

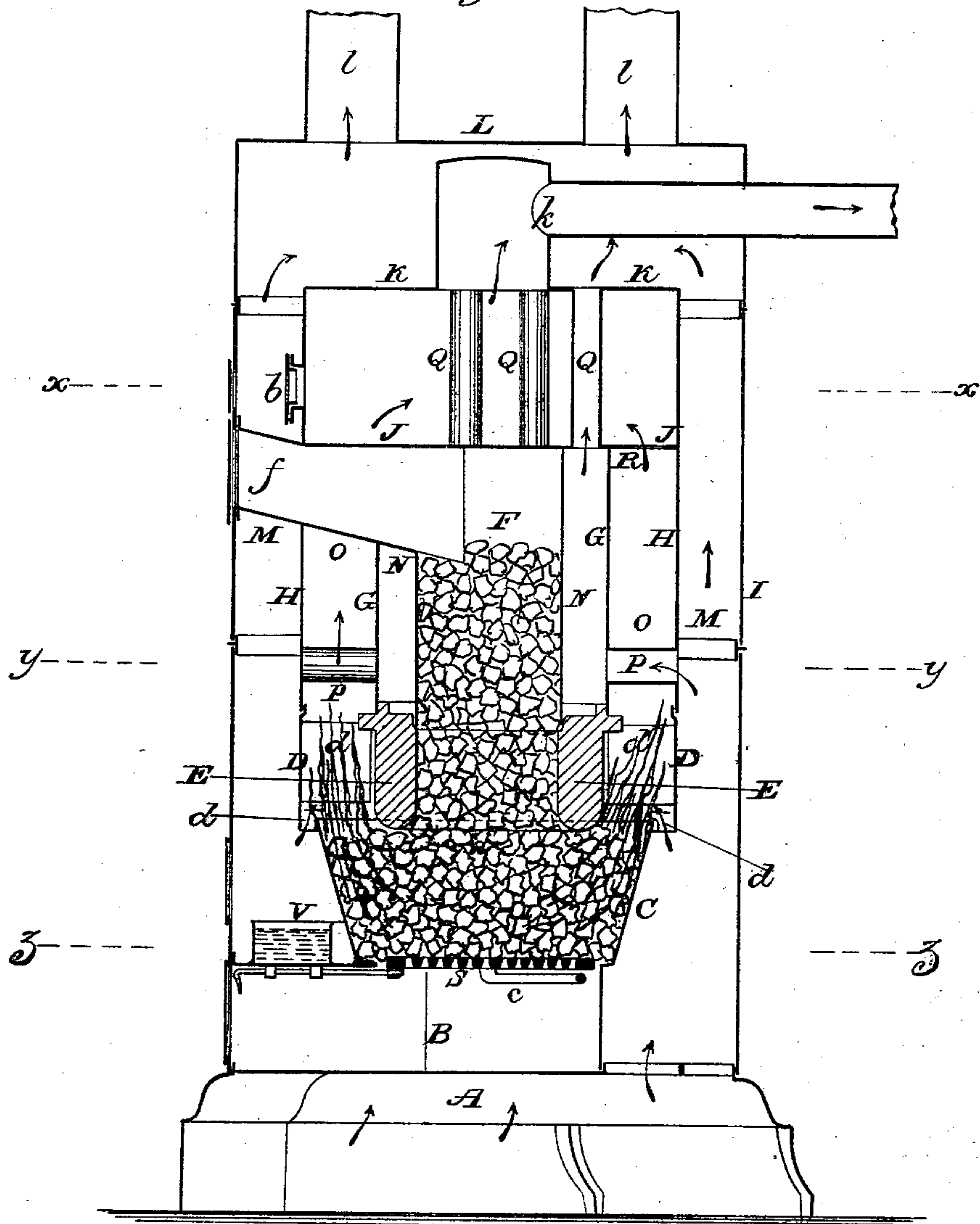
M. W. LESTER.

## HOT AIR FURNACE.

No. 94,224.

Patented Aug. 31, 1869.

*Fig. 1.*



Witnesses:  
H. F. Everts,  
C. W. Searns

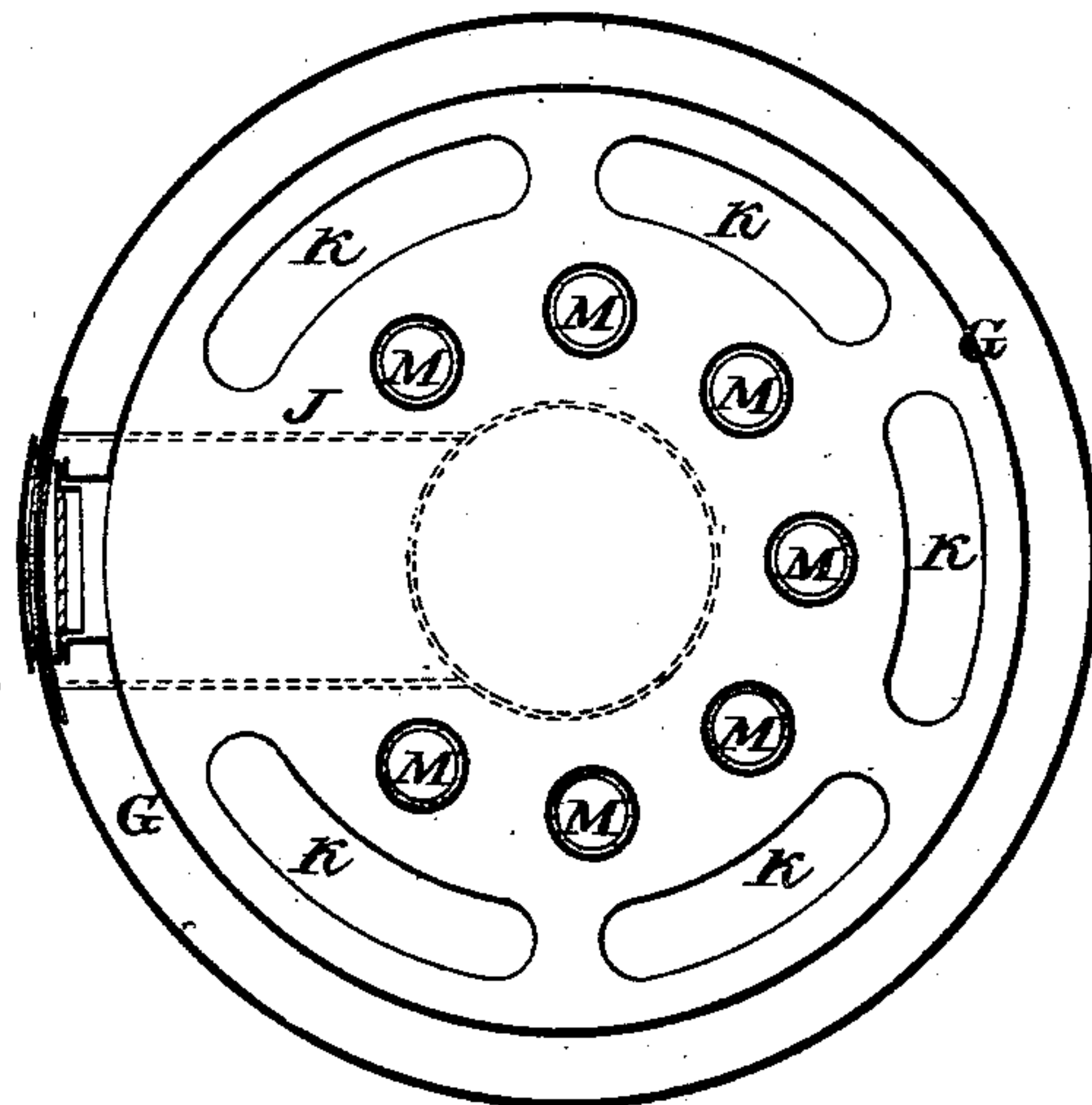
Inventor:  
M W Lester

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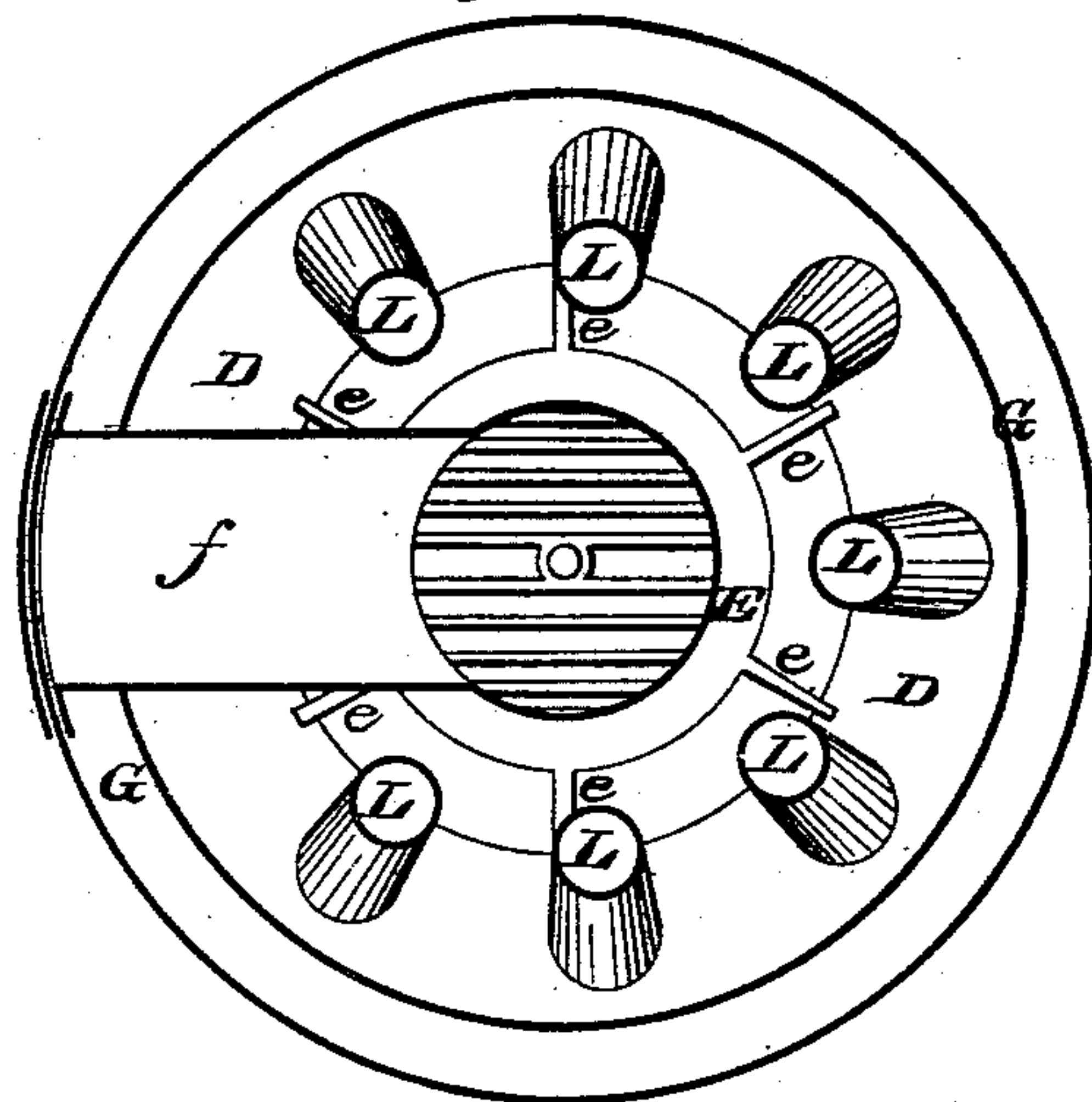
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*Fig. 2.*



*Fig. 3.*



*witnesses:*

*H. F. Everts.  
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Fig. 2.

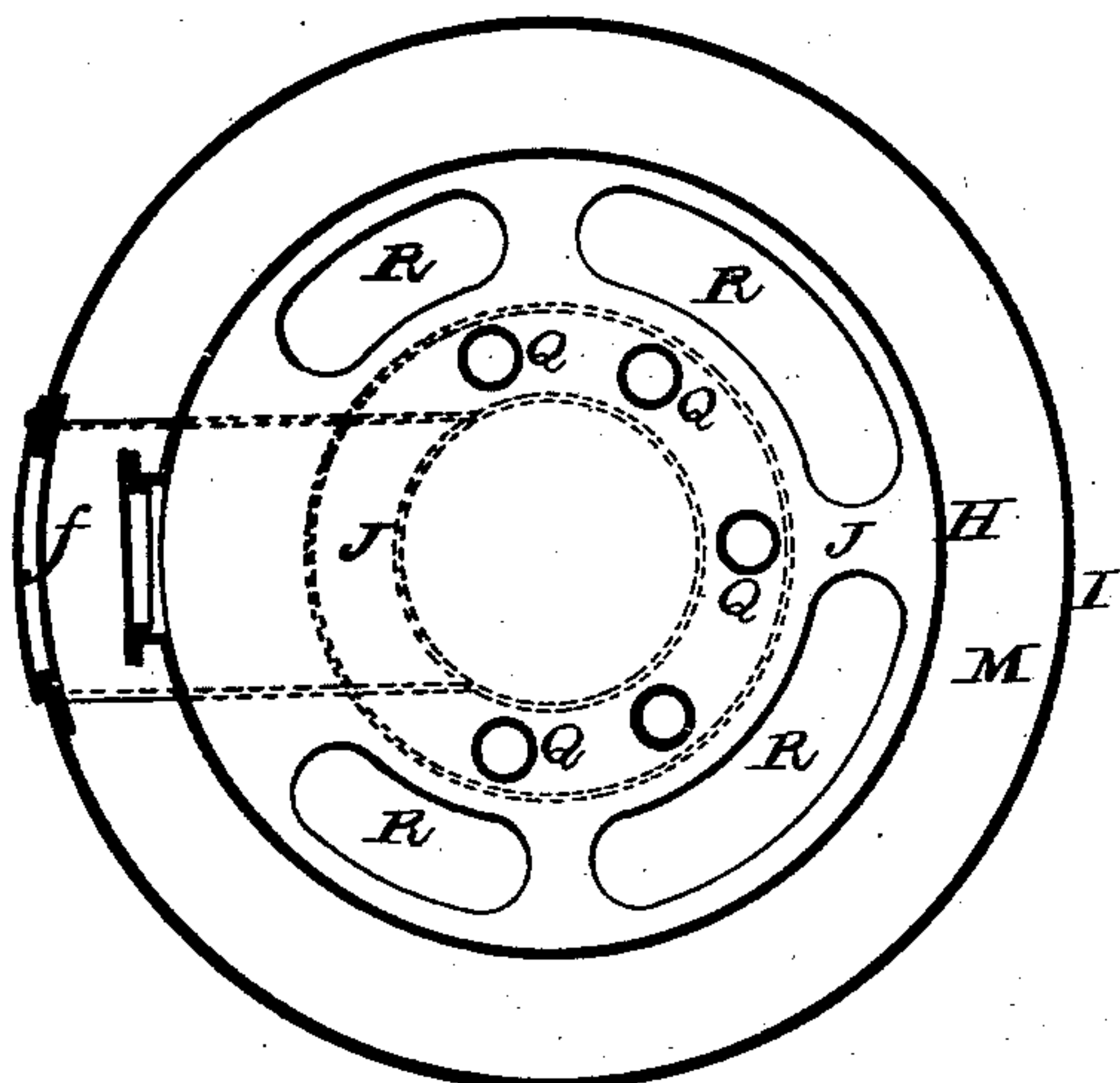


Fig. 4.

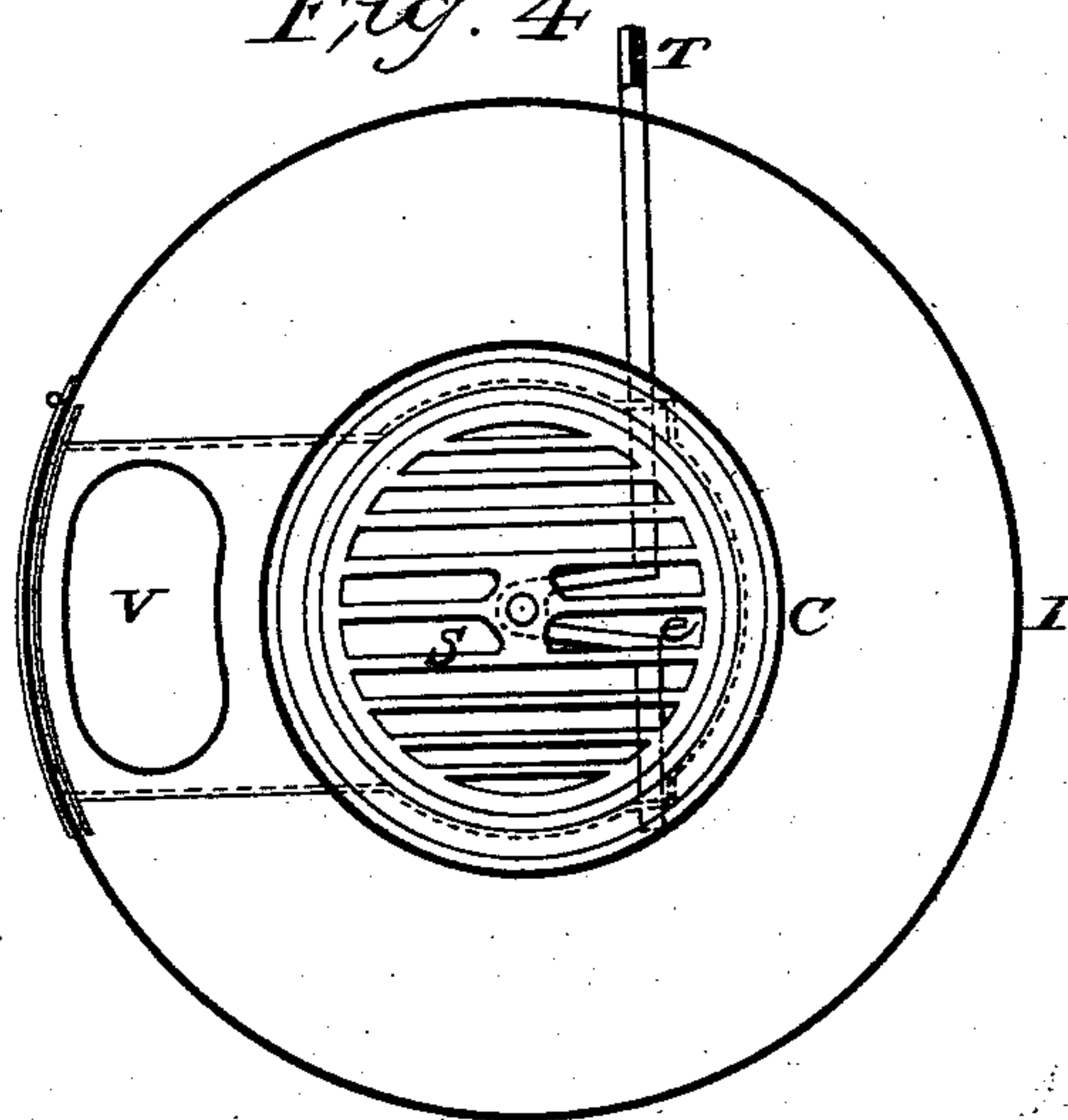


Fig. 3.

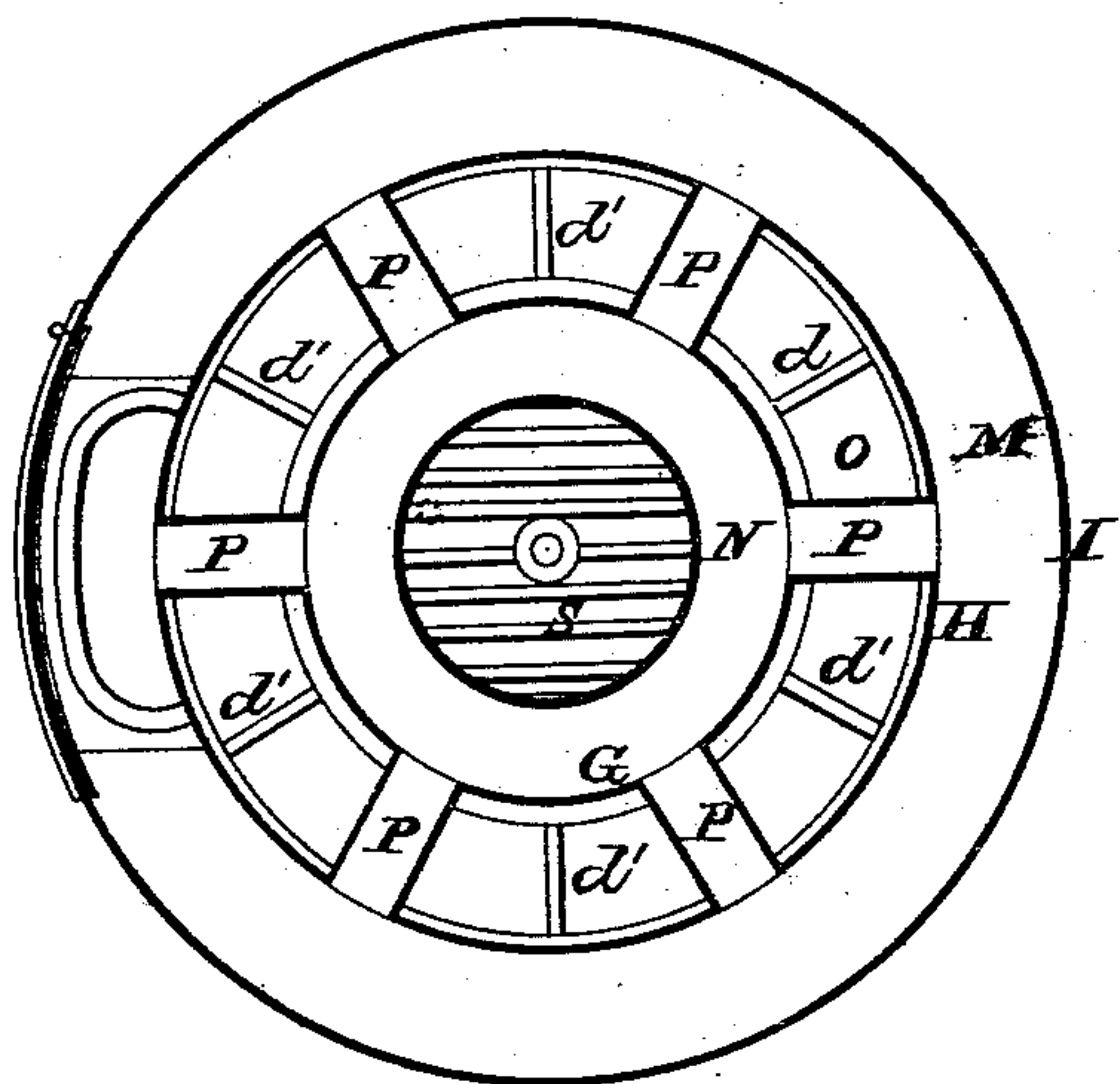
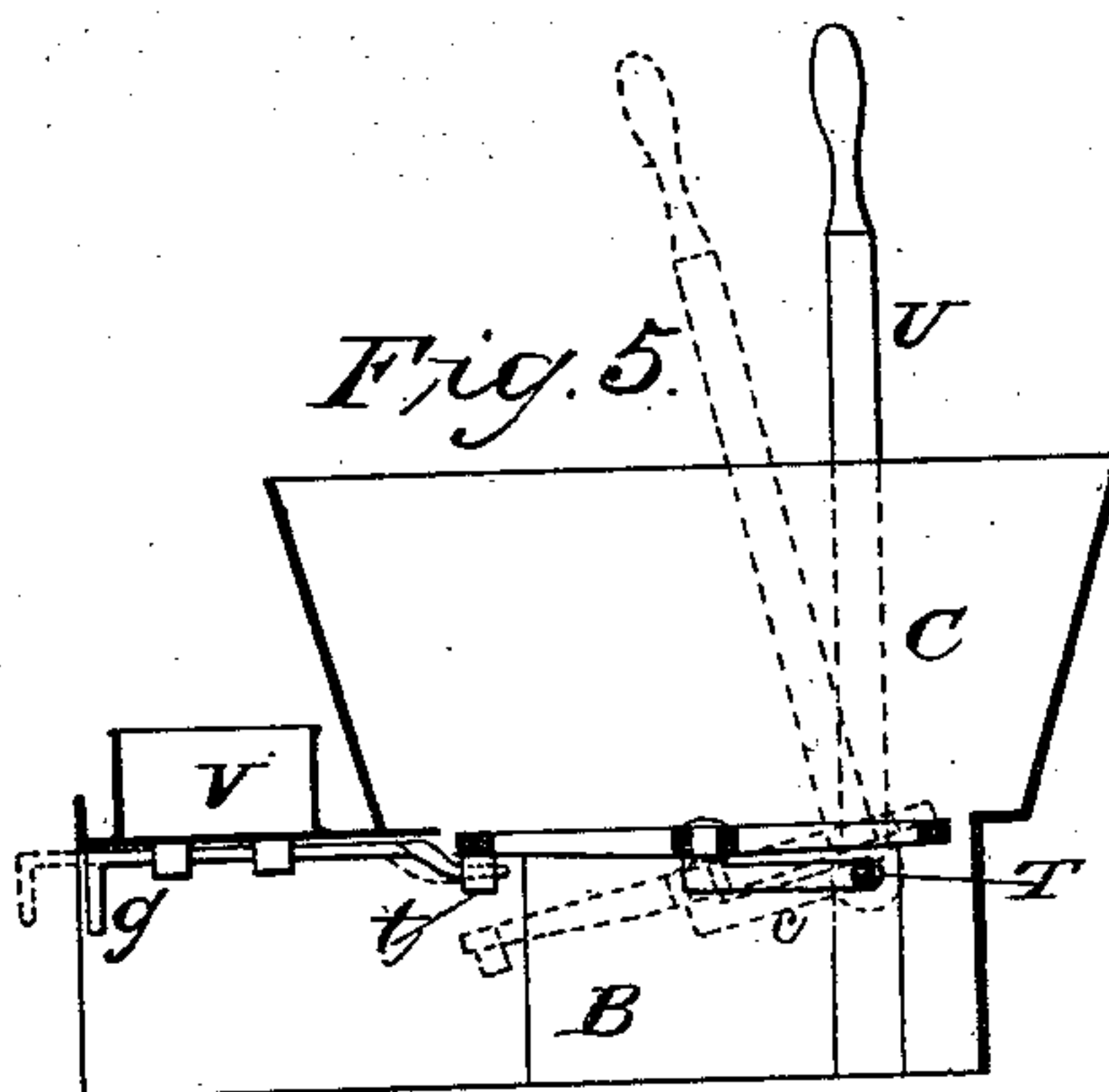


Fig. 5.



witnesses:

H. F. Eberle.  
C. W. Scoville

Inventor,  
M. W. Lester



# United States Patent Office.

MOSES W. LESTER, OF CHICAGO, ILLINOIS.

Letters Patent No. 94,224, dated August 31, 1869.

## HOT-AIR FURNACE.

The Schedule referred to in these Letters Patent and making part of the same.

### To whom it may concern:

Be it known that I, MOSES W. LESTER, of Chicago, in the county of Cook, and State of Illinois, have invented a new and useful Improvement in Air-Heating Furnaces; and I do hereby declare that the following is a true and accurate description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, and being a part of this specification, in which—

Figure 1, plate 1, is a vertical section of my improved furnace;

Figure 2, plate 2, is a cross-section on the line  $x x$  of fig. 1;

Figure 3 is the same on the line  $y y$ ;

Figure 4 is the same on the line  $z z$  of fig. 1; and

Figure 5 is a vertical section through the fire-pot and ash-pit, showing the method of inclining the grate for removing the clinkers.

Like letters indicate like parts in each figure.

The nature of this invention relates to an improved construction of air-heating furnaces, wherein bituminous coal is used as fuel, and consists in the peculiar arrangement of an inner air-chamber surrounding the magazine, said chamber being supplied with air through pipes which connect it with an outer air-chamber. The air which rises through this inner annular space is heated in its passage by radiation from the inner wall of the combustion-chamber surrounding it, while at the same time it prevents heating to a high degree the magazine, and thus causes its contents to throw off noxious gases, as would be the case were the flame to pass up in contact with its exterior wall.

It also consists in providing the lower end of the magazine with a combustion-ring of cast-metal so arranged that its expansion and contraction do not affect the surrounding parts, and being of great weight and strength, will resist the destructive action of heat and abrasion of the coal on its lower edges much longer than any known equivalent device now in use for that purpose; also, in a novel method of hinging the grate, which may be inclined forward to remove the clinkers accumulating upon it without danger of dumping and extinguishing the fire, and the general arrangement of its parts, as hereinafter more fully shown and set forth.

In the accompanying drawings—

A, fig. 1, represents the open base of my improved furnace supported by proper lugs;

B is the ash-pit; and

C, the fire-pot.

D is the gas-ring, forming the lowermost section of the annular combustion-chamber.

The lower part of this ring is provided with inwardly-projecting studs  $d$ , which rest upon the edges of the fire-pot, leaving an annular space between it and the lower edge of the ring, through which passes, as indicated by the arrows, a thin sheet of air, whose oxy-

gen combining with the unconsumed products of the combustion of the coal below, insures immediate and perfect combustion of the whole.

$d'$  are wings projecting inward from the body of the gas-ring, which wings support the combustion-ring E by its flange.

The ring E is a heavy casting, forming the lower end of the magazine F, which is filled with coal through the chute  $f$  at its top.

By making this combustion-ring independent of the surrounding parts, they are not liable to damage from its contraction and expansion, and being of considerable depth and thickness, it will resist for a long time the destructive action of the heat on its lower edge and abrasion of the continually-descending coal, while those of ordinary construction, from either of the causes cited, seldom last a season.

Surrounding the magazine is a cylinder, G, which, in turn, is surrounded by a similar cylinder, H, while I is the outer casing of the whole.

The bases of the cylinder G and magazine F are flanged in the upper edge of the combustion-ring E, that of the cylinder H to the gas-ring D, and of the casing I to the rim of the base A.

J is a plate covering the cylinder H and the interior cylinders, and forms the bottom of the smoke-box, of which the plate K is the top and  $k$  the flue.

L is the covering-plate of the furnace, and forms the top of the hot-air chamber, from which the hot-air pipes  $l$  convey the heated air to the desired points.

By the arrangement of the concentric cylinders above described, I have an outer annular air-chamber, M, an inner one, N, and a combustion-chamber, O, between them.

The air-chambers M and N are connected at intervals by pipes P, admitting air from the former into the latter.

From the chamber N, the air is conducted to the reservoir at the top by tubes Q passing through the plates J and K of the smoke-box, so that the heated products of combustion in their upward passage through the chamber O, heat two columns of air; instead of one, by outward radiation from the cylinder H, and inward from the cylinder G, while the flame is not allowed to come in contact with the magazine, and heat the coal in it, and cause it to throw off noxious gases.

R are openings in the bottom-plate J of the smoke-box, through which the heated products of combustion pass, impinging against and passing between the tubes Q on their way to the flue, imparting additional heat to the currents of air passing up through the tubes.

$a$  and  $b$  are doors, tightly fitted to the front of the outer casing and smoke-box, through which access is had to the interior of the smoke-box to clear the bottom-plate J of ashes when necessary.



The arrangement of my grate is an important feature of this invention, which I will now describe:

S is a circular grate, centrally pivoted to a crank or arm, *c*, on the rock-shaft T, journaled into the sides of the ash-pit under the back edge of the grate, which is supported in front by a bolt, *g*, working in a sleeve in the upper part of the ash-pit.

The grate is provided with a lug, *t*, under its front edge, in a recess in which a bar or rod is inserted to give the grate a vibratory motion on its pivot to shake down the ashes.

To remove the clinkers from the surface of the grate without dumping the fire into the ash-pit, I place horizontally, on one end of the rock-shaft, the lever U, (which, to be shown in the drawing, is vertical.) With this lever in one hand, I support the grate; with the other, I withdraw the bolt *g*, and with the lever easily incline the grate forward, the coals being supported by the rear part of the grate, which, from the peculiar manner in which it is hung, moves but slightly, so as not to break the arch naturally formed by the coals in the fire-pot. With my free hand, I insert a poker and rake the clinkers from the surface of the grate into the ash-pit, when the grate may be raised to and secured in position.

As air, in heating, parts with a portion of its hydrogen, to replace it in the air passing through this furnace, I place an evaporating-pan, V, containing water on the front of the ash-pit for that purpose.

It will readily be seen that this furnace combines several important features and advantages; in the facility with which clinkers are removed from the grate; in a gas-ring which furnishes oxygen to the flame in a thin and almost uninterrupted sheet, instead of minute jets; in a durable combustion-ring, easily replaced, when necessary; and in a double radiating-surface, by means of which the greatest amount of air is heated with the least consumption of fuel.

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

1. In air-heating furnaces, the combination of the combustion-chamber O with the annular air-chambers M and N, the pipes P, and tubes Q, when constructed, arranged, and operating as and for the purpose set forth.

2. The gas-ring D, provided with studs *d* and wings *d'*, and the combustion-ring E, arranged and operating substantially as and for the purposes herein set forth.

3. The rock-shaft T, provided with arm *c* and the grate S, when pivoted to said arm and supported by the bolt *g*, the whole arranged and operating substantially in the manner and for the purposes herein specified and shown.

MOSES W. LESTER.

Witnesses:

H. F. EBERTS,

C. W. SERVOS.