P. HOLLENBECK.

AIR HEATING FURNACE.

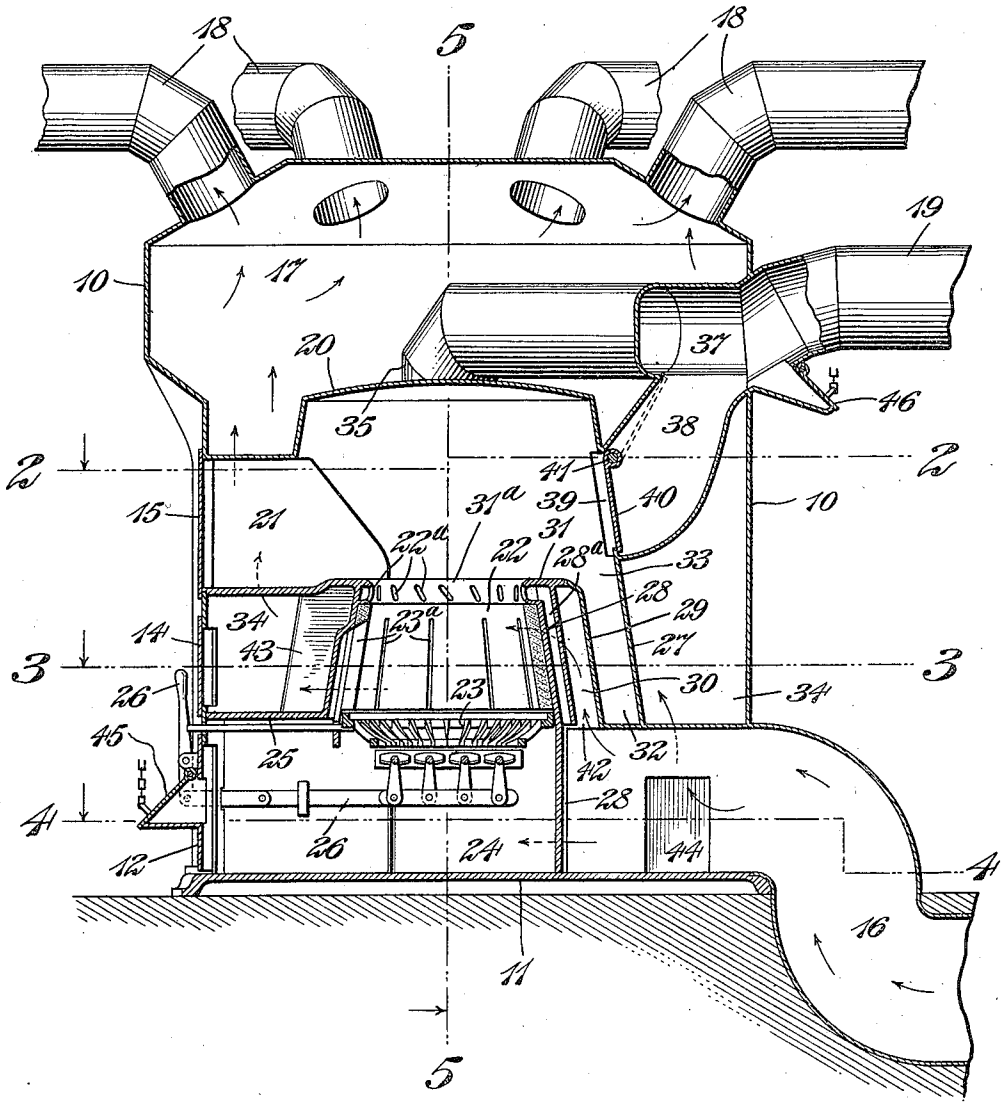
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1,069,952.

Patented Aug. 12, 1913.

3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

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3 SHEETS—SHEET 2.

Fig. 3.

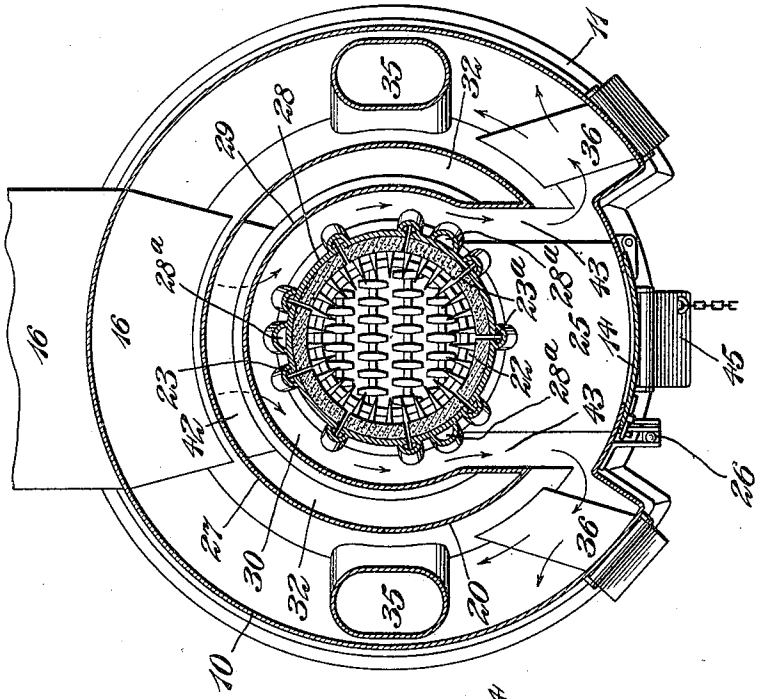
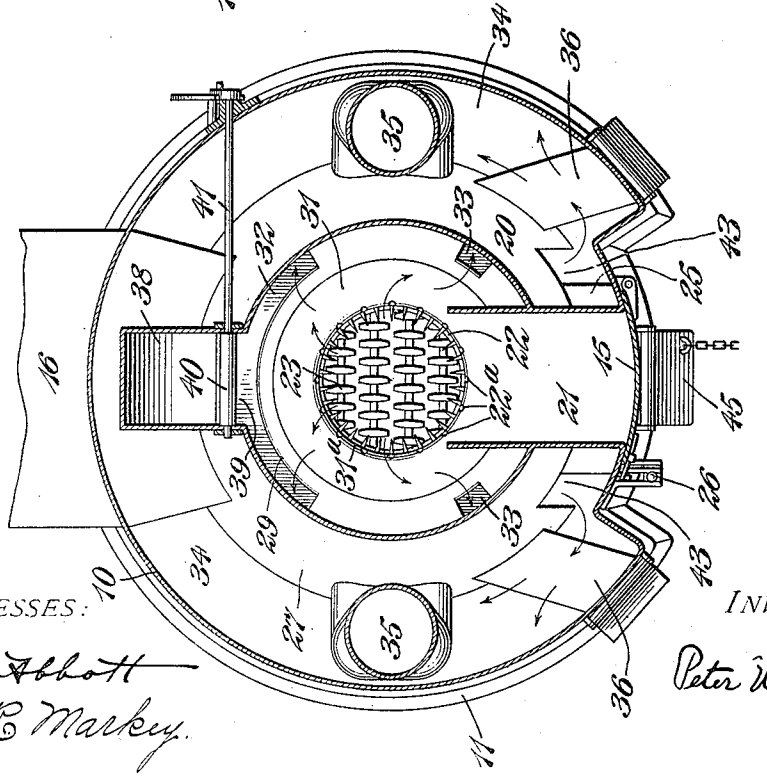


Fig. 4.



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3 SHEETS—SHEET 3.

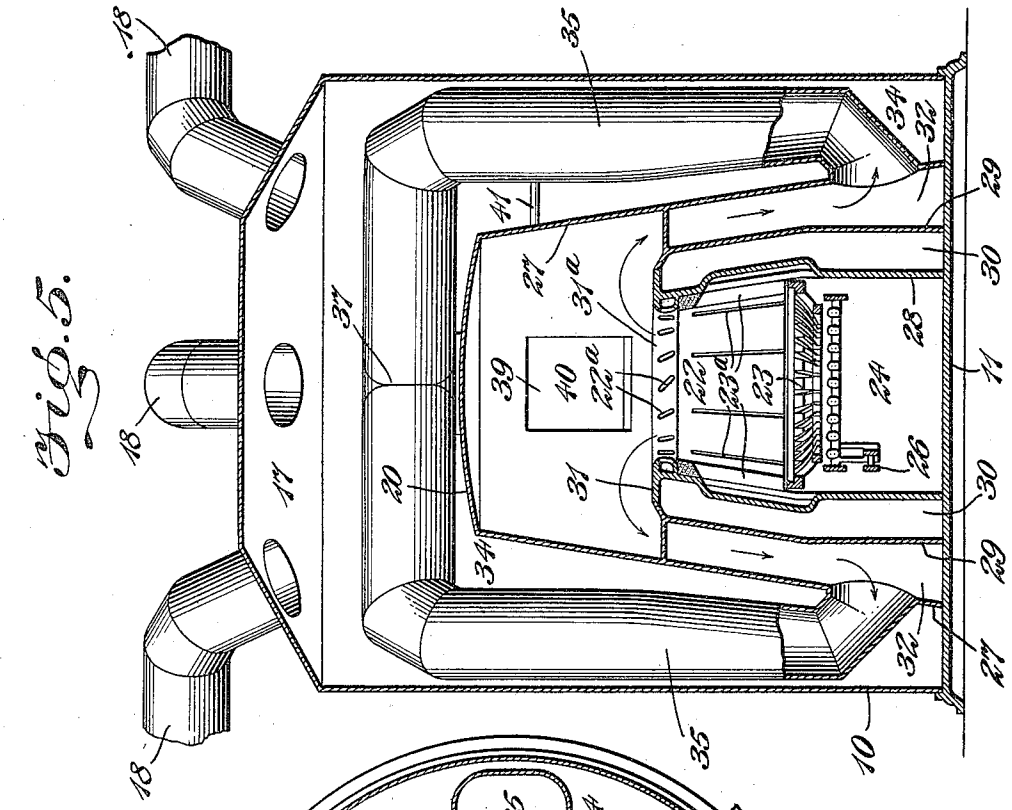


Fig. 5.

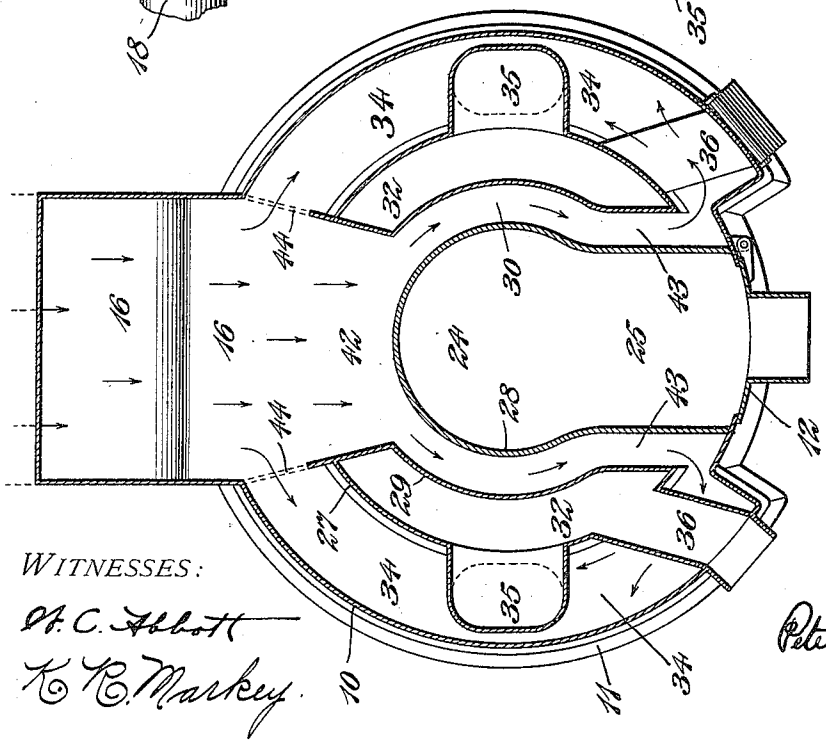


Fig. 4.

WITNESSES:

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UNITED STATES PATENT OFFICE.

PETER HOLLENBECK, OF KILDARE, OKLAHOMA.

AIR-HEATING FURNACE.

1,069,952. Specification of Letters Patent. **Patented Aug. 12, 1913.**

Original application filed February 27, 1911, Serial No. 611,228. Divided and this application filed August 12, 1911. Serial No. 643,681.

To all whom it may concern:

Be it known that I, PETER HOLLENBECK, a citizen of the United States, residing in Kildare, Kay county, Oklahoma, have invented certain Improvements in Air-Heating Furnaces, of which the following is a specification, being a divisional application of copending application, Serial No. 611,228, filed February 27, 1911.

This invention relates to certain improvements in heating furnaces, and more particularly in that class of such furnaces which are especially designed and adapted for use in connection with air heating systems, and the object of the invention is in part to provide a furnace of this general character of a comparatively simple and inexpensive nature and of a compact and durable construction having certain features of novelty and improvements affording an increased heating capacity without proportional increase in fuel consumption.

Other objects of the invention are to so improve the construction and operation of the furnace as to afford increased radiating surface near its base in order that the heating effect may be augmented without corresponding increase in the height or dimensions of the furnace; to provide means for initially heating the air prior to its entry into the hot air chamber, whereby more effective heating of the air in said chamber is assured; and to provide means for assuring a more uniform heating surface.

With these and other objects in view, the invention consists in certain novel features of the construction, combination and arrangements of the several parts of the improved furnace, whereby certain important advantages are attained and the furnace is rendered more simple, less expensive, and otherwise better adapted and more convenient and effective for use, all as will be hereinafter fully set forth.

The novel features of the invention will be carefully defined in the claims.

In order that my improvements may be the better understood, I will now proceed to describe the same with reference to the accompanying drawings, wherein I have illustrated one embodiment of my invention.

In these drawings Figure 1, is a sectional view taken vertically and axially through the improved furnace. Fig. 2, is a sectional view taken horizontally through the improved furnace in the plane indicated by the line 2—2 in Fig. 1. Fig. 3, is a sectional view similar to Fig. 2, but taken through the improved furnace in the plane indicated by the line 3—3 in Fig. 1, and showing certain features of the means for initially heating the air prior to its introduction into the hot air chamber of the furnace. Fig. 4, is another sectional view similar to Figs. 2 and 3 but taken through the ash pit of the improved furnace in the plane indicated by lines 4—4 in Fig. 1, and Fig. 5, is a vertical section taken on the line 5—5 of Fig. 1, certain parts being shown in elevation.

As shown in the drawings the improved furnace is provided with preferably an upright cylindrical outer casing 10, mounted upon a base 11, and in the front with an ash door 12, adjacent to the base; an auxiliary door 14, above the ash door and communicating with a space wherein a water pan may be supported; and a fuel door 15, above said auxiliary door, affording access to the fire pot, as will be hereinafter explained.

16 represents a fresh or cold air inlet which is directed into the lower part of the casing 10, and the upper part of said casing incloses a warm or hot air chamber 17, wherewith a plurality of hot air flues 18, 18, have communication for the supply of heated air to the different rooms of a building in a well known way.

19 represents the smoke outlet, herein shown as leading from the upper part of said casing.

20 represents a heating drum centrally positioned within the outer casing 10, below said hot air chamber 17, said heating drum being rested at its lower part upon the base 11, and having preferably the form of a frustum of a cone as in the structure herein shown, in order that its exterior surface may radiate heat vertically as well as laterally within said casing for the more effective heating of the air therein, from contact of said heating drum with the flames and heat escaping from the fuel burning in the fire pot, and from their passage downward through the descending flue 32, hereinafter

described. The upper part of this heating drum 20 has a forwardly directed extension or fuel chute 21, affording a passage communicating with the fuel door 15, in the furnace front, for the supply of fuel to the fire pot 22, which is later referred to and is preferably frusto-conical in form and has an inner cellular wall with vertical tubular cells slotted as at 23a for the purpose of admitting air from the ash pit through said cells to the outer surface of the burning fuel to assist in consuming the gases therefrom, and is centrally positioned within the heating drum 20 beneath the rear end of said fuel chute, and is provided with a grate 23, at its lower part, separating it from the ash pit 24 centrally positioned within the lower part of said heating drum and beneath said fire pot, and communicating with a forward extension 25, from said ash pit, affording an inclosed passage for the removal of ashes therefrom, and leading to the ash door 12 in the furnace front. In the structure herein shown the upper side of the ash pit extension 25 affords a support for a water pan to which access may be had by way of the auxiliary door 14, previously referred to.

26 represents means for operating the grate 23 from the front of the furnace.

As shown herein the heating drum 20 is formed with a tight continuous perimetrical wall 27 extended downward from its upper part to the base 11, and the extensions 21 and 25 are also formed with continuous walls for preventing the leakage of products of combustion, and their entry into the hot air chamber 17. The preferably vertically set, frusto-conical, double walled structure of the fire pot 22, and the ash pit 24, are formed as shown in Fig. 5 with inner and outer continuous walls respectively 28 and 29, spaced apart but connected at the top by ring plate 31, to produce a free air heating space 30 between and adjoining said inner and outer walls, and to which air is admitted from the exterior of the outer casing through inlet 16 to be initially heated prior to its introduction into said hot air chamber with which said space has connection as in Figs. 1 and 4, and as will be hereinafter explained. The said space 30 is closed at its upper part as shown at 31, and as herein shown is connected with, and extends continuously and laterally from the rear of the outer casing to the front of the heating drum, and continuously and downwardly from the upper part of said fire pot to the furnace base 11, except at the furnace front where the ash pit extension 25 is extended through said space. It will be seen however, that said space 30 surrounds and adjoins the entire inner wall of said fire pot as in Fig. 2, thus abstracting a large supply of heat directly from the entire mass of fuel burning in the fire pot. The fire pot is also formed with a slotted tubular gas ring 31a situated on the upper inner surface of the inner wall of said fire pot for the purpose of supplying air from space 30 by the way of air ducts 28a and gas ring slots 22a as in Fig. 1, to assist in consuming gases escaping from the upper portion of the burning fuel.

At its lower part, the heating drum 20 is so much larger than the outer wall 29 of the air space 30 as to afford a descending annular flue 32 between said wall 29 and the wall 27 of the heating drum 20, and concentric with said wall 29, said flue 32 having communication at its upper part with the fire pot near the rear upper part of said heating drum, and also by the way of ports 33, 33, through which the flames and hot gases from the burning fuel in the said fire pot are drawn downwardly through said flue 32 around the outer wall 29 of space 30, said flue 32 being extended downward to the furnace base 11, so as to afford comparatively great heating surface adjoining said space both at the fire pot and ash pit of the furnace. 36, 36, are doors communicating with the lower part of said flue 32 whereat it may be cleaned.

The heating drum 20 is so much smaller in diameter than the furnace casing 10, as to afford an intervening annular hot air chamber 34, extended upwardly from the base of the furnace, and communicating at its upper part with the hot air chamber, 17, within the upper part of said casing for the supply of heated air thereto, and at opposite sides of the drum 20 there are provided indirect smoke flues 35, 35, leading therefrom, and extending upwardly within said annular air chamber 34, and having communication at their lower ends with the lower part of the descending annular flue, 32, nearly surrounding space 30, outside the outer wall 29 of the fire pot and ash pit so that the hot gases descending in said annular flue 32 are drawn upwardly from the lower part thereof through said indirect smoke flues 35, 35, as in Fig. 5.

The flues 35, 35, are extended upward within the casing 10, to the top of the heating drum 20, whereat they are directed toward the rear side of said casing and come into communication with each other and with the smoke outlet 19, within the furnace casing as indicated at 37, so that their heated walls being wholly exposed within said casing, afford a greatly increased heat radiating surface, and also a more uniform distribution of heat to different parts of the furnace.

38 represents an auxiliary or direct smoke flue within the furnace casing, communicating at its upper part with the smoke outlet 19, and having its lower end adapted for communication with the upper part of the heating drum 20, as shown at 39 so that the

waste products of combustion may be carried off by a direct path from the fire pot to the smoke outlet.

In the furnace herein shown an outwardly freely opening damper 40 is supported upon a horizontal rod or damper shaft 41 and controls by any suitable means the lower end of the direct smoke flue 38, which is normally closed by said damper to assure the passage of the products of combustion from the fire pot downward through the annular flue 32, and thence by way of the indirect flues 35, 35, to the smoke outlet of the furnace in order that the greater part of the heat escaping with the gaseous products of combustion may be abstracted before their final discharge from said smoke outlet.

The space 30, wherein the initial heating of the air is accomplished prior to its passage to the hot air chamber 17, has communication at the lower part of its rear side back of the ash pit 24, and adjacent to base 11, as shown at 42, with the exterior of the outer casing through inlet 16, so that air is supplied through said inlet into said space between the inner and the outer walls of the fire pot and ash pit, and is caused to be drawn therethrough in order to be directly heated by the burning fuel to a comparatively great extent by means of the radiating surfaces of the walls 28 and 29, the former being exposed to the heat from within said fire pot and ash pit, and the latter to the heat from the flames and hot gases descending in the annular flue 32. The air traversing space 30 is thus highly heated after which it is discharged from said space through its outlet 43, at the forward side of the heating drum 20, in front of the fire pot and ash pit, into the forward part of the annular hot air chamber 34, surrounding said drum, and thence into the hot air chamber 17, said outlet 43, being positioned as shown immediately below the fuel chute 21, so that said fuel chute operates to deflect the heated air laterally within the said annular chamber 34, in such a manner as to assure a more uniform distribution of hot air within the outer casing, and to the several flues 18, 18, with which said chamber has communication. It may therefore be seen that space 30 of the double walled fire pot 22 as formed, has the additional advantage of initially heating its air supply, and before it reaches the annular hot air chamber, thus greatly increasing the heating capacity of a furnace over other methods in general use.

The air inlet 16, passes through the lower part of the annular chamber 34 at the rear of the furnace, and its opposite sides are provided with similar openings 44, 44, communicating with the lower part of said annular chamber for the discharge of cold air in suitable volumes thereto. The air thus supplied to said chamber being caused to pass upwardly through the same in close contact with the outer side of wall 27 of the heating drum 20, and with the indirect flues 35, 35, abstracts the greater part of the heat therefrom, thereby augmenting the heating capacity of the furnace; increases the uniformity of air circulation; and also lessens the liability of injury to those parts from overheating, by bringing cold air in direct contact with their heated surfaces. The furnace is further provided with a draft door 45, connected with the outer side of the ash door 12, of the ash pit extension 25, for controlling the draft of air therethrough to the ash pit and fire pot; and the furnace is also provided with a check draft-door 46, connected with smoke outlet 19, for admitting air therein to aid in controlling the draft when desired, said draft door and said check draft door being operated by any suitable means for purposes referred to.

From the above description of my improvements, it will be seen that the furnace constructed according to my invention is of a simple and comparatively inexpensive nature and is particularly well adapted for use by reason of its efficiency, but it will be obvious that the device may be susceptible of some modification without material departure from the principle and spirit of the invention, and for this reason I do not desire to be understood as limiting myself to the precise formation and arrangement of the several parts herein set forth in carrying out my invention in practice.

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

1. In a furnace having an outer casing, and a heating drum within said outer casing at a distance therefrom, thus forming an annular hot air chamber between them; a fire pot set within said heating drum, and formed with an inner and an outer wall spaced apart and connected, inclosing between and adjoining said inner and outer walls an annular air heating space having an inlet at one side of said fire pot, leading from the exterior of said outer casing, and a lateral outlet at the opposite side of said fire pot, leading into said annular hot air chamber, substantially as shown and described.

2. In a furnace having an outer casing, and a heating drum within said outer casing at a distance therefrom, thus forming an annular hot air chamber between them; a fire pot and an ash pit set within said heating drum, and formed respectively with an inner and an outer continuous wall spaced apart and connected, inclosing between and adjoining said walls an annular air heating

space having an inlet at one side of said fire pot and ash pit, leading from the exterior of said outer casing, and a lateral outlet at the opposite side of said fire pot and ash pit, leading into said annular hot air chamber, substantially as shown and described.

In witness whereof, I have hereunto signed my name this 8th day of August, 1911, in the presence of two subscribing witnesses.

PETER HOLLENBECK.

Witnesses:
B. C. WOLF,
W. C. LILLIS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents Washington, D. C."