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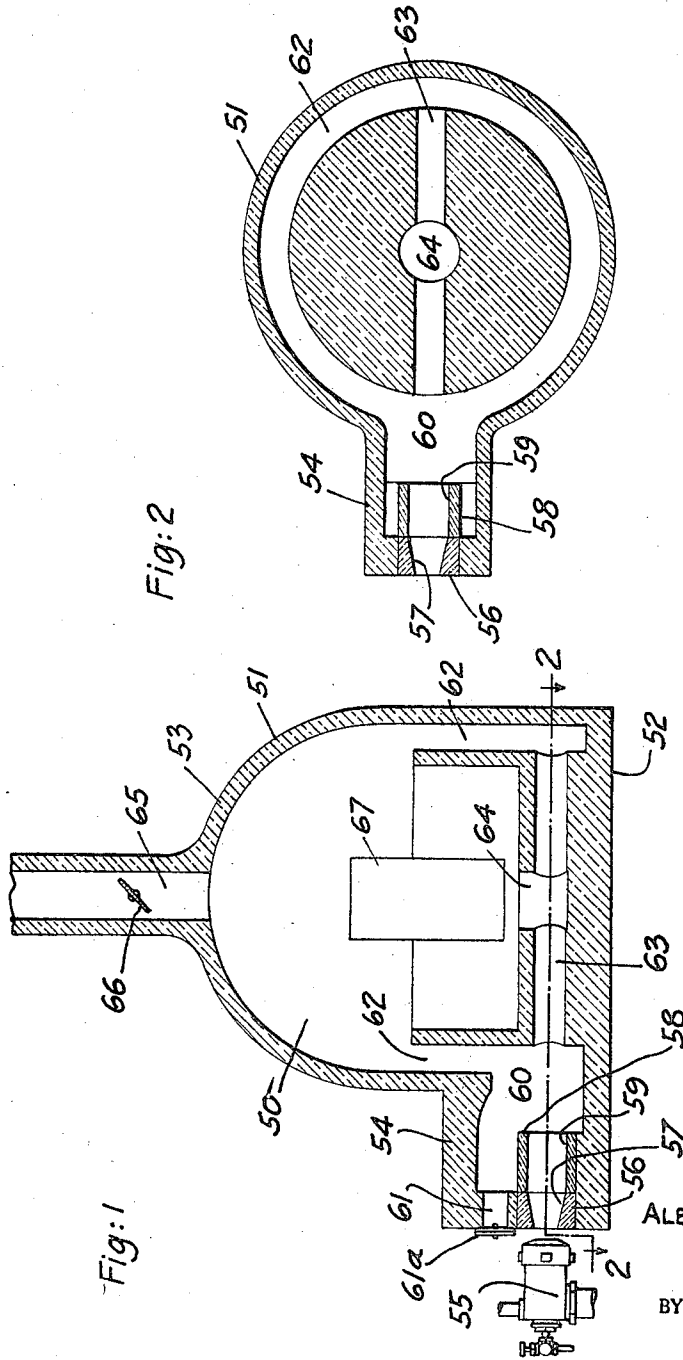
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A. W. MORSE

OIL FIRED KILN

Filed Dec. 22, 1925

2 Sheets-Sheet 1



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INVENTOR

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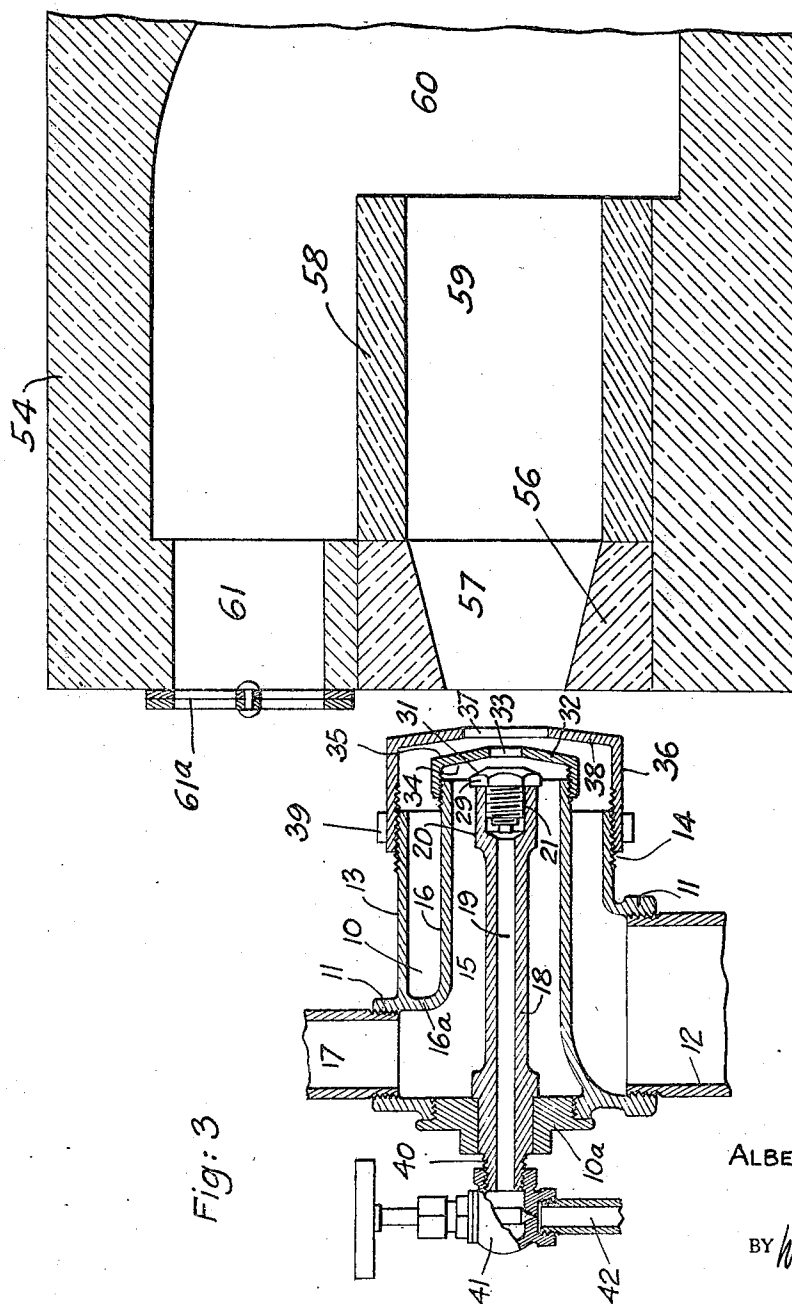
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UNITED STATES PATENT OFFICE.

ALBERT W. MORSE, OF LONG ISLAND CITY, NEW YORK.

OIL-FIRED KILN.

Application filed December 22, 1925. Serial No. 76,987.

This invention relates to oil-fired kilns, particularly the kind used in the ceramic industry.

In kilns for making ceramic products, it is essential to provide for two distinct heating periods, namely, the drying period, and the baking period.

During the drying period, the kiln is heated to a low temperature, using a very small amount of oil and a large amount of air, the latter being needed in the drying process. During the baking period, a relatively high heat is maintained, the burners using approximately 5 to 8 times the amount of oil as during the drying period, and only a small amount of air, just enough to complete combustion.

In some of the kilns heretofore in use, in order to make oil available for heating them, 2 sets of burners were employed, one set of very small capacity to be used during the drying period, and another set of large capacity during the baking period, necessitating a complete change over at the beginning of each heating period. In some kilns, a coal fire was maintained during the drying period and oil burners employed only during the baking period. A variety of other make-shift arrangements were used to accomplish the desired heating effects.

It is the purpose of this invention to so construct a kiln and provide in connection therewith an oil burner of particular characteristics, that the complete change-over from drying to baking may be accomplished without any alterations in the burner installation or in the kiln proper, but by a simple adjustment in the burner structure.

It is another object to make the kiln particularly applicable to be used in connection with an oil burner of a relatively small and a relatively large capacity, preferably of the kind described in a copending application filed by me July 30, 1923, and bearing Serial Number 654,709.

A still further object is to provide the kiln with features which enable the proper amount of air to be drawn into it for each heating period, without affecting detrimentally the combustion efficiency of the burner, and to prevent the influx of air during the drying period extinguishing the flame of the burner while adjusted to a low capacity.

Still further objects will become apparent in the following specification and the accompanying drawings, in which

Fig. 1 is a sectional view through an oil-fired kiln embodying my invention;

Fig. 2 is a cross sectional view along the plane of line 2—2, in Fig. 1;

Fig. 3 is an enlarged sectional view through a preferred form of oil burner, used in connection with the kiln, of which a fragmentary sectional view of the parts adjacent the burner is shown.

Like characters of reference denote similar parts throughout the several views and the following specification.

50 is a kiln of a type used for the drying and baking of ceramic products, consisting principally of a housing 51 having a substantially flat base 52 and a dome-shaped top 53. At the side of the housing is an extension 54, in front of which is mounted an oil burner 55 of a construction hereinafter described in detail. 56 is a so-called "combustion block" made of fire brick, having an inwardly diverging opening 57 through which the flame from the burner is discharged into the kiln. Adjacent the inner side of the combustion block 57 is another block 58, having an opening 59, preferably round in cross section and in alignment with the opening 57. 60 is a combustion chamber into which the flame of the burner or its gases are discharged after having passed through opening 59. Preferably above the combustion block 56 is an air inlet opening 61 provided with a rotary damper mechanism 61^a of the usual and well known construction (therefore not described in detail) for the purpose of regulating the size of opening 61. This air opening is in communication with combustion chamber 60. 62 is an annular passage extending partially upwards at the inner side of the housing 51 for the deflection of hot gases, and 63 is a transverse passage having a central outlet 64 for conducting hot gases into the center of the kiln. 65 is an outlet for waste gases at the top of the kiln, controlled by a damper 66. 67 is a charging door for loading the kiln, usually made of slabs of refractory material.

The burner 55 is substantially the same as the one illustrated and described in my copending application Serial #654,709 above referred to, and for sake of convenience the same reference numbers are used.

10 is a cylindrical casing of substantially L-shape; its shorter branch 11 is threaded interiorly to receive a relatively large air supply pipe 12. The terminal of the longer

branch 13 of the casing 10 is threaded exteriorly at 14. A tubular chamber 15 formed by a wall 16 extends through the casing in axial alignment with its longer branch 13. Wall 16^a connects the chamber 15 with the outer wall of casing 10 opposite its shorter branch 11, and is threaded interiorly for connection with a relatively small air supply pipe 17. Casing 10 is threaded interiorly, adjacent to branch 11, to receive a plug 10^a which is bored out to receive an oil spindle 18. This oil spindle is of hollow construction, being provided with a central duct 19, and extends through the tubular chamber 15 in central alignment therewith. 20 is an enlarged end of spindle 18, threaded interiorly to receive a nebulizer plug 21. 29 is a polygonal projection around the outside of the plug 21, slightly larger than enlarged end 20 of spindle 18, to facilitate screwing the same into the spindle. 31 is an air deflecting surface at the top of the nebulizer 21. 32 is a deflector cap screwed onto the exterior of the cylindrical chamber 15 formed by wall 16, and is provided with a circular central opening 33 which is smaller than the outside diameter of the deflecting surface 31 of the nebulizer 21. Deflector cap 32 is provided with inner air deflecting surfaces 34 and outer air deflecting surfaces 35. 36 is a cap adapted to screw onto the threaded end of branch 13 of casing 10 which cap is provided with a central opening 37 of a diameter smaller than the outside diameter of the air deflecting surface 35 of cap 32. 38 is an inner deflecting face of cap 36. 39 are lugs on the outside of the cap 36 to facilitate screwing the same onto the threaded part 14. 40 is a reduced portion of oil spindle 18, projecting outside of plug 10^a, and is threaded exteriorly to receive a needle valve 41 of standard construction, controlling the flow of oil to the burner from a pipe 42.

The operation of the kiln is as follows:

The work, viz, the ceramic products to be treated, is placed within the kiln through the charging door 67 which is then closed. The first object is then to thoroughly dry the product by an even and comparatively low heat, admitting simultaneously the greatest amount of air. In order to do so, the oil valve 41 is opened which permits oil, under pressure, to pass through conduit 19 into the nebulizer 21 where it is atomized and expelled. Air under pressure is then admitted into the chamber 15 by way of the small pipe 17, and is then deflected by inner face 34 of cap 32 and outer deflecting face 31 of the nebulizer 21, under its full pressure, into the spray or mist of oil issuing from the nebulizer. The resulting mixture leaves the burner through the outlets 33 and 37, and passes through opening 57 in the combustion block 56 into the passage 59. The spray of

oil is ignited by holding burning waste in front of the burner in the usual manner, the block opening 57 being of diverging shape to allow for flame expansion. The flame is directed into the combustion chamber 68 and its heat deflected through passages 63 and 64 into the center of the kiln and through passage 62 around its sides. At this stage, it is important that a large amount of air be induced into the kiln to effect a low temperature within the kiln and carry off the moisture in the clay, because subjecting the ceramic products to too high a temperature, before being thoroughly dried, will crack or otherwise damage them. With oil burners of the customary construction throttled down to a minimum, cooling air drawn in through an opening in the kiln, such as 61^a, would have the tendency of lowering the ignition temperature to a point where the flame might easily be extinguished. To overcome this, I have provided within the kiln, immediately adjacent the combustion block 56, the block 58 with its passage 59. This passage which is practically an extension of the combustion block, or, as it might be properly called, "primary" combustion chamber, serves as a high temperature gas retort, wherein the oil and air mixture from the burner is completely converted into a highly combustible gas and burned before reaching the combustion chamber 60 or, what might also be termed "secondary" combustion chamber. Moreover, the flame at low velocity fills entirely the passage 59 and causes only a small amount of air to be drawn into the kiln through the mouth of the primary combustion chamber. If the flame were not exerting a slight pressure against the sides of the passage 59 at low velocity, a relatively great amount of air would be induced into the kiln which might cause the flame to be extinguished. The combustion temperature is then lowered for drying purposes by admitting air, as required, through the air inlet 61 to mix with the burned gases beyond the retort.

After the ceramic products are dried and the kiln is to subject them to baking, instead of admitting air through the small supply pipe 17, I admit it through the large pipe 12 into the space between casing 10 and chamber 15. This air is then similarly deflected against the spray of oil issuing from the nebulizer 21 through opening 33, by being directed against the same by inner deflecting surface 38 of cap 36 and outer deflecting surface 35 of cap 32, to expel the combustible mixture from final outlet 37 of the burner. In order to maintain a high temperature within the kiln, the shutter 61^a of the auxiliary air opening 61 is usually closed, and additional air for combustion drawn in through the mouth of the primary combustion chamber 57 by the velocity of

the mixture discharged from the burner outlet, the flame in this case being propagated into the secondary combustion chamber.

5 The advantages of the combination of the employment of a burner, constructed as explained, in connection with the specially designed combustion chamber and retort are obvious. Only one type of burner is used.
10 The change from the drying to the baking period can be effected by simple adjustments only.

While I have shown the block 58 with a round passage 59, I do not wish to limit myself to this particular construction, but any kind of a baffle wall or arch or chamber with suitable outlets may be used, whereby the flame is restricted in a retort-like fashion and the primary combustion chamber maintained under a slight pressure. Furthermore, while I have illustrated one particular form of kiln only, it is understood that the same principle of oil firing for two distinct heating periods may be used in any other form of kiln, and that any number of burners may similarly be applied to one kiln, the essential feature being, broadly, the combination of an oil burner, capable of adjustment to a very large and a very small capacity, with a particular form of kiln inlet, the kiln having an additional air inlet independently of the one provided by the burner itself at the mouth of the inlet into the combustion chamber.

35 Various changes in the form, proportion, and minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of the invention, as defined in the appended claims.

What I claim as new, is:

1. The combination of an oil burner, with a kiln having a primary combustion chamber, an extension thereto, and a secondary combustion chamber having an adjustable air port in communication therewith.

2. The combination of an oil burner adapted to be adjusted to a relatively large capacity and a relatively small capacity, with a kiln having a primary combustion

chamber, an extension thereto, and a secondary combustion chamber having an adjustable air port in communication therewith.

3. The combination of an oil burner adapted to be adjusted to a relatively large capacity and a relatively small capacity, with a kiln having a primary combustion chamber of inwardly diverging shape, a straight extension thereto, and a secondary combustion chamber having an adjustable air port in communication therewith.

4. The combination of an oil burner having a large and a small air connection, independently of each other, an oil connection, and an outlet for the discharge of oil and air from either of the said air connections, with a kiln having a primary combustion chamber for the mixture of oil and air from the said burner, an extension thereto, and a secondary combustion chamber having an adjustable air port in connection therewith.

5. The combination of an oil burner having a large and a small air connection, independently of each other, an oil connection, and an outlet for the discharge of oil and air from either of the said air connections, with a kiln having a primary combustion chamber of inwardly diverging shape, a straight extension thereto, and a secondary combustion chamber having an adjustable air port in connection therewith.

6. The combination of an oil burner having a large and a small air connection, independently of each other, an oil connection, and an outlet for the discharge of oil and air from either of the said air connections, with a kiln having a primary combustion chamber for the mixture of oil and air from the said burner, a secondary combustion chamber having an adjustable air port in connection therewith, and a housing around the flame discharged by the said primary combustion chamber, adjacent the said primary chamber, to prevent air from extinguishing the said flame while operating the said burner with air from the said small air connection.

In testimony whereof I affix my signature.
ALBERT W. MORSE.