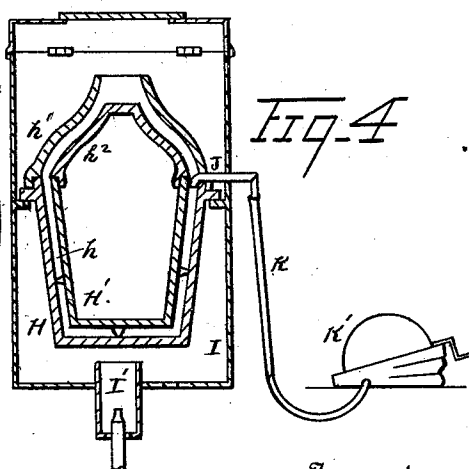
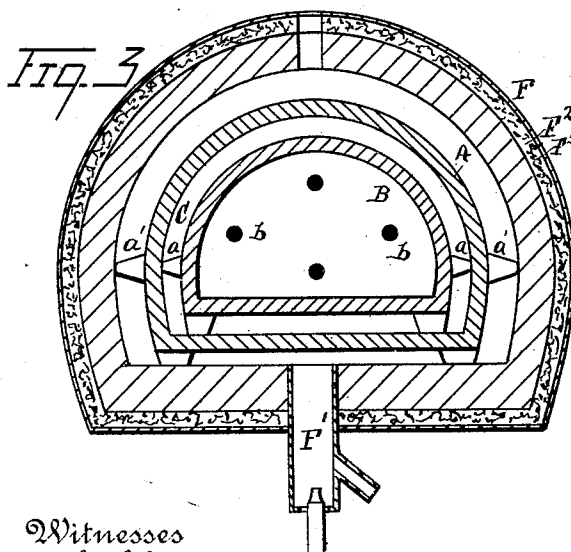
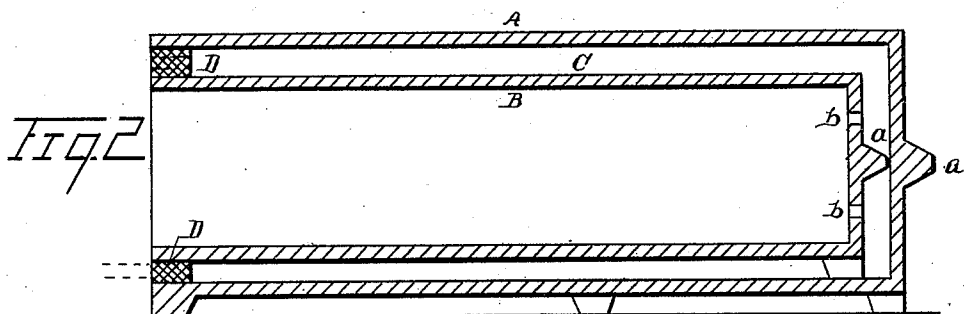
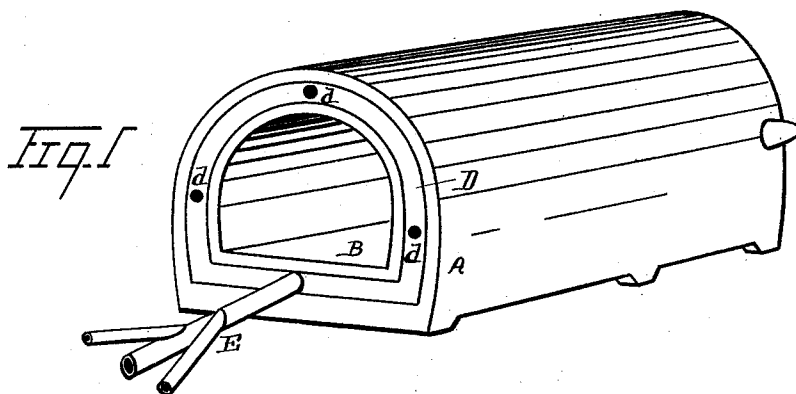


(No Model.)

C. H. LAND.
MUFFLE FURNACE.

No. 446,947.

Patented Feb. 24, 1891.



Witnesses
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UNITED STATES PATENT OFFICE.

CHARLES H. LAND, OF DETROIT, MICHIGAN.

MUFFLE-FURNACE.

SPECIFICATION forming part of Letters Patent No. 446,947, dated February 24, 1891.

Application filed August 31, 1889. Serial No. 322,542. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. LAND, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Muffle-Furnaces; and I declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to a new and useful apparatus for controlling chemical effects on various substances while under the influence of various degrees of heat, so as to secure at the will of the operator definite chemical effects desired free from contamination from foreign matter.

I carry out my invention as more particularly hereinafter described and claimed, and illustrated in the accompanying drawings, in which—

Figure 1 is a view in perspective illustrating features of my invention. Fig. 2 is a vertical longitudinal section. Fig. 3 is a vertical cross-section showing the muffles inclosed in a furnace, and Fig. 4 is a vertical section illustrating a modification of my invention.

This invention is more particularly designed as an improvement on features embodied in United States Letters Patent granted to me January 3, 1888, No. 376,003.

The apparatus employed in my present invention consists of a muffle, retort, crucible, oven, or other analogous device constituting an inner receptacle, the same being located within an outer receptacle and forming an intermediate space between said receptacles, which in turn are located within the combustion-chamber of a furnace, the construction and arrangement being such that an independent air or gas space is interposed between the inner receptacle and the products of combustion in the combustion-chamber, through which space the atmosphere or any determined gas or gases or the vapors of metals may be circulated to secure the desired action upon the substances placed within the inner receptacle and to protect said substances from injurious results while un-

der the influence of heat in said combustion-chamber.

Accordingly, A represents the outer muffle, B the inner muffle, and C the intermediate space between the two receptacles. The front of said space may be closed in any desired manner, as by an asbestos wall or packing D, which for certain purposes may be perforated, as shown at *d*, to afford an outlet for the atmosphere, gas, or vapors caused to circulate about the inner receptacle through said space.

E represents an inlet-conduit communicating with said space C, and through which any desired gas or gases or vapors or the atmosphere may be conducted into said space. Instead of perforating the wall D, as shown at *d*, said space may be provided with any desired outlet.

In some cases it will be desirable to inject the gas, atmosphere, or vapor into the inner receptacle and to discharge it from the mouth thereof. Accordingly my invention contemplates perforating the interior muffle B at any desired point or points, as shown, for example, at *b*.

F represents the furnace, in the combustion-chamber of which the two receptacles are located. F' is a burner led therethrough. This furnace may be of any well-known or improved construction; but as shown in the drawings it is provided with a heat-retaining packing F², over which is secured a metallic covering F³. The muffles may be provided with lugs *a a'* to keep them in place and to insure free circulation about the inner receptacle.

In Fig. 4 I have shown two crucibles H H', the one located within the other, forming an intermediate space *h* between them. The crucibles are supported in any desired furnace or heating apparatus I. The crucibles may or may not be provided with a hood *h' h''*, respectively, the space *h* opening upward through and between the hoods, as shown. These hoods, if employed, may be removable to afford access to the interior of the inner crucible. An inlet-pipe J may lead through the case of the furnace into the space *h* and a tube K connect a pressure device K' with said inlet-pipe for injecting the gas, atmos-

phere, or vapor into said space under pressure.

It will be evident that by locating the substance to be acted upon within the interior muffle said substance, when subjected to heat within the combustion-chamber of the furnace, may readily be separated from the deleterious products of combustion in said chamber and from other injurious influences by enveloping said substance within an air, gas, or vapor space wholly independent of and separate from the products of combustion in the combustion-chamber. It is equally obvious that the gases, atmosphere, or vapors introduced into said space may be wholly distinct from said products of combustion in the combustion-chamber, and also from any gases otherwise present or generated in the inner receptacle. This feature of surrounding the work in the interior muffle within such an air, gas, or vapor space, separating it from the products of combustion in the combustion-chamber, and of introducing into said space any desired gas, atmosphere, or vapor enables me to effectually regulate and control the chemical effects produced within the interior muffle. Take, for example, the manufacture of porcelain wares, as artificial teeth, for instance. In such manufacture by means of my invention embodied in the Letters Patent above referred to, when air was injected directly into the muffle containing the work, in order to force out deleterious gases or to introduce a desired gas directly to the work within the muffle, it was found that the force of the current injected in a large volume was apt to carry small particles of matter with it in a measure injurious to the work. By injecting the current, however, between two muffles into an intermediate space in the manner herein described any such injury is entirely overcome and much more uniform and perfect effects are secured. I have demonstrated, also, that free carbon, either conveyed through the monoxide of carbon or an excess of hydrocarbon, has a tendency at high temperatures within the combustion-chamber of a muffle furnace to give up its carbon and unite with the oxides of the work within the muffle and with the oxides of the muffle itself unless guarded against, tending to deoxidize the work of certain description—such as porcelain, for example—as well as injuring the muffle. To guard against such a liability, my improved device is found peculiarly well adapted, as thereby a current of air may be circulated about the inner muffle to protect it and the work from the liability of injury above described. Air or any other suitable gases or vapors may be so introduced into the

intermediate space to drive off any injurious gases and prevent their entrance into the muffle; or a suitable gas can be introduced into said space to unite with an injurious gas and change it to one of a harmless character at the proper temperature. Thus monoxide of carbon may be changed to dioxide of carbon by the introduction of oxygen into the said space at a suitable temperature.

For another example illustrating the application of my improved device attention is called thereto as an adequate prevention of the oxidation of metals within the muffle when subjected to high degrees of heat in the combustion-chamber, as in the tempering of steel. By this device I am able to maintain an atmosphere of nitrogen or hydrogen, for instance, about and in the inner receptacle, by means of which the steel may be brought to the desired temperature without oxidation, the steel being immersed in the nitrogen or hydrogen, oxygen being excluded thereby from the inner receptacle. The same is true where other gases or vapors are similarly injected for analogous purposes.

Where oxygen is desired, it may be uniformly and rapidly injected into the interior muffle to oxidize a given substance placed therein, as in assay work, where this method is of greatest practical utility and value.

What I claim is—

1. In an apparatus for controlling chemical effects, the combination, with the furnace, of an outer receptacle located therein and spaced therefrom, an inner receptacle located within the outer receptacle and spaced therefrom to form an air or gas space, said air or gas space having an inlet and outlet, means for conveying to said space air, gas, or vapor, and a burner or heating means communicating with the space formed between the furnace and outer receptacle.

2. In an apparatus for controlling chemical effects, the combination, with the furnace, of an outer receptacle located therein and spaced therefrom, an inner receptacle located within the outer receptacle and spaced therefrom to form an air or gas space communicating with the inner receptacle and provided with an inlet, means for conveying to said space air, gas, or vapor, and a burner or heating means communicating with the space formed between the furnace and the outer receptacle.

In testimony whereof I sign this specification in the presence of two witnesses.

CHARLES H. LAND.

Witnesses:

N. S. WRIGHT,
CHAS. F. SALOW.