

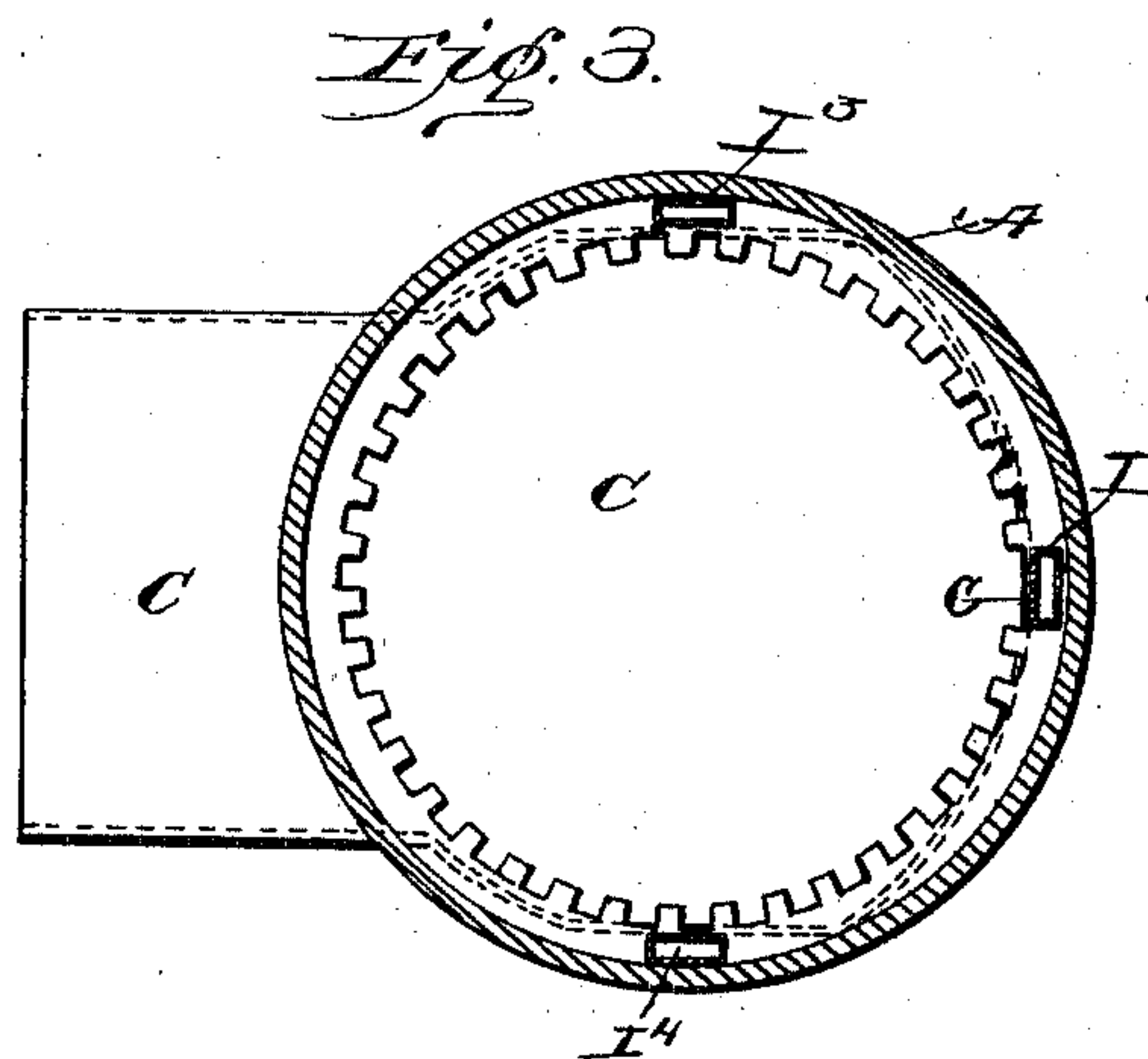
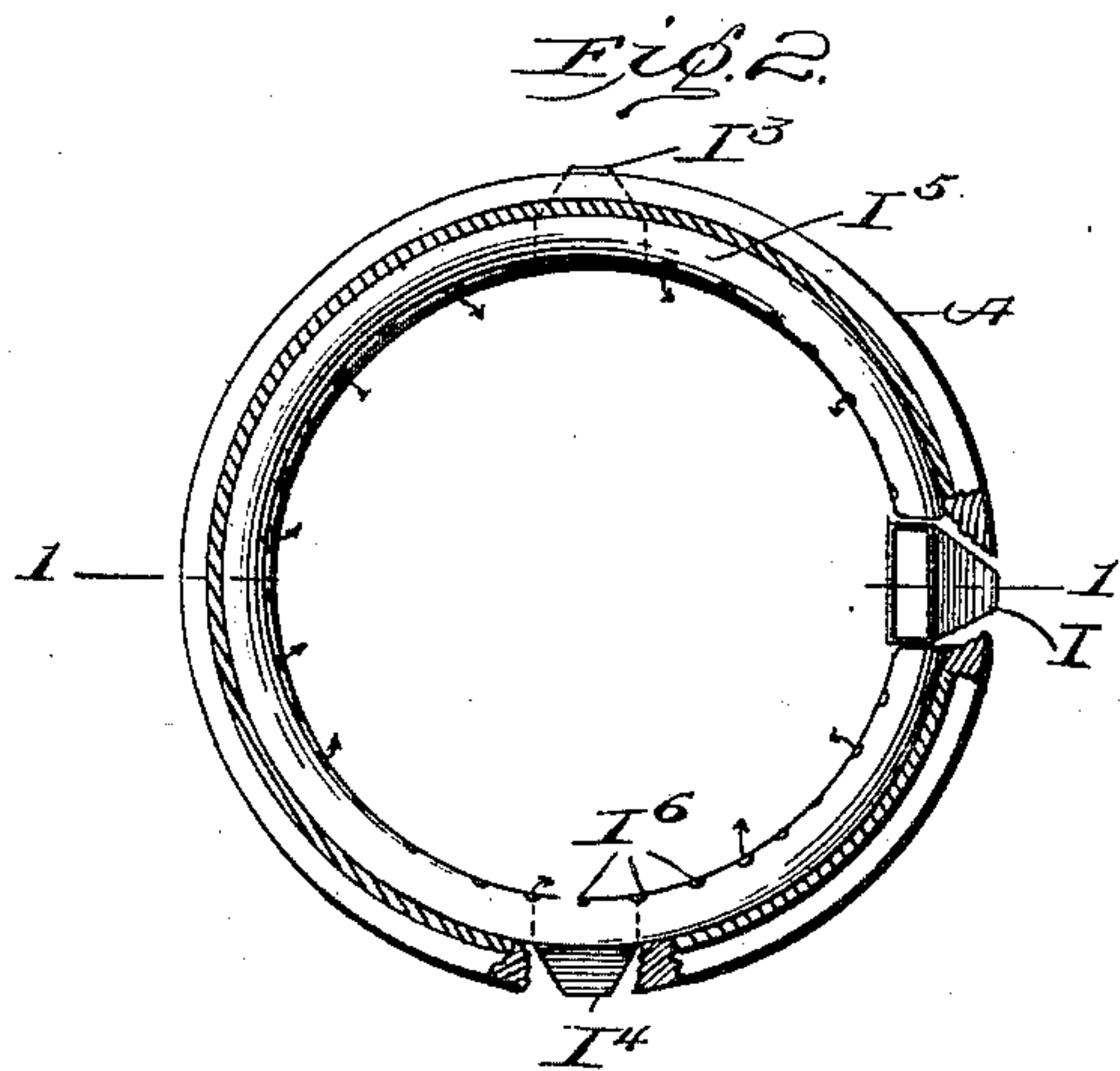
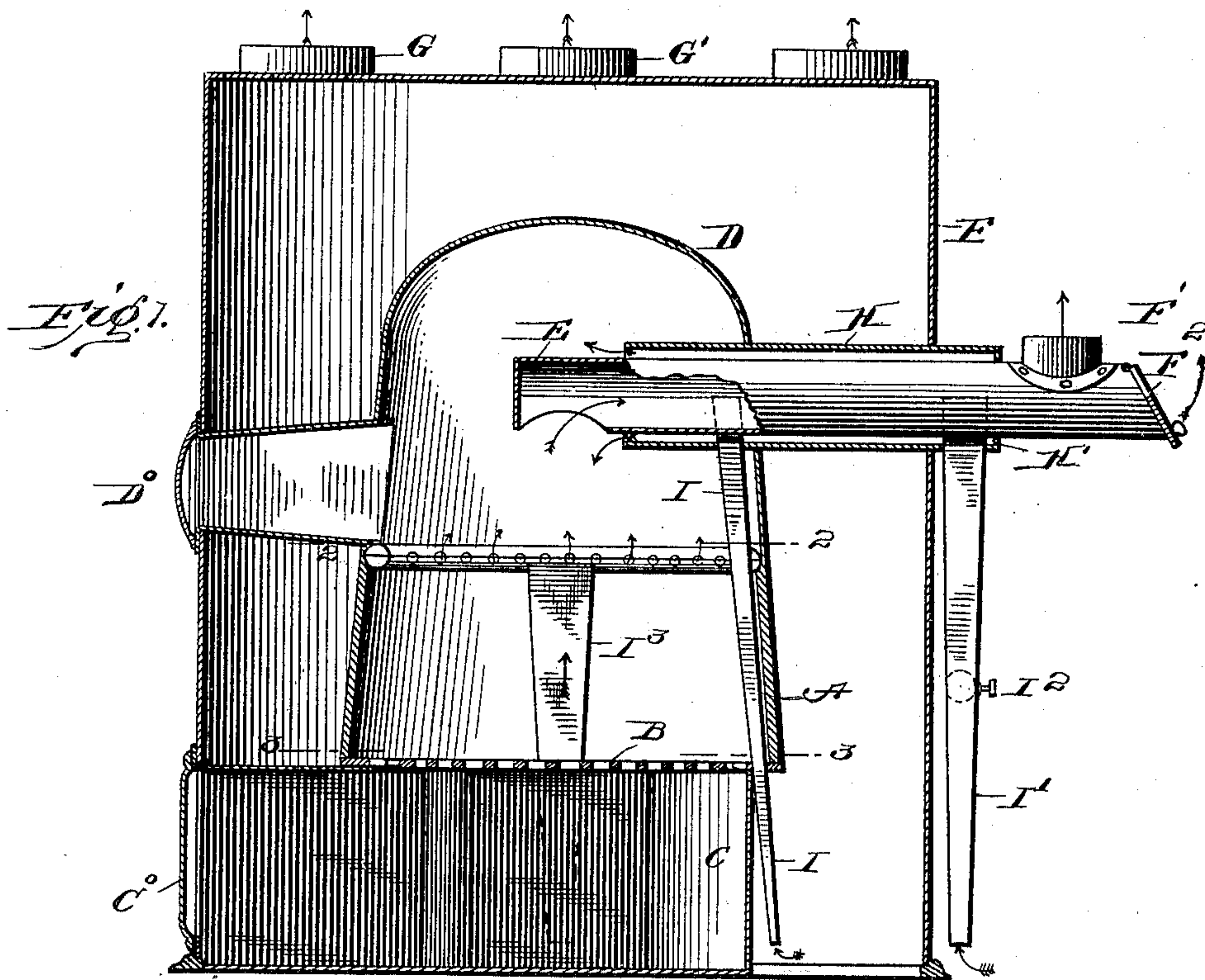
No. 719,271.

PATENTED JAN. 27, 1903.

S. P. SMITH.  
FURNACE.

APPLICATION FILED JAN. 13, 1902.

NO MODEL.



Witnesses:

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# UNITED STATES PATENT OFFICE.

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## FURNACE.

SPECIFICATION forming part of Letters Patent No. 719,271, dated January 27, 1903.

Application filed January 13, 1902. Serial No. 89,566. (No model.)

*To all whom it may concern.*

Be it known that I, SOLOMON P. SMITH, a citizen of the United States, residing at Waterford, in the county of Saratoga and State of New York, have invented certain new and useful Improvements in Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

A leading general object of my invention is to provide a furnace capable of burning without smoke or other waste any coal, hard or soft, which it may be desired to use as fuel. Another object is to materially lessen the usual loss of heat through the chimney. This latter result is sometimes sought by simply cutting off nearly all draft, allowing a large body of coal to smolder with an under supply of oxygen—an idea of economy more perfectly realized by extinguishing the fire.

My invention involves the radically-different idea of temporarily holding the ordinary products of combustion in a highly-heated space just above the burning coal and at the same time introducing into this space superheated air, whereby the partially-oxidized carbonous gas and the wholly-unoxidized carbon particles rising with it from the fuel are all fully burned, each atom of carbon combining with two atoms of oxygen and forming an invisible gas carrying nothing capable of combustion.

The furnace chosen for purposes of illustration is a simple one, such as may be used for heating a dwelling or the like.

In the accompanying drawings, Figure 1 is a central vertical section of a furnace embodying my invention. Fig. 2 is a section on the line 2 2, Fig. 1. Fig. 3 is a section on the line 3 3, Fig. 1.

In the figures, A designates a fire-pot; B, a grate therefor; C, an ash-receiving box below the grate and provided with the usual door at C<sup>0</sup>; D, a dome above the fire-box; D<sup>0</sup>, a fuel-door; E, a pipe for carrying away the gaseous products of combustion, and F the usual jacket into which cold air is introduced in the ordinary way by means not shown and from which hot air is conveyed by pipes at G, G', &c., to apartments to be heated.

The fire-pot A differs from those ordinarily used in that it gradually diminishes in diameter in passing upward from the grate, which may be of any approved form. The fire-pot is made of this form, so that coal soft enough to become plastic with heat may press downward freely as combustion proceeds.

Upon the fire-pot rests the upwardly-diminishing dome D, preferably cast in one piece and entirely closed above. The pipe E extends laterally into the lower part of the dome, is closed at its inner end, and is downwardly open at a point in the axis of the fire-pot and dome, the opening forming the only passage for escape of gases arising from combustion. This pipe extends outward through the casing or jacket F and is there provided with a lateral branch at F' and beyond this branch is cut off obliquely and provided with a suitable closure at F<sup>2</sup>, shown as an upwardly-opening hinged door, readily opened to check the draft or to allow cleaning the horizontal portion of the pipe where a certain amount of ash only accumulates, no soot accumulating at any point in the apparatus. The horizontal portion of the pipe lies axially in a sleeve or jacket H, closed at the outer end H' and open at the inner end. A pipe I, extending from a point in the lower portion of the cold-air space upward through the fire-pot, opens into this sleeve, and a similar pipe I', provided with a valve I<sup>2</sup> and lying without the casing, enters the sleeve in a like manner. Now the valve being closed air cannot pass in the outer pipe; but at all times when the apparatus is in use the air in the pipe I being heated in the fire-pot rises rapidly and entering the sleeve H escapes around the free end of the outlet-pipe E. Other pipes I<sup>3</sup> I<sup>4</sup> pass in like manner upward from points in the cold-air space around the ash-receiving box through the fire-pot and open into an annular tube or channel I<sup>5</sup> near the upper limit of the fire-pot. This tube is provided with a series of perforations I<sup>6</sup>, arranged to discharge inwardly over the burning coal. Each of these pipes gradually increases in cross-sectional area in passing upward from the bottom, and this is of great importance in the practical working of the apparatus, as it insures a much more rapid delivery of air and



of air at a higher temperature than it would otherwise have.

As usual, air is supplied to the grate through the ash-receiving space below, which is of  
5 course entirely cut off from the air-space within the jacket F, to which air to be heated is supplied in the ordinary manner.

In operation the apparatus needs, ordinarily, no attention whatever other than that  
10 usually given to furnaces of this general class, there being nothing to be especially arranged or adjusted. As soon as combustion begins partially-burned matter rises from the fuel. In many furnaces and stoves this matter, lack-  
15 ing oxygen for complete combustion, passes to the chimney and is lost so far as heating is concerned and far worse than lost in that it closes the passage and fouls the surrounding atmosphere. In my apparatus this mat-  
20 ter on rising from the fuel is at once thoroughly mixed with a fresh supply of highly-heated air, the location of the jets and the form of the device materially aiding rapid mixture. The combustion begun in the body  
25 of fuel is carried to completion in the dome, where the gases have a rapid and complex movement, and owing to this combustion the dome is constantly maintained at such a high temperature that nothing readily ox-  
30 idized can escape combustion therein. The pipe through which the resultant gases finally escape is located so far below the top of the dome that practically no gases escape before complete combustion, and the delivery of hot  
35 air around this outlet and in a highly-heated zone gives additional security in insuring the combustion of any unburned matter that by chance reaches this region. Obviously by opening the valve I<sup>2</sup> air from the space about  
40 the furnace may be admitted to the sleeve inclosing the pipe E.

It is to be remarked that in this apparatus the rapid destruction of the pipes subjected to a high heat is prevented by the rapidly-  
45 moving body of air always in contact with at least one of their surfaces, and this moving body of air can never be arrested even when the apparatus is operated by those entirely ignorant of the principles which it involves.  
50 For brevity the term "furnace" is used without addition or qualification, it being understood that its significance when so used is generic, including such structures as are commonly called "stoves." It is further to be  
55 observed that the construction illustrated may be varied in many ways without passing beyond the proper limits of my invention, which I wish to claim broadly and specifically.

60 What I claim is—

1. The combination with a furnace having above the area of primary combustion an up-  
wardly and laterally inclosed space to receive and confine the products of combustion, a  
65 pipe arranged to take the products of com-

bustion directly from the lower central portion of said space and convey them laterally outward, and a larger air-supplying jacket extending inward around said pipe terminat-  
70 ing at some distance from the end of the same and discharging air around the uncovered end of the pipe.

2. The combination with a furnace having a fire-pot and above the same a dome with its upper portion without openings, of a smoke-  
75 pipe extending inward below the imperforate portion and terminating in the central space, a shorter air-jacket extending inward around said pipe and delivering air along the pro-  
80 jecting end of the latter, and a fresh-air pipe extending from below upwardly through the fire-pot and into said jacket.

3. The combination with a downwardly-divergent fire-pot, of an annular tube support-  
85 ed at the upper margin thereof and having openings along its concave side, open pipes leading from said tube downward alongside the inner face of the fire-pot wall, a grate lying in the space between said pipes, and an ash-  
90 box separating the space directly below the grate from the space into which said pipes open at their lower ends, substantially as set forth.

4. The combination with a fire-pot and an upwardly-closed dome forming a continuation  
95 of the fire-pot, of the usual jacket inclosing the fire-pot and dome to form an air-heating chamber, a smoke-pipe leading out from the dome through the jacket, an air-conveying pipe inclosing the smoke-pipe, passing with  
100 it out from the dome through said jacket and having beyond said jacket valve-controlled communication with the external air, and an open pipe leading from within the air-heating  
105 chamber through the fire-pot and space within the dome into said air-conveying pipe.

5. The combination with a fire-pot and an upwardly-closed dome above the same, of a jacket inclosing both fire-pot and dome to  
110 form an air-heating chamber, a smoke-pipe leading outward from the dome through the jacket and having without the jacket a valve-controlled opening, an air-conveying pipe in-  
115 closing the smoke-pipe and passing with it outward from the dome, and an open pipe leading from within the air-heating chamber through the space within the fire-pot and dome into said air-conveying pipe.

6. The combination with the grate, the up-  
120 wardly-converging fire-pot above the same and the upwardly-closed dome forming a continuation of the fire-pot, of the jacket forming an air-heating chamber around the fire-  
125 pot and dome, the horizontal smoke-pipe having at its outer end a door and at its inner end opening downwardly in the central portion of the dome, the larger pipe inclosing the smoke-pipe, closed about it at the outer end and stopping short of it at the inner end,  
130 the upwardly-expanding valve-controlled



5 tube opening into the larger pipe without the jacket, the upwardly-expanding open tube extending from within said chamber through the fire-pot into said larger pipe, a perforated ring at the top of the fire-pot, and upwardly-expanding tubes leading from said chamber through the fire-pot into said ring.

In testimony whereof I affix my signature in presence of two witnesses.

SOLOMON P. SMITH.

Witnesses:

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