

A. J. BLACKFORD.  
WICK BLUE FLAME BURNER.  
APPLICATION FILED JUNE 3, 1907.

944,840.

Patented Dec. 28, 1909.

6 SHEETS—SHEET 1.

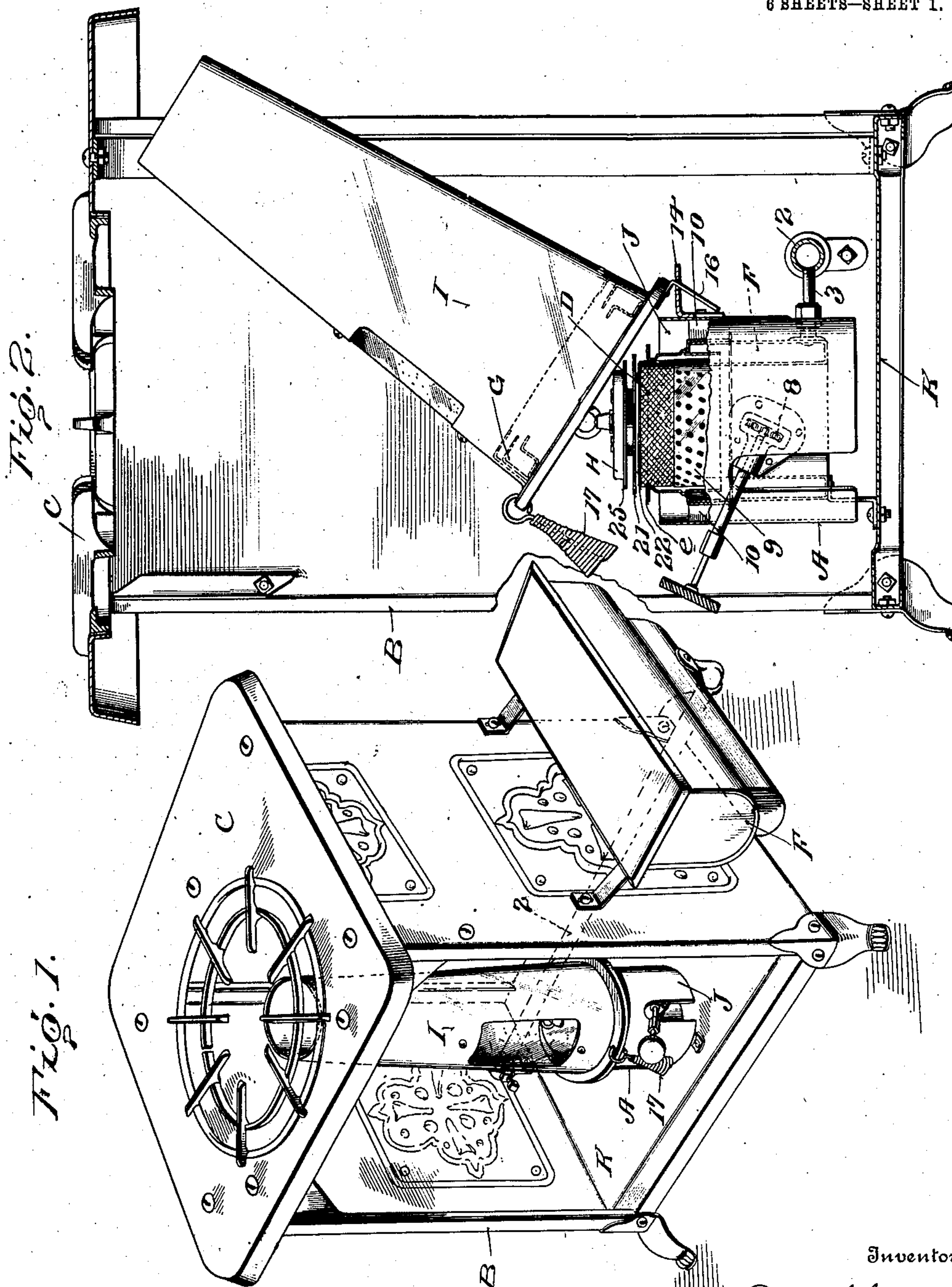


FIG. 1.

Witnesses  
*C. P. Wright, Jr.*

By

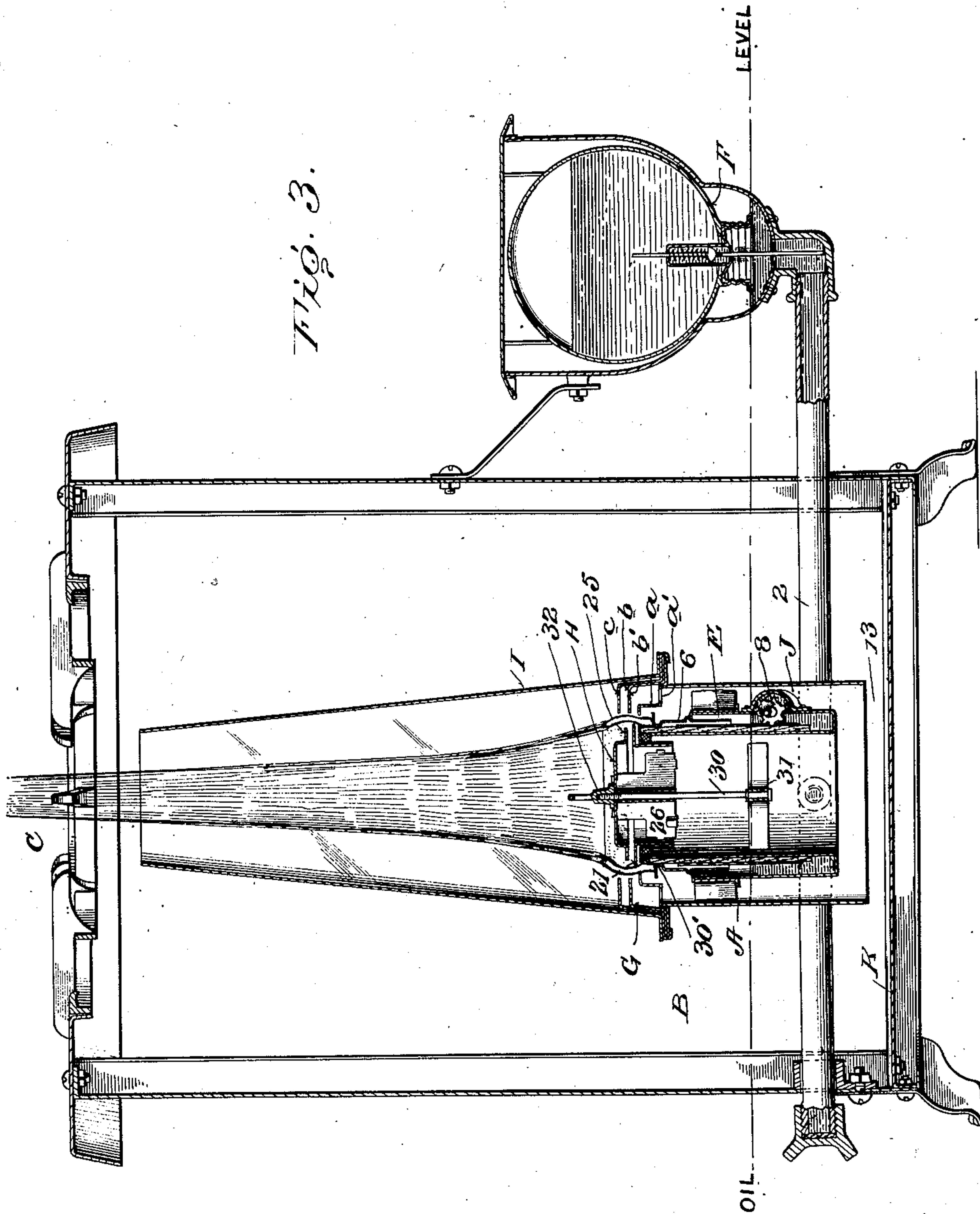
Inventor  
*A. J. Blackford*  
*A. S. Pattison,*  
Attorney

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6 SHEETS—SHEET 2.



Witnesses

*Wm. J. ...*  
*C. P. Wright, Jr.*

By

*A. J. Blackford,*  
*A. Patton,*

Inventor

Attorney

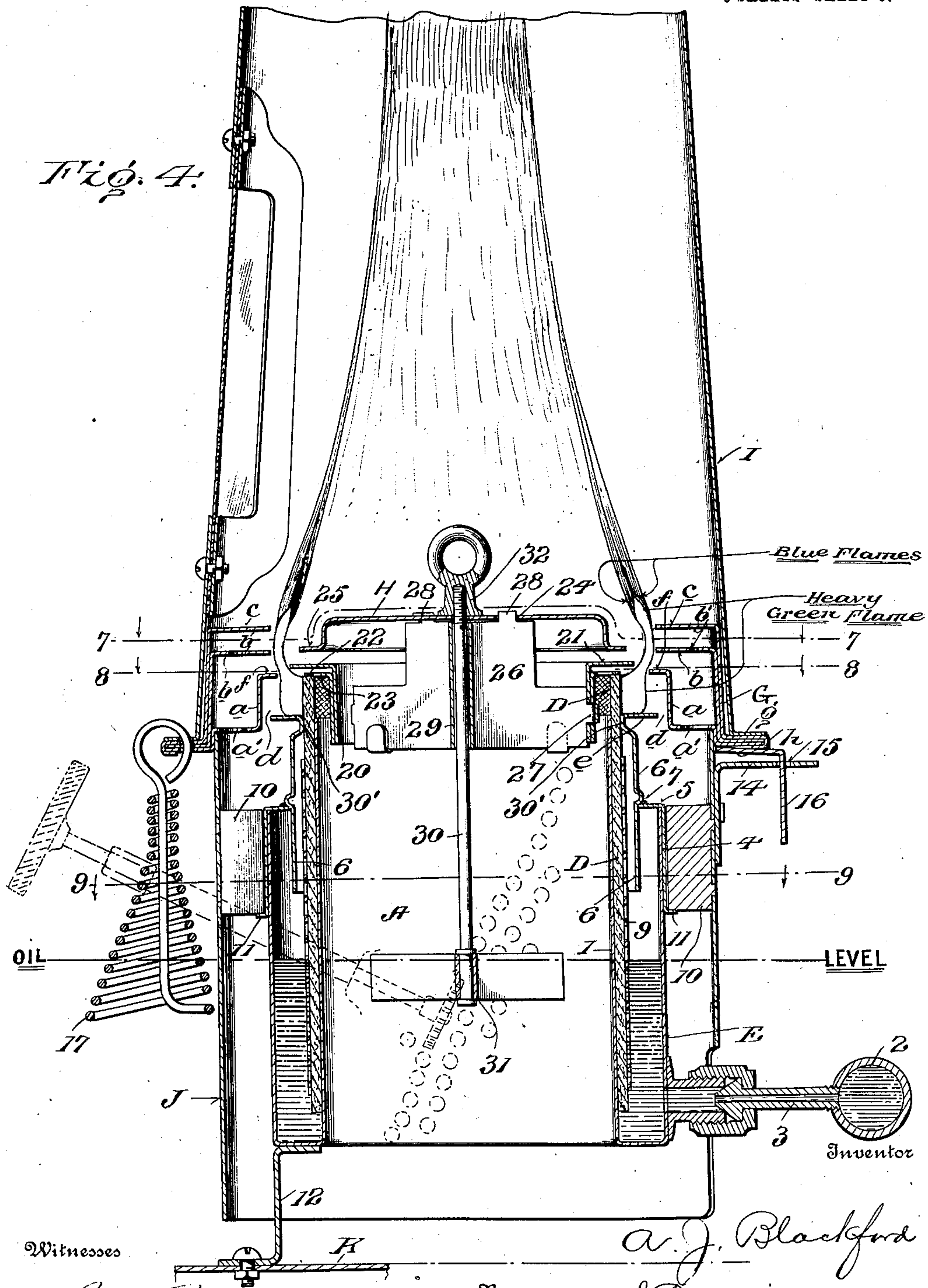


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6 SHEETS—SHEET 3.



Witnesses

*E. P. Wright, Jr.*

By

*A. J. Blackford*  
*A. S. Patterson,*

Attorney

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6 SHEETS—SHEET 4.

Fig. 5.

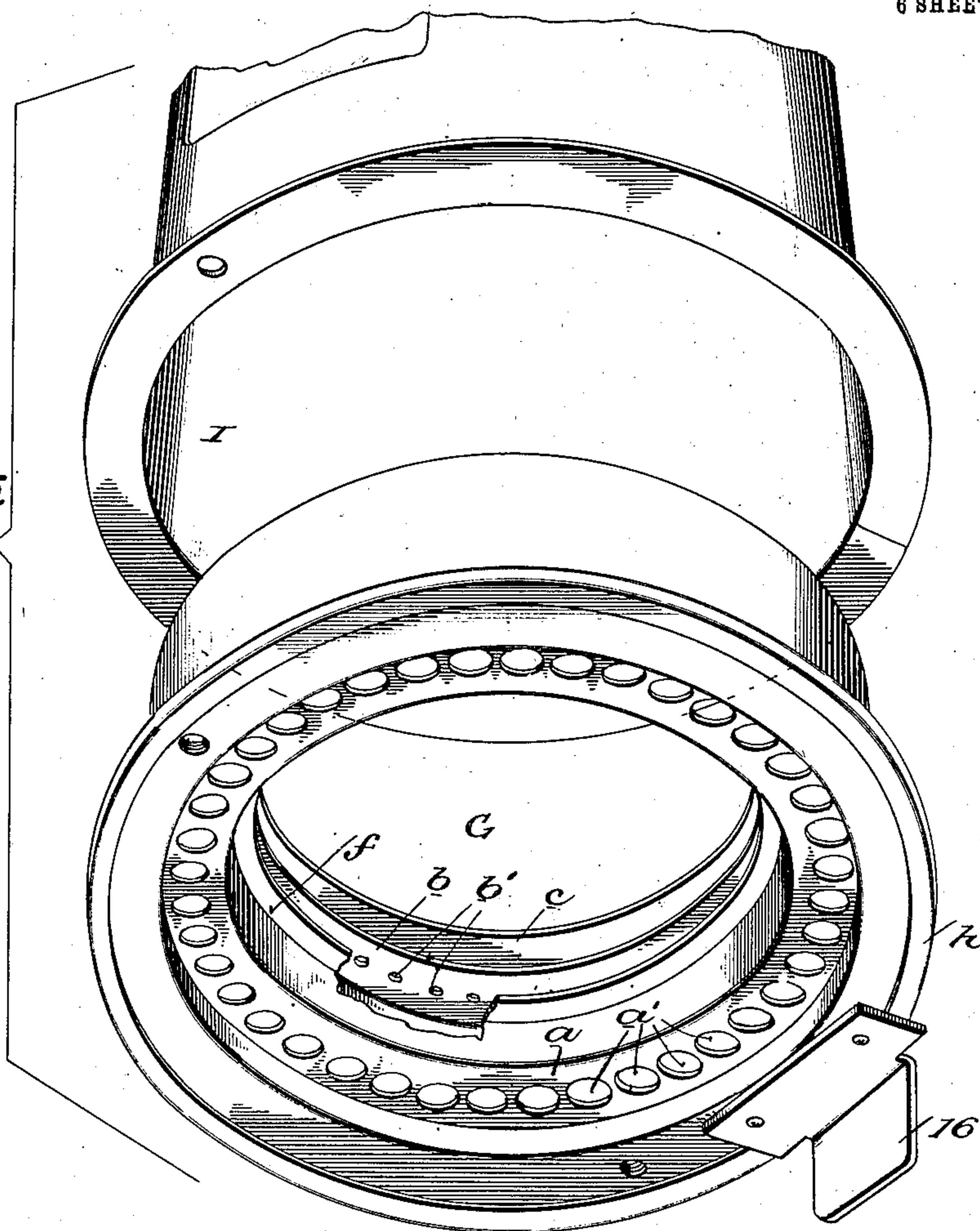
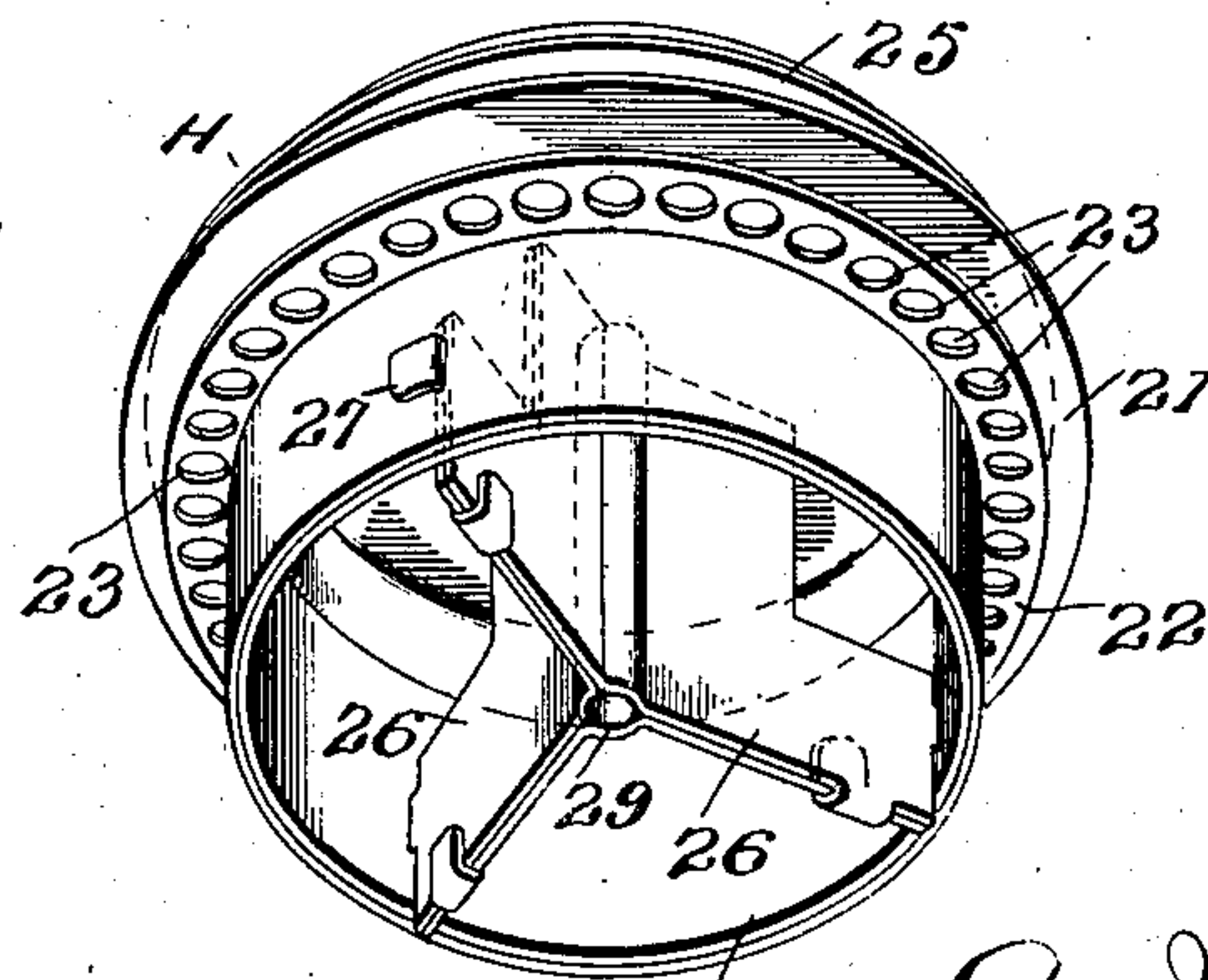


Fig. 6.



Witnesses

*C. P. Wright, Jr.*

By 20

*A. J. Blackford,*  
*A. Patterson,*

Inventor

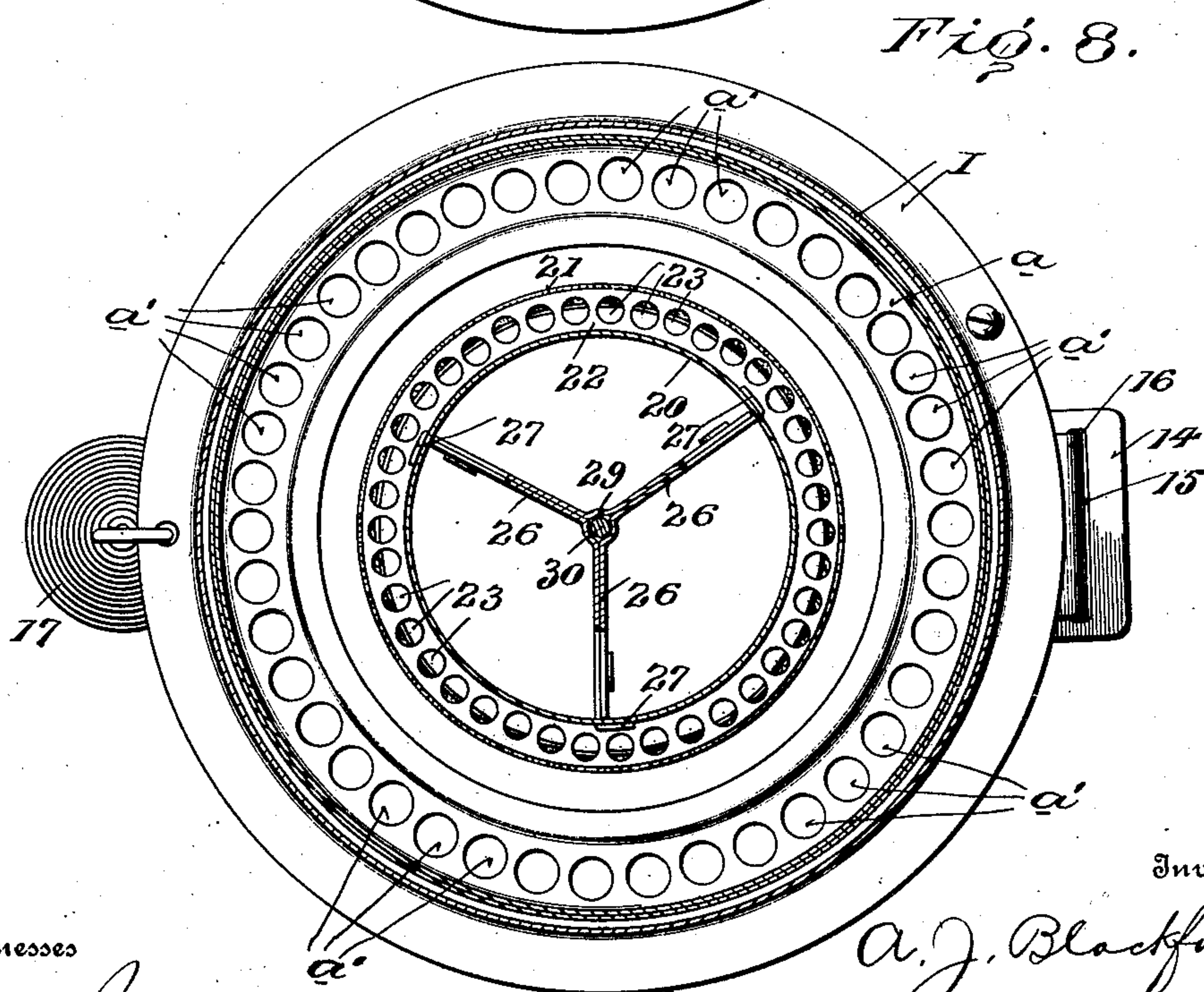
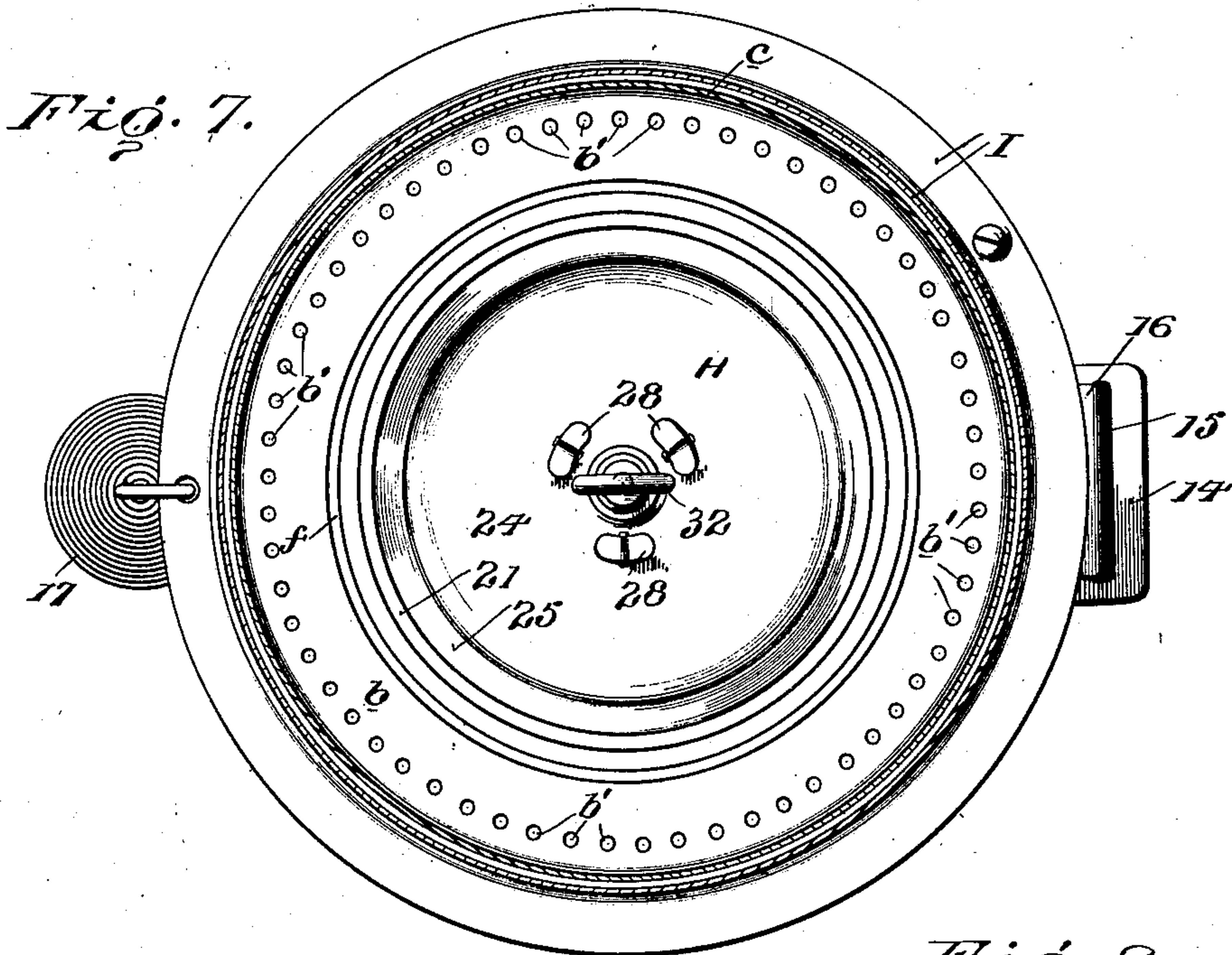
Attorney



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6 SHEETS—SHEET 5.



Witnesses

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*C. P. Wright, Jr.*

Inventor

*A. J. Blackford,*  
*A. Pattison,*

Attorney

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6 SHEETS—SHEET 6.

Fig. 9

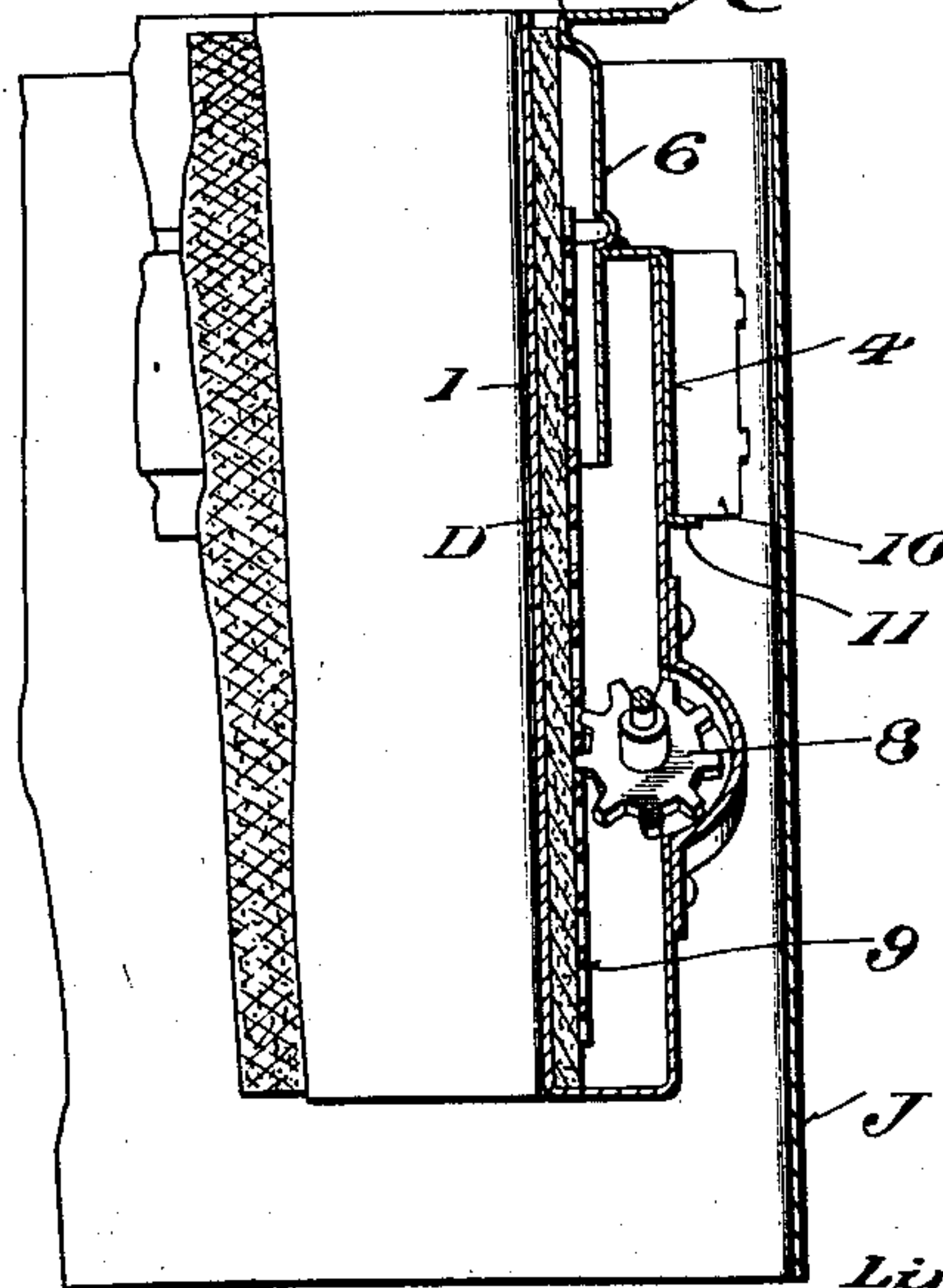
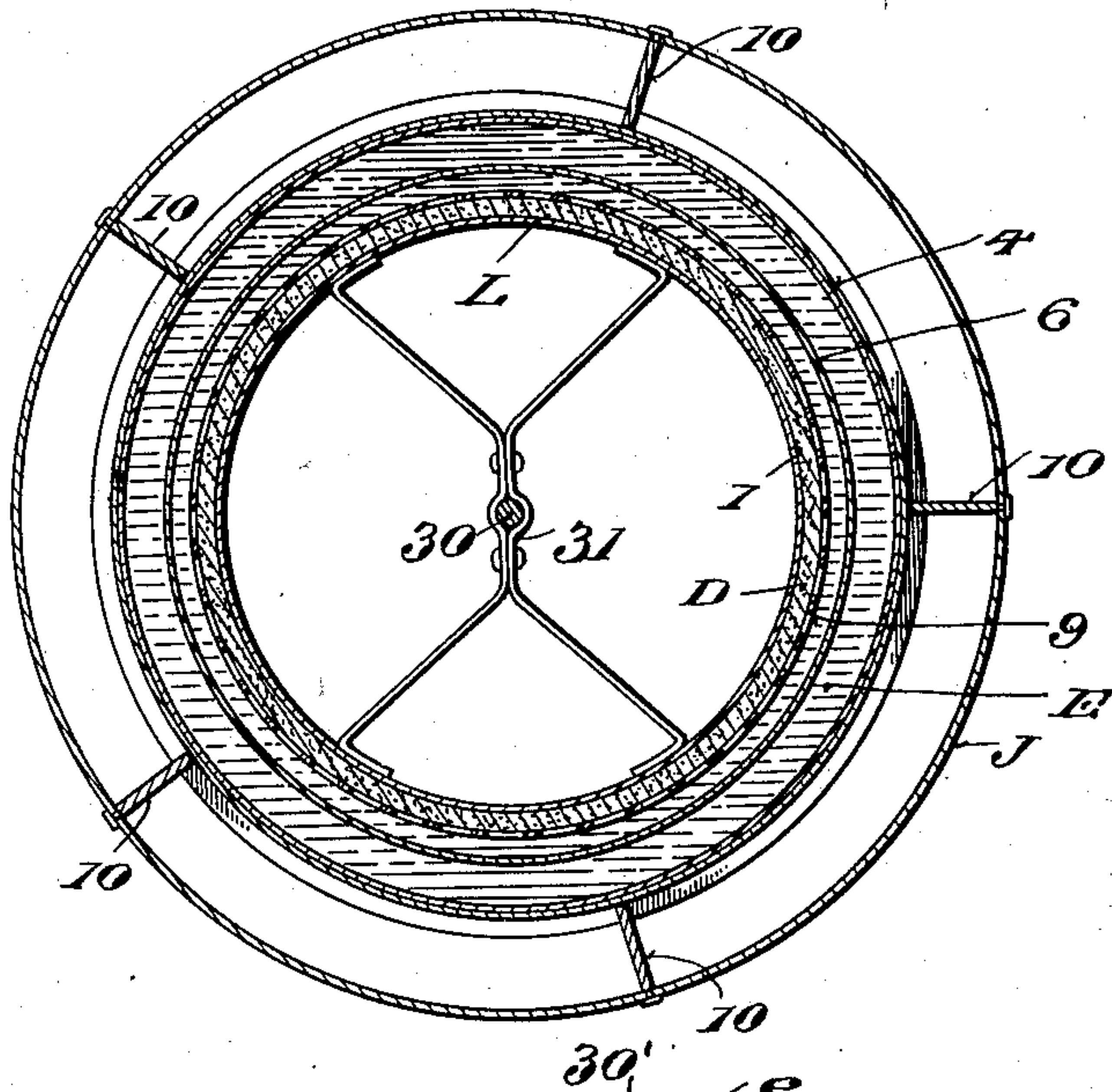


Fig. 10.

Witnesses

*C. P. Wright, Jr.*

Stove

By

*A. J. Blackford*  
*A. Patterson,*

Attorney



# UNITED STATES PATENT OFFICE.

ATWELL J. BLACKFORD, OF CLEVELAND, OHIO.

WICK BLUE-FLAME BURNER.

944,840.

Specification of Letters Patent.

Patented Dec. 28, 1909.

Application filed June 3, 1907. Serial No. 377,057.

*To all whom it may concern:*

Be it known that I, ATWELL J. BLACKFORD, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Wick Blue-Flame Burners, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to improvements in wick blue flame burners, which is particularly intended for domestic purposes such as cooking, and pertains to that class of blue flame burners in which a blue flame is produced without the use of the well known concentric perforated combustion tubes.

One object of my invention is to so construct a burner of this character as to produce a longer and more effective flame than in the burners of this class known to me by concentrating the flame and delivering it and the heat units at a concentrated point against the bottom of the utensil, thereby obtaining greater efficiency from a given amount of fuel.

In the burners of this class now known to me, the blue flame is changed to a yellow or illuminating flame when the burner is turned low to produce what is known as a simmering flame, which has certain objections well known to those skilled in the art.

Another object of my invention is the production of a burner which is capable of adjustment from the full blue flame to the minimum or simmering flame without any change in the character of the flame produced thereby, and to so arrange the parts as to make it impossible for a careless operator to at any time produce a yellow or smoky flame in the operation of the burner.

A further object of my present invention is to produce a burner in which the wick requires less attention on the part of the operator, than any burner of this character known to me, and to so deliver the currents of air to the burning vapor as to prevent any tendency to yellow points in the resultant flame.

Other objects of my present invention pertain to certain structures and relative arrangements of parts whereby advantageous results are produced in the manner hereinafter pointed out.

In the accompanying drawings, Figure 1,

is a perspective view of a single burner 55 stove which embodies my invention. Fig. 2, is a central vertical sectional view of Fig. 1. Fig. 3, is a vertical central sectional view taken at right angles to Fig. 2. Fig. 4, is a full sized central sectional view of 60 the burner which embodies my present invention. Fig. 5, is an enlarged detached under perspective view of the chimney gallery, and the lower portion of the chimney. Fig. 6, is a detached under perspective view 65 of the movable flame converter. Fig. 7, is a horizontal, sectional view on the line 7—7 of Fig. 4. Fig. 8, is a horizontal sectional view on the line 8—8 of Fig. 4. Fig. 9, is a horizontal sectional view on the line 70 9—9 of Fig. 4. Fig. 10, is a vertical section through one side of the wick tube, showing the wick raiser.

In carrying out my invention the burner A is supported in any desired or suitable 75 form of frame B, which preferably has a utensil-supporting grate C at its top, and especially is this true when my improved burner is used for domestic purposes. The wick D in my improved burner is placed 80 with its lower portion within a narrow vertical reservoir E, and surrounds an inner wick tube 1, for a purpose to be described presently. Oil is supplied to this reservoir E through a suitable pipe 2 which has one 85 end communicating with a maintained oil level supply device F, and a branch pipe 3 which communicates with the said reservoir E. The device F for maintaining an oil level is well known, and does not need to be 90 described, and it maintains an oil level within the reservoir E as indicated in Figs. 3 and 4, which is approximately about one-half the depth of the reservoir E. This reservoir E is provided with a removable head which 95 consists of an outside ring 4 which surrounds the upper end of the reservoir E and has an inturned flange 5, and an outside wick tube 6 which passes downward inside of the flange 5, and is provided with a projecting bead 7 which is soldered to the flange 5, thus uniting the outside ring 4 and the 100 outside wick tube, so that they are placed in position and removed as a single member.

The object of this construction and the 105 reservoir E is to permit the ready removal of the wick, and the substitution therefor of a new wick. When the outer wick tube with



its ring 4 is removed, the operator can readily remove the wick, and the wick regulating wheel 8 can be readily seen, thus enabling it to be easily caused to register with the openings in the perforated wick sleeve 9.

My improvements which affect the character and efficiency of the flame, comprise a chimney gallery G of certain constructions and functions, and a movable flame converter and controller H, also of certain construction and functions, all of which will be particularly pointed out hereinafter.

Projecting from the chimney gallery G is a chimney I which is tapered inwardly from its lower portion to its upper end, and located below and supporting the chimney gallery and chimney is a suitable inclosing outside casing J, for the purpose of preventing outside air currents from affecting the flame. This casing J is provided with inwardly-extending wings 10 which engage and rest upon an out-turned flange 11 on the ring 4, whereby the casing, gallery and chimney are supported by the reservoir, and the reservoir is supported by the pipe connection 3 at one side, and by a depending foot 12 at the other side. It will be observed that the casing J does not extend entirely down to the bottom K of the frame B, whereby a passage-way 13 is afforded at the lower end of the casing to permit the air to pass within the casing, and to the burner.

Projecting from the rear side of the casing J is an arm 14 having an opening 15 into which a depending arm 16 of the chimney gallery loosely passes. The chimney I and its gallery are suitably detachably connected, so that the chimney and gallery may be tilted backward by a suitable handle 17 to permit access to the wick for lighting purposes. The backward movement of the chimney is limited by the engagement of the lower end of the arm 16 with the outer side of the casing J, whereby the chimney will remain in this tilted position without any support on the part of the operator as long as may be desired.

*Chimney-gallery.*—As illustrated in Fig. 4 the vapor is generated from the wick, and combustion occurs at the outer side of the wick, which produces what is designated in this figure "heavy green flame", which in the operation of the burner is plainly apparent. The function of the chimney gallery G is to deliver air to the outer periphery of the heavy green flame in such a manner, and in such a way as to materially increase the volume of this flame, and to prevent at the same time any tendency to white or yellow points or streaks at the tip of the green flame, which is true of those burners of this character now known to me.

In my improved burner the chimney gallery delivers the air to the outside of the flame in a continuous unbroken sheet, and

preferably it is delivered to the outside of the flame in a plurality of continuous sheets, one located in a plane above the other, and the best results are produced by having the upper sheet or sheets of air less in volume than the volume of the lower sheet or sheets of air. These results are accomplished by providing the chimney gallery with a plurality of inwardly-extending flanges between which the air is admitted and issues from their peripheries in continuous sheets of air. For instance, the chimney gallery is provided with a lower flange or deflector *a* which, as here shown, is preferably of a Z-shape in cross-section. Located above the upper portion of this flange *a* is a second inwardly-extending flange *b*, and above this flange is a third flange *c*. Formed in the lower portion of the Z flange *a* are a plurality of openings *a'* which delivers the air behind the same and it passes outward between this flange and the flange *b* in a continuous unbroken sheet, and is delivered directly against and into the heavy green flame. A portion of the air which is admitted behind the flame *a* passes upward through a plurality of small openings *b'* in the flange *b* into the space between the flanges *b* and *c*, and is delivered from between these flanges also directly against and into the heavy green flame. There is a third and lower current of air delivered against and into the base of the heavy green flame approximately or directly at the point where the vapor is generated from the outer side of the projecting wick D. Attention is directed to the fact that this lower base current of air passes through a continuous slit *d* (Fig. 4) which is formed between the edge of a peripherally outwardly-projecting flange *e* formed on the upper end of the outer wick tube 6, which limits the amount of air, or volume thereof, which is delivered to the space between this flange *e* and the horizontal inwardly-extending flange *f* at the upper end of the Z flange *a*. The function of the flange *e* is two-fold, one to restrict or limit the volume of air which passes between it and the flange *a*, and the other to cause the generated vapor to expand at this point, as shown in Fig. 4, and thus produces an enlarged base for the heavy green flame, and air is delivered directly against and into this expanded base of the green flame. Preferably the flanges *f*, *b* and *c* are horizontal for the purpose of driving the escaping sheets of air directly against the outer surface of the heavy green flame, and thus forcing it more effectively directly into the flame and more effectively causing it to mix with the burning vapor. This is found in practice to have a material effect in the production of perfect combustion; the increasing of the volume of the flame, and in the efficiency of the flame, and also results in



producing a green flame with practically an even tip, and with practically no tendency to white or yellow points.

As shown in Fig. 5, the gallery G has its several elements connected together in fixed relations, and is detachably connected in any suitable manner with the base of the chimney I. The lower end of the chimney I has an outwardly turned annular flange *g* which rests outside of and on the lower out-turned horizontal portion of the flange *c*, and this horizontal portion of the flange *c* is turned under and embraces the horizontal lower portions of the flanges *a* and *b* as shown at *h* Fig. 4. This construction of flanges insures their accurate assembling in the manufacture of the burner, since these flanges are constructed by drawing tools, thus insuring accuracy in construction, one fitting accurately within the other, which makes these parts interchangeable.

*Flame converter and controller.*—My improved burner includes what I term a combined flame converter and controller H, the object of which is to cooperate with the gallery, not only to convert what would otherwise be a yellow flame into a blue flame, but after its conversion thereby, to control this flame and hold it to the blue flame from the minimum to the maximum adjustment of the flame, which, so far as I am aware, has not before been accomplished in a blue flame burner of the character herein disclosed. This combined flame converter and controller is movable up and down with the wick, and is preferably for convenience supported and moved by the wick itself. In describing the specific construction of this combined flame converter and controller, reference is particularly made to Figs. 4 and 6. This device comprises what may be termed a vertical body portion 20 from the upper portion of which there is an upper outwardly-projecting flange 21 which is located above and separate from the wick D, and projects beyond the outer periphery of the wick, and also a narrower flange 22 located a short distance below the flange 21, and has its outer portion resting upon (or substantially upon) the upper end of the wick. Formed in this flange 22 and located at a point inside of the wick D are a plurality of openings 23 which are arranged in a circular series entirely around the flange, as illustrated in Fig. 6. Preferably for convenience in construction, these openings 23 are located with the outer sides of their peripheries immediately at the inner edge of the wick, and this location is found to produce the best result, though it may be varied, the principal requisite of location being such as to permit air to pass through this flange at a point inside of the wick. The upper portion of this combined converter and controller is provided with a cap 24 which is dished upwardly as shown,

and is provided with a peripheral outwardly-extending flange 25. This flange 25, and also the flanges 21 and 22 extend in a horizontal direction, so that the air which passes between these flanges to the heavy green flame is delivered thereto in a horizontal direction, and thus effectively forced into the flame and caused to mingle with the partially burned vapors. A greater volume of air is fed between the flanges 21 and 25 than between the flanges 21 and 22, by reason of the larger space between the flanges 21 and 25. The body portion 20 and the cap 24 are connected by means of a flange spider 26, which has ears 27 connecting it to the body portion 20, and ears 28 connecting it with the cap 24, and this flange member is formed of a plurality of flanges, as clearly shown in Fig. 6, which are separated at a central point, as shown at 29, to form a tubular opening, through which loosely passes a vertical rod 30 which has its lower end rigidly connected to the inner wick tube 1 at the point 31 in any suitable manner. This rod 30 projects above the cap 24 a short distance, and carries a detachable stop 32, which limits the upward movement of the cap, and in turn limits the upward movement and maximum adjustment of the wick.

The air passing through the openings 23 of the flange 22, strikes the under side of the flange 21 as it is delivered in an upward direction, and is caused to spread and to issue from between these flanges in a continuous unbroken sheet, which is essential to prevent the tendency to white or yellow points at the tip of the green flame. Owing to the proximity of the openings 23 to the wick, and consequently to the base of the green flame, they are preferably made of such size that their combined area for the passage of air is greater than the vertical area of the escaping point between the flanges 21 and 22, so that these openings are capable of delivering more air between these flanges than will pass out the escaping point, which still further insures the flattening out of the air, and causes it to be delivered in an unbroken, continuous, horizontal sheet to the inner side of the flame for the purpose previously stated. The object of having the cap 24 dished upward is to form a pocket or reservoir for the air, whereby there is insured always a sufficient volume above the flange 25 to cause the air to be delivered from between this flange and the flange 21 in a steady, unbroken sheet. Furthermore, it forms a vertical annular shoulder which prevents the uprushing air from being forced outwardly in broken currents with the bad effect heretofore mentioned, and it also serves to keep the converter and controller from becoming overheated, which is desirable in order to obtain the best results. By having this device H to move up and down



with the wick, the currents of air delivered to the base of the flame are maintained at a fixed point in respect to the upper end of the wick, and the device in practice, because  
5 of this, not only serves to convert an otherwise yellow flame into a blue flame, but controls the flame and maintains a blue flame at the various adjustments of the wick from minimum to maximum. Furthermore, by  
10 having the upper end of the wick practically covered by the flange 22, the current of air delivered immediately above the wick, does not come in contact with the end of the wick, which prevents the wick from having a rag-  
15 ged or irregular top. In burners of this character where the air which is delivered above the wick passes across or in contact with the top of the wick, the air coming in contact with the unavoidable irregularities  
20 of the top of the wick, is found to cause yellow or white points in the tip of the green flame.

In the practice of this improved burner, there is produced a clearly perceptible heavy  
25 green flame having the contour shown in Fig. 4, of large volume with an enlarged base portion, the tip of the green flame being drawn inwardly, and there is clearly perceptible distinct light blue flames issuing  
30 from opposite sides of the tip of this green flame, and these blue flames unite at a point thereabove and are drawn inward, as illustrated in Figs. 3 and 4, which concentrates the flame and the heat units at a point terminating above the grate C. With a utensil on the grate the concentrated flame strikes the bottom thereof and spreads around the utensils, which is found to be very effective in the utilization of the  
40 heat units produced by a burner of this character. It is also found in the practice of this improved burner, that the flame extends to a point several inches above the top of the chimney, and that the combustion is  
45 so nearly perfect that this projecting flame is only visible in the dark.

I desire it to be understood that persons skilled in this art, with the teachings of this disclosure before them, defining the functions of the several parts, would be capable  
50 of making variations in details which would still embody the principles and constructions here sought to be protected, and for this reason I do not therefore limit myself to the exact details herein shown and specifically described, so long as any modification or variation therefrom will accomplish the result or results herein disclosed, they will come within the scope and spirit of my invention.  
60

From the foregoing description, it will be understood that the volume of vapor generated is controlled by the amount of exposed surface of the wick, and that the wick is in  
65 effect a movable generator or vaporizer,

which, by its movement, controls the volume of vaporization, and therefore the size or height of the flame. This operation or result is present in the ordinary well known wick lamp, and is also true of burners of the  
70 character herein described. I have discovered that it is this movement of the generator or wick in respect to the air currents of a blue flame burner of the character herein disclosed, that causes the blue  
75 flame to change to a yellow flame when the wick is turned low to produce a low or simmering flame. I have also discovered that a blue flame can be maintained throughout the adjustment of the generator—that is, 80 from a low or simmering flame to a full flame, and vice versa—by having the devices for delivering the air currents at either the inner or the outer side of the flame so arranged that there will be a limited air supply and flame passage-way when the generator is approximately in its lowest, as well as its highest adjustment. I have discovered that this may be accomplished in several ways. I have herein disclosed what I  
90 consider the preferable way that I have discovered in which this result is accomplished. For instance, I have discovered that the preferred way for maintaining a non-illuminating flame in the burner of this  
95 character, from a full flame to a simmering flame, and throughout the intermediate adjustment, is by having the air currents delivered to the flame at either the inner or outer side thereof to move in unison, or substantially so, with the movement of adjustment of the generator or wick, and that it is not necessary to move the air currents at both sides of the flame.

While I have shown, and prefer to have  
105 the air currents which are delivered to the inner side of the flame to move in unison with the adjustment of the generator, as being most convenient to construct, and as giving the best results, yet I desire it to be  
110 understood that the non-illuminating flame can be maintained throughout the adjustment of the generator by having the outer air currents to move with the generator, instead of the inner air currents, as here shown  
115 and described. I desire it also to be understood that this part of my present improvement is involved in any structure which provides for supplying a limited flame space, and a limited air supply at a point adjacent  
120 the generator when it is at or approximately at its lowest adjustment, as well as at its highest adjustment, whereby the non-illuminating flame is maintained throughout the adjustment of the generator. In other  
125 words, my invention involves a structure which provides a sufficiently restricted flame and air space so located in respect to the adjustment of the generator as to prevent the production of a yellow flame when the gen- 130



erator is at a low point to produce a simmering flame, and to produce a non-illuminating flame in all the various adjustments from the simmering to the full flame. I wish also to state that while a tapered chimney is not essential to a burner of my improved construction, in order to concentrate the flame and the heat units as heretofore explained, yet it has a beneficial tendency in this direction, and also serves to hold the flame steady to prevent the lateral waving of the flame which has a tendency to occur in a straight-wall chimney, and it also serves to increase the draft through the burner, and by this increased draft, the laterally delivered sheets of air are more forcibly delivered to the green flame, and thereby caused to more intimately mix with it. I desire also to call attention to the function performed by the particular construction of the upper end of the outer wick tube 6, in addition to the function of enlarging the base and volume of the green flame, as previously explained. The upper end of this outer wick tube 6 is caused to bear against the outer surface of the wick at the point 30', and at this point the wick tube is preferably provided with a short vertical surface. The functions of this is to preserve the uniformity of the wick; to keep the outer surface of the wick clean, and to form a stop for the wick sleeve 9, to prevent the operator from turning the wick so high as to carry the adjusting wheel 8 out of mesh with the wick sleeve 9, and thus lose control of the wick. This portion 30' serves to preserve the uniformity of the wick by engaging its outer surface, and thus prevents the upper end from flattening out under the weight of the converter and controller H. That is to say, the wick, when the burner is not in use, is withdrawn within the wick tubes, and in the act of being projected it is caused to engage this point 30' and to be straightened and smoothed out as it moves upward to engage the flange 22 of said converter and controller. It serves to clean the wick in that combustion occurs only at the outer side of the wick, and the tendency for the accumulation of carbon is only on the outer side of the wick. When the wick is moved downward this portion 30' will scrape from the outer surface of the wick any accumulated carbon or other particles, and will straighten out any fragments of the wick. Should, however, any of the roughness or particles be carried past this member when the wick is retracted, the lower edge of this part 30' will have a tendency to remove it when the wick is extended. It serves as a stop for the wick to prevent it from being turned upward out of control of the wheel 8, in that it lies in the path traveled by the wick sleeve 9, and fits the outer surface of the wick so snugly that the wick

sleeve cannot be forced by it, and the wick sleeve is of a length at least equal to, and as here shown, longer than the distance between the engaging periphery therewith of the wheel 8 and the portion 30'. This also permits of a free and easy movement of the wick, since the outer wick tube is enlarged outwardly, as shown, and engages the wick only at the short point 30'.

As previously explained, the outer wick tube is detachable and is removed when the wick is to be taken out or a new wick placed therein.

I do not make any claim herein for the flame converter herein having a sleeve projecting upwardly from the upper end of the inner wick-tube and having secured thereto a flange extending over the top of the wick and serving as a stop therefor, and a second flange secured to the sleeve in proximity to the first mentioned flange and also extending over the top of the wick in position to shield the first mentioned flange from radiant heat of the flame, as this is made the subject-matter of a co-pending divisional application Serial number 426,831, filed February 13th 1908.

Having thus described my invention, what I claim and desire to secure by Letters Patent, is:

1. In a blue flame burner of the character described, the combination with a vertically-movable generator, of means located respectively inside and outside of the flame for delivering a horizontal sheet of air to both sides of the flame from the generator, and arranged to produce a blue flame, one of the said air-delivering means actuated by and vertically-movable with the generator for the purpose described.

2. In a burner of the character described, the combination with a vertically-adjustable generator, of an air deflector located at one side of the flame and approximately in the same horizontal plane as the upper end of the generator when the latter is at the limit of its upper adjustment, and an air deflector arranged to deliver air laterally at opposite side of said flame and at a point approximately at the top of the generator in all of its various adjustments and coöperating with the other air deflector to produce a blue flame throughout all of the adjustment of the generator.

3. The combination in a burner of the character described, of a wick, a combined flame converter and controller actuated by and movable with the wick and comprising means for delivering a horizontal sheet of air to the interior of the flame at a fixed point in respect to the wick irrespective of the vertical adjustment of the wick to maintain a non-illuminating flame throughout the vertical movement of the wick.

4. In a blue flame burner of the character



described, the combination with a generator, of an air and flame limiting device inclosed by the flame from the generator, and a surrounding air and flame limiting device comprising three inwardly-extending annular flanges, the two lower flanges having relatively large and small air passages, the large air passages being in the lower flange.

5. In a blue flame burner of the character described, the combination with an annular generator, of an air and flame limiting device inclosed by the flame from the generator, and a detachable surrounding chimney gallery consisting of a plurality of inwardly-extending annular flanges which are connected together and arranged in fixed relations and adapted to be applied as a single member in operative position.

6. In a blue flame burner of the character described, the combination with an annular generator, of an air and flame limiting device inclosed by the flame from the generator, and a surrounding air and flame limiting gallery consisting of a plurality of inwardly-extending flanges, the upper flanges extending inwardly and the lower flange being substantially Z-shaped to provide a pocket between it and the flange above with a relatively small outlet space between said flanges, the lower flange having an air passage to supply the said pocket with air.

7. The combination in a burner of the

character described, of a circular generator, and a flame converter and controller for the interior of the flame consisting of a body portion having three closely-arranged outwardly-extending flanges to supply separate horizontal sheets of air to the flame, the flanges having air passages to establish communication to the spaces between them, the lower flange located immediately above the generator and nearer to the intermediate flange than the flange above for delivering a greater volume of air through the upper passage than is delivered through the lower one.

8. A flame converter and controller for an annular burner of the character described comprising a body portion having two separated outwardly-extending flanges with an outwardly-extending air communication with the space between the flanges, of a cap portion located above the upper flange, the said cap portion dished upwardly and having a peripheral outwardly-extending flange cooperating with the flange below to form a horizontally-extending air passage-way.

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

ATWELL J. BLACKFORD.

Witnesses:

HUGH J. McBRIDE,  
E. A. SCHNEIDER.