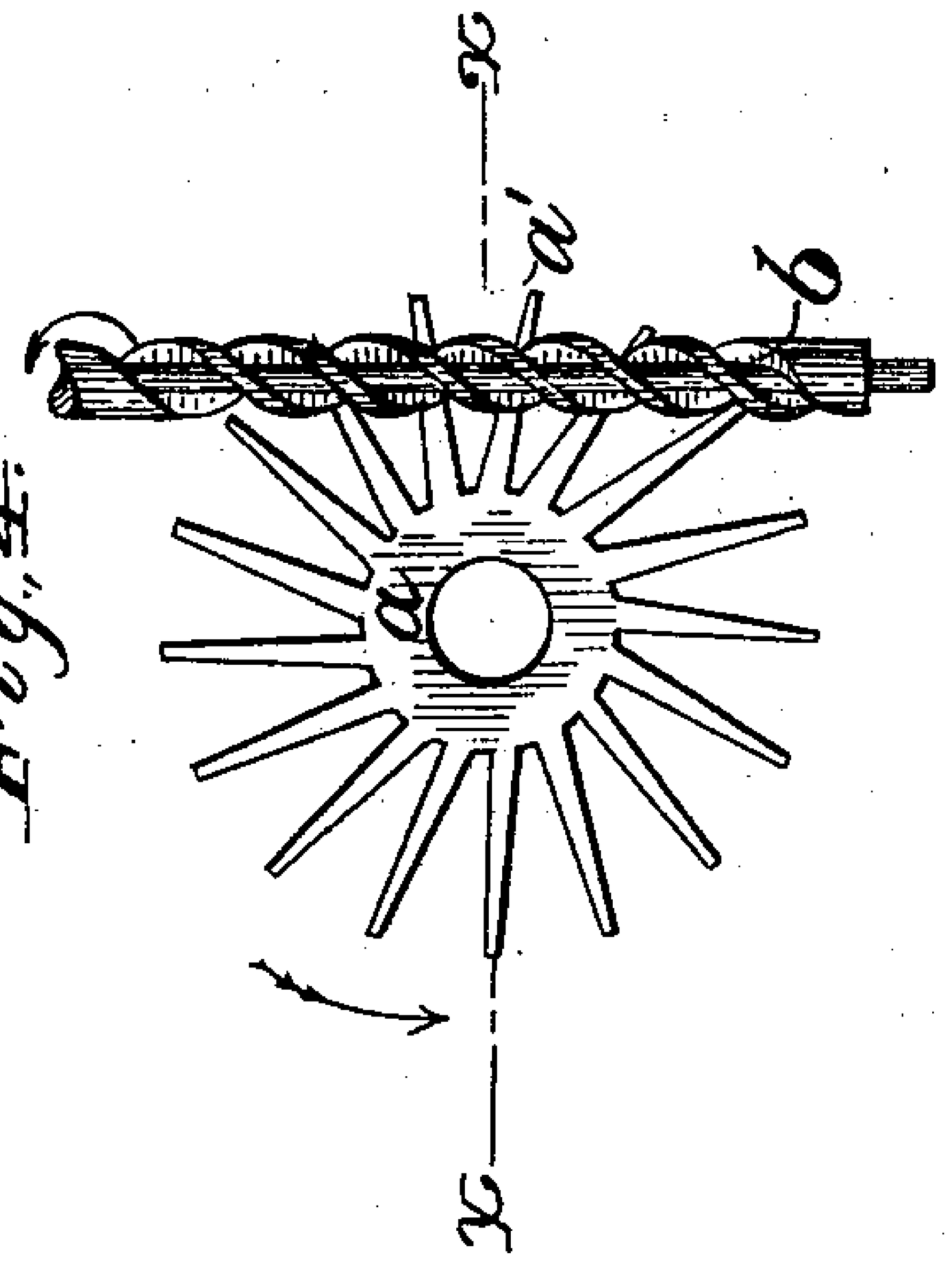


Fig. 5.

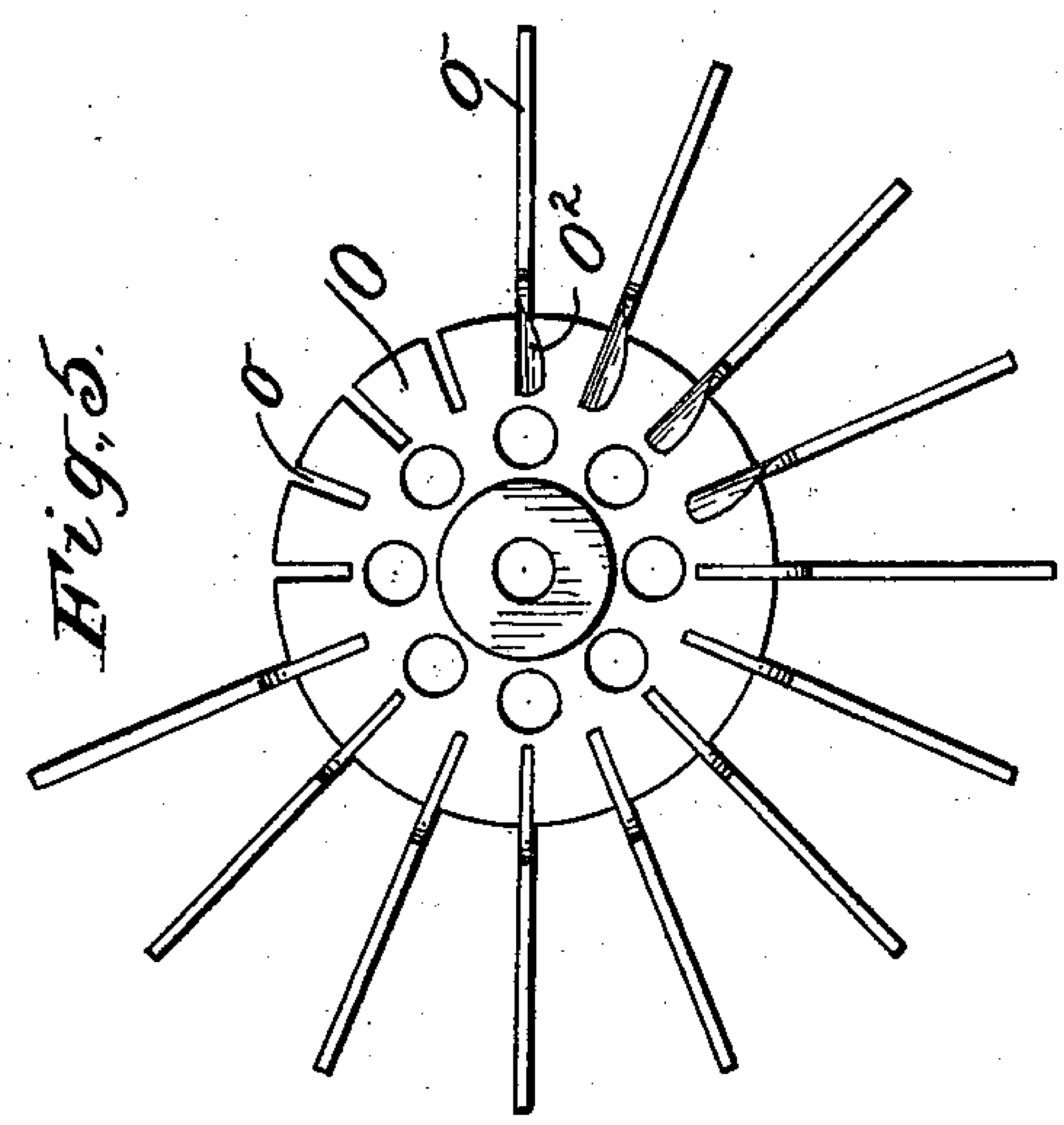


Fig. 7.

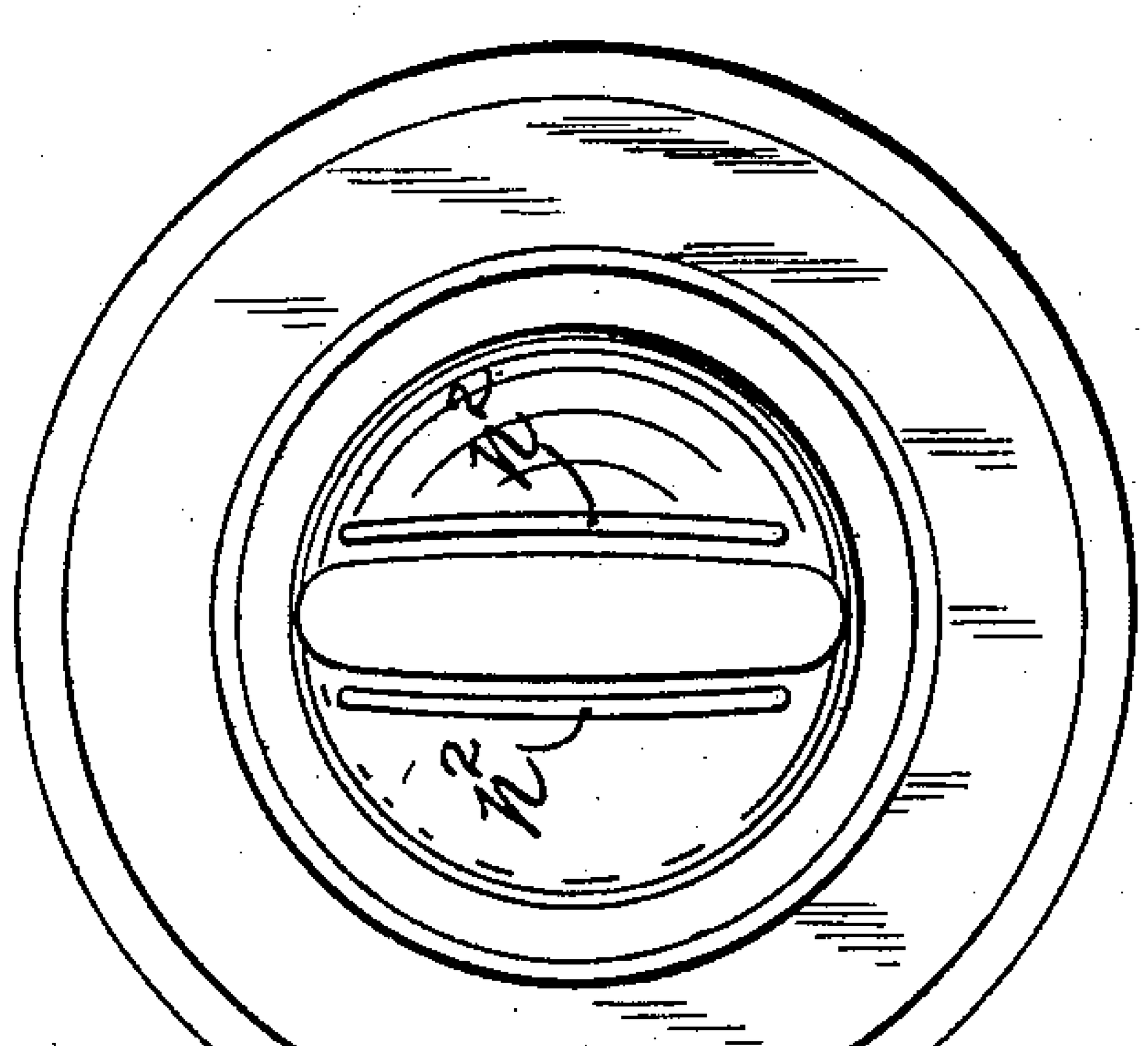
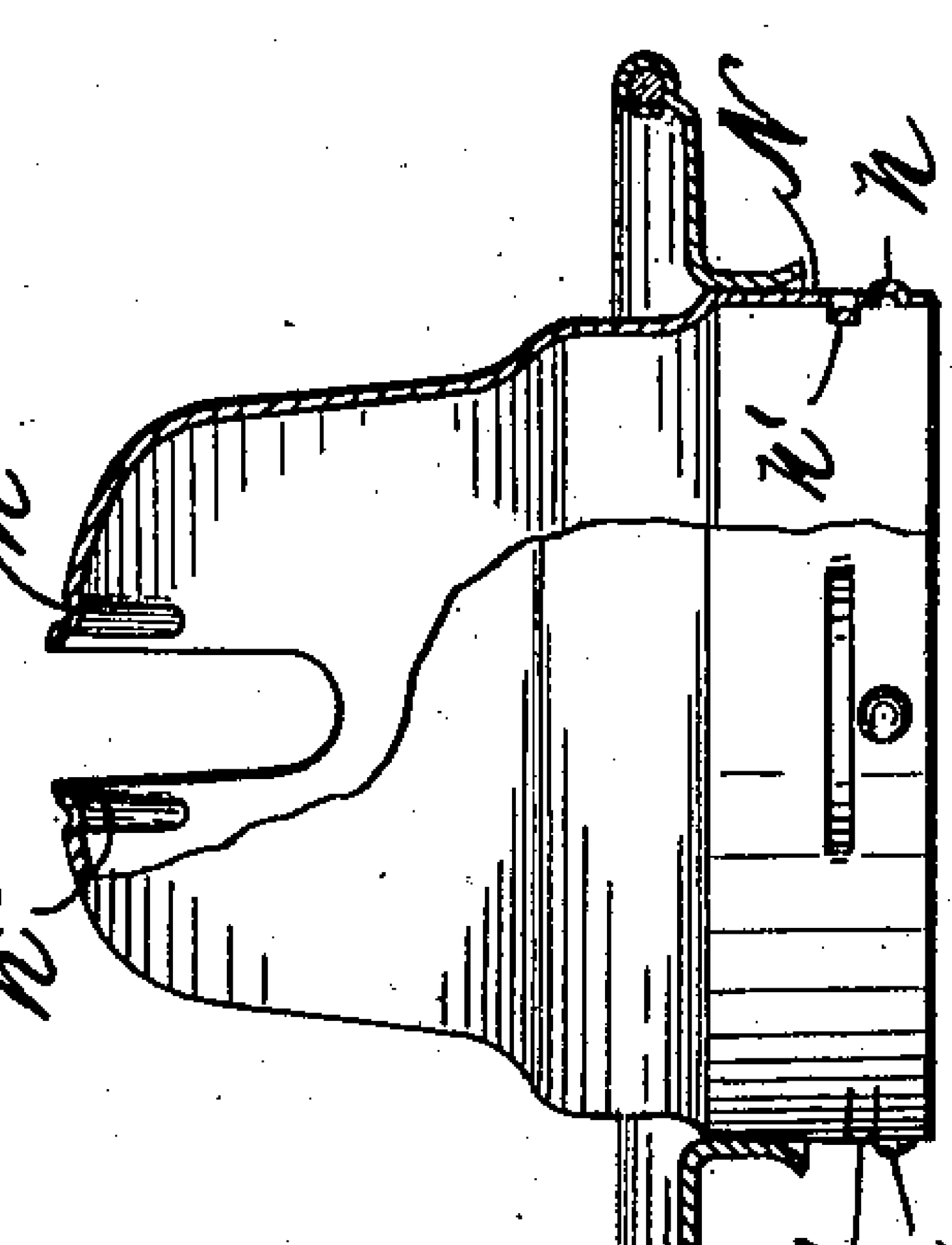


Fig. 8.



Witnesses
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his attys.

UNITED STATES PATENT OFFICE.

ROBERT HITCHCOCK, OF WATERTOWN, NEW YORK.

FORCED-DRAFT LAMP.

SPECIFICATION forming part of Letters Patent No. 620,130, dated February 28, 1899.

Application filed September 24, 1898. Serial No. 691,813. (No model.)

To all whom it may concern:

Be it known that I, ROBERT HITCHCOCK, of Watertown, New York, have invented a new and useful Improvement in Forced-Draft Lamps, which improvement is fully set forth in the following specification.

This invention relates to "forced-draft" or "mechanical" lamps, such as are described in many Letters Patent of the United States heretofore granted to me, and more particularly to the lamp described in my Patent No. 551,728, dated December 17, 1895.

With the object of still further perfecting the operation of the lamp of my last-mentioned patent and of cheapening the cost of manufacture thereof my present invention embraces improvements in the worm-wheel, the mounting of the worm-wheel shaft, whereby the same may be adjusted to secure a noiseless engagement of the pinion thereof with its driving-gear, the formation of the base or that part of the shell below the neck in two parts, the diaphragm for separating the air-chamber or pressure-chamber from the chamber containing the motor mechanism for driving the blower being formed integrally with the lower one of said parts, the frame for supporting the motor mechanism and the blower-casing, the dome and the means for detachably securing the same to the shell, and the blower. These improvements will be best understood by reference to the accompanying drawings, illustrating a lamp embodying the same, and with the exception of said improvements the lamp therein shown is substantially the same as that of my patent already referred to.

In said drawings, Figure 1 is a vertical section, partly in elevation. Fig. 2 is a side elevation of the blower and air-blast mechanism. Fig. 3 is an elevation of the framework for the motor mechanism of the blower, one of the side plates thereof (that shown in elevation in Fig. 2) being omitted. Fig. 4 is a detail view of the worm and its driving-wheel, showing the relative position thereof when in operation. Figs. 5 and 6 are detail views of the blower-wheel. Fig. 7 is a top view, and Fig. 8 a side elevation, partly in section, of the dome for the burner.

The worm-wheel.—One of the most difficult problems in the production of a noiselessly-operating forced-draft lamp has been the construction of the worm-wheel which operates the worm carrying at its upper end the blower. Many different forms of worm-wheels have been tried, and while most of them have been abandoned some have given satisfactory results, operating with little, if any, perceptible noise. These results, however, have not been uniform in different lamps and are found to depend largely upon accuracy in the construction of the wheel and in its adjustment with reference to the worm, which add much to the cost of the lamp. The little noise that is even then perceptible (and to many users it is not objectionable) I have found to be principally due to the impact that takes place when the teeth of the worm-wheel come into contact with the worm, and while the worm-wheel has generally been made of hard rubber, which is a bad conductor of sound, nevertheless, the teeth of the wheel being in all cases rigid and unyielding, some of the vibrations reach the more resonant metal of the movement, the result being an augmentation of the sound, due directly to the impact of the teeth of the worm-wheel with the worm.

In accordance with my present invention I eliminate the cause of the noise above referred to and produce what I now believe to be a practically noiseless mechanism by the use of a worm-wheel having flexible or yielding teeth which yield or bend while acting in contact with the worm and follow up the worm on parting contact therewith, thereby avoiding the shocks and impacts that take place when rigid or unyielding teeth are employed. The yielding or bending of the teeth absorbs what vibration there may be, if any, so that it does not reach the movement to produce noise therein, as pointed out with reference to the old forms of worm-wheels. Moreover, a more regular and uniform rotation of the blower is secured, with the effect of avoiding a slight tremor in the flame discernible by an expert in lamps employing the form of worm-wheel heretofore generally used.

As preferably constructed, my improved worm-wheel is of the form shown in Fig. 4 and indicated by the reference-letter *a*, it being somewhat greater in diameter than the wheels ordinarily used and the teeth *a'* thereof being of such length and cross-section as to

render them sufficiently elastic and enable the ends thereof to extend beyond the center of the worm *b*. The acting edges a^2 of the teeth (instead of being on radial lines) are inclined, respectively, toward tangents to the circumference of the wheel, so that in operation the inclination of the said acting edges approaches more closely the inclination or pitch of the thread of the worm against which they act, thereby giving a more even and prolonged contact with the latter. With the wheel so formed the teeth do not strike as they come into the spiral grooves of the worm at the lower end thereof, but make contact with the worm and begin their action when they reach a position approximately on an imaginary line at right angles to the axis of the worm through the axis of rotation of the wheel, (see line *x x*, Fig. 4,) the action of each tooth being from its base toward its outer end, (just the reverse of the action of the worm-wheels previously used, in which the extreme points of the teeth first came into contact with the worm and the action was inward toward the base of the tooth,) and a greater number of teeth are at all times in action on the worm than with wheels heretofore employed.

Another important advantage in the use of my improved worm-wheel having flexible teeth is that inaccuracies in cutting or spacing the teeth will not ordinarily affect the operation of the mechanism, for the reason that the teeth will yield to compensate for such imperfection, whereby a great saving in cost of labor and material is effected. Furthermore, the liability of breakage of the teeth upon falling or rough handling of the lamp is much less.

Hard rubber is the material of which the worm-wheel is preferably made, although other materials suitable for the purpose may be employed.

Mounting of worm-wheel shaft.—I have found that in the operation of the blower mechanism noise sometimes results from the imperfect meshing of the pinion *c* (see Figs. 1 and 2) with gear-wheel *d* of the movement, and in order to avoid this I have by my present invention provided for the adjustment of the shaft *c'*, which carries pinion *c* and worm-wheel *a*. To that end openings or free holes of approximately the shape of an inverted **U** are cut in the plates E E' of the supporting-frame for the movement, thereby forming tongues *e e'*, in the upper ends of which the ends of shaft *c'* are journaled. By bending the tongues *e e'* in one direction or the other by means of a suitable tool the desired adjustment can be attained. By reason of the length and flexibility of the teeth of the worm-wheel such adjustment does not impair the engagement thereof with the worm. The same adjustment would not be practicable with the old form of worm-wheel.

The lamp-shell.—The lamp-shell has in accordance with my present invention been improved by making the lower half thereof (the part below the neck) in two parts (indicated by reference-letters F F') instead of in one piece, as heretofore, the diaphragm *f* for separating the compression or air-pressure chamber from the chamber containing the motor mechanism for the blower being formed integrally with the lower part F (as by stamping from a single sheet of metal) and having an opening therethrough surrounded by vertical flange *f'* and horizontal flange f^2. The upper part F rests against a shoulder f^3, formed around the part F', and is secured to the latter by soldering or in any other convenient way. A collar *g*, projecting upwardly, fits closely and is firmly secured in the opening through diaphragm *f* and fits around the drum H inclosing the blower, said drum projecting upwardly into the pressure-chamber, outlet-openings *h* being formed in the periphery thereof. The close fit of the collar *g* forms a tight joint between the drum and diaphragm and prevents the escape of air from the pressure-chamber, at the same time permitting the ready removal of the drum, thus enabling me to dispense with packing heretofore employed for this purpose. The collar may of course be formed integral with the diaphragm. By reason of the upwardly-turned flanges around the opening through diaphragm *f* a secondary drip-cup is formed about the blower for catching oil-drippings and particles of wick that may get past drip cup or thimble I in the neck of the shell. By the construction above pointed out not only is a much more rigid and durable shell produced, but its cost of manufacture is cheapened.

The frame for supporting the parts of the movement or motor mechanism and consisting principally of the plates E E' is the same as that set forth in my 1895 patent with the exception of the differences which I shall now point out. As in my former patent, the diaphragm-plate *k* is secured to plates E E' at one side (the left in Figs. 2 and 3) by lugs *k' k'*. (See Figs. 1 and 3.) For connecting the plates E E' and securing the diaphragm-plate *k* thereto at the other side (the right in Figs. 2 and 3) I now provide a bar *l*, which is riveted through plate E' at one end, has upwardly-projecting arms *l' l'* thereon, which are riveted through the diaphragm-plate *k*, and at its other end is detachably secured to plate E, as by means of a screw l^2. The bar *l* and arms *l' l'*, integral therewith, are stamped from a single sheet of metal by a suitable die, no gaging to determine the proper length thereof being required, as with the two studs and pillar of my patented structure, which must be of exactly the proper dimensions in order that the plates shall not be too far apart or too close together.

Burner-dome and means for detachably securing the same to the shell.—In my last patent hooks manipulated by push-pins and engaging under a shoulder on the shell were the

means illustrated for detachably securing the burner-dome to the shell. Said devices have, however, been found inconvenient and difficult to handle for the reason that there are too many parts to be manipulated at the same time in detaching the dome. The principal objection, however, is the cost of manufacture. In accordance with my present invention I overcome the difficulties and objections above referred to by forming a depression or groove m' around the inner face of the collar or vertical annular flange m at the upper end of the shell and form a number of nubs n around the lower edge or band of the dome N, so that when the lower end of the latter is forced into collar or flange m said nubs engage groove m'. To provide for the yielding or flexibility of the nubs as they are forced into engagement with the groove m', a slit n' of sufficient length is cut entirely through the metal of the dome just above each nub, as clearly shown in Fig. 8, so that the latter is, in effect, carried by a narrow spring-band. Without such provision being made, the dome-band being rigid and unyielding, the nubs would wear quickly and soon become useless for the purpose for which they are intended.

The flame-slot in the burner-dome of course greatly weakens the latter, and in order to render it sufficiently durable and rigid it has heretofore been necessary to make it of comparatively thick metal, which is objectionable principally in that it conducts more heat to the other parts of the lamp and is more expensive and heavier than thinner metal. In order to employ thinner metal and at the same time render the dome adjacent to the slot sufficiently rigid to withstand hard usage, I form corrugations n^2 therein at each side of and parallel with the burner-slot. The ridges (not the depressions) of these corrugations being on the inside of the dome, the air-blast is not interfered with.

The blower (see Figs. 5 and 6) consists of a central disk O, having radial slots o therein, in which the vanes or wings o' are secured. The inner ends of these vanes are reduced in width and the edges thereof are bent down tightly against the disk O, as at o^2, to secure the blades in the slots. This is much preferable to soldering the blades in the slots and, furthermore, does not necessitate extra balancing of the wheel, as required after soldering. In Fig. 5 only a few of the blades are shown with their edges bent over.

Having thus described my invention, what I claim as new is—

1. In air-forcing mechanism for forced-draft lamps, the combination with the blower and its worm, of a worm-wheel having flexible teeth for driving said worm, substantially as described.

2. In air-forcing mechanism for forced-draft lamps, the combination with the blower, and its worm, of a worm-wheel for driving said worm, said wheel having flexible teeth of such length as to extend to and past the center of the worm when in engagement therewith, substantially as described.

3. In air-forcing mechanism for forced-draft lamps, the combination with the blower and its worm, of a worm-wheel having flexible teeth the acting faces of which are inclined away from radii drawn from the axis of rotation of said wheel, substantially as described.

4. In air-forcing mechanism for forced-draft lamps, the combination with the blower and its worm, of a worm-wheel having long narrow flexible teeth and being so disposed with reference to the worm that said teeth project to and past the center of the same, whereby two or more teeth are at all times in engagement with the worm, substantially as described.

5. The shell of a forced-draft lamp formed in two parts below the neck thereof and having a diaphragm formed integral with one of said parts for separating the pressure-chamber from the chamber containing the motor mechanism for the blower, substantially as described.

6. The shell of a forced-draft lamp formed in two parts below the neck thereof, and having a diaphragm formed integral with one of said parts for separating the pressure-chamber from the chamber containing the motor mechanism for the blower, said diaphragm having an opening therein through which the blower projects into the pressure-chamber, and an upturned flange around said opening forming a drip-cup, substantially as described.

7. In a forced-draft lamp, the combination with the shell formed in two parts below the neck thereof, of a diaphragm formed integral with the lower part for separating the pressure-chamber from the chamber containing the motor mechanism, a blower and its inclosing drum having air-inlet openings therein, projecting upwardly into the pressure-chamber through an opening in the diaphragm, and a collar forming a tight joint between said drum and diaphragm, substantially as described.

8. The combination with a lamp-shell having a collar at the upper end thereof, of a burner-dome adapted to fit into said collar at its lower end, a spring-nub on said dome, adapted to engage a depression in the collar on the shell formed by cutting a slit through the metal of the dome in proximity to the nub, substantially as described.

9. The combination with a lamp-shell having a collar at the upper end thereof, said collar having a groove or depression around its inner surface, of a burner-dome adapted to fit into said collar at its lower end, spring-nubs adapted to engage the groove or depression in the collar of the shell and disposed at intervals around said dome and near the edge thereof and formed by cutting slits through the metal of the dome just above the nubs and parallel to the edge of the cone, substantially as described.

10. A blower consisting of a central disk having slots in the periphery thereof, vanes fitting into said slots and bent down against the disk to hold them securely in position, substantially as described.

11. In a frame for supporting the parts of a motor mechanism for a forced-draft lamp, the combination with two vertically-disposed plates and a diaphragm-plate thereon, of a bar adapted to be firmly secured at one end through one of said vertical plates and detachably secured at its other end to the other plate, and two upwardly-projecting arms formed integral with said bar and adapted to be firmly secured to the diaphragm-plate, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

ROBERT HITCHCOCK.

Witnesses:
G. E. WOOD,
B. A. FIELD.