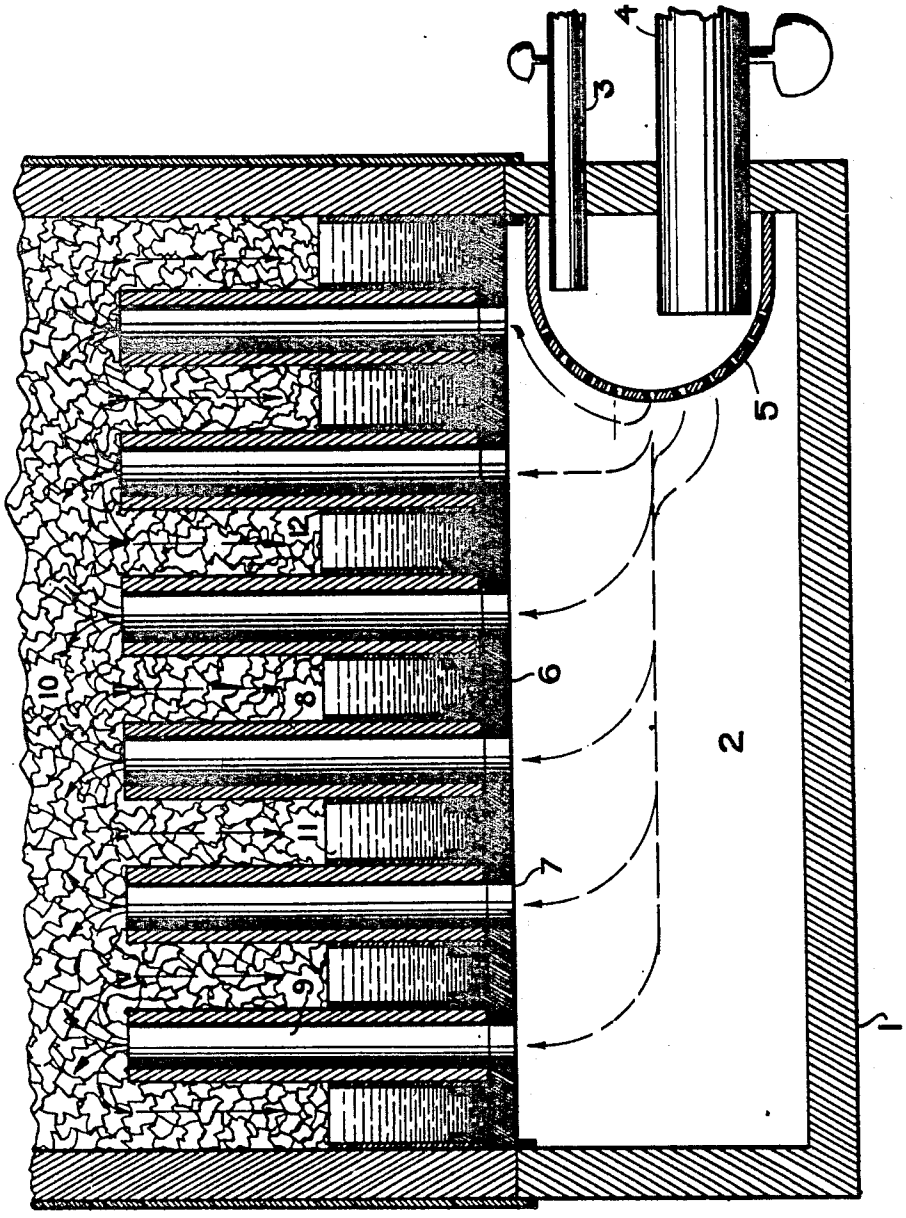
W. McA. JOHNSON.

METALLIC UNION.

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1,133,245. Patented Mar. 23, 1915.



WITNESSES:

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WOOLSEY McALPINE JOHNSON, OF HARTFORD, CONNECTICUT, ASSIGNOR TO THE CONTINUOUS ZINC FURNACE COMPANY, OF HARTFORD, CONNECTICUT, A CORPORATION OF CONNECTICUT.

METALLIC UNION.

1,133,245. Specification of Letters Patent. Patented Mar. 23, 1915.

Application filed December 8, 1914. Serial No. 876,127.

To all whom it may concern:

Be it known that I, WOOLSEY McAL. JOHNSON, a citizen of the United States, and residing at Hartford, in the county of Hartford and State of Connecticut, have invented a new and Improved Metallic Union, of which the following specification is a full disclosure.

This invention deals with the formation of a bond between impervious material and material presenting a rough or uneven surface, as is the case with fire-clay, so that the union will be gas-tight even under the severe conditions of heat and pressure.

In its more intense aspect, however, this invention proposes a construction especially advantageous as a structural characteristic of certain types of combustion apparatus, as for instance furnaces operated on the flameless combustion principle.

One object within the contemplation of this invention is to create a very simple and easily formed way of forming a gas-tight joint at a surface of fire-clay or other similar material.

Another object is to provide a structure for a combustion furnace in which an efficient and reliable metallic seal will be formed between separated surfaces of fire-clay so as to prevent the flow of gas along said surfaces.

Other objects will be in part obvious from the annexed drawings and in part indicated in connection therewith by the following analysis of this invention.

This invention accordingly consists in the features of construction, combinations of parts, and in the unique relations of the members and in the relative proportioning and disposition thereof, all as more completely outlined herein.

To enable others skilled in the art so fully to comprehend the underlying features thereof that they may embody the same by the numerous modifications in structure and relation contemplated by this invention, drawings depicting a preferred form have been annexed as a part of this disclosure, and in such drawings, like characters of reference denote corresponding parts throughout all the views of which the figure illustrates a vertical section of one type of combustion furnace embodying this invention.

Continuing now by way of a more detailed description, the furnace illustrated consists of a metallic base 1, here having a pan-like form, and providing an annular combustion chamber 2 adapted to receive gas by means of a gas pipe 3 and to receive air under pressure by means of a blast pipe 4, each of which is suitably controlled by suitable valves. In order that the incoming gas may be thoroughly mixed with the necessary amount of air, a mixer 5 is employed. This provides a multiplicity of perforations through which the air and gas must pass before being received by the mixing chamber 2, with the consequence that the mixture is complete and intimate. The dome 6 of the mixing chamber is preferably in the form of a perforated cast-iron plate providing a number of holes 7 which are about $\frac{1}{2}''$ in diameter and extending upwardly through the sockets 8. In these holes are placed a series of upwardly extending fire-clay pipes 8 which are about $\frac{5}{8}''$ in external diameter and have a bore 9 of about $\frac{3}{8}''$ in diameter. These fire-clay tubes are plastered into their sockets by means of a little "dope" of fire-clay and water-glass so as to make a sufficiently tight connection to retain the molten metal which is employed in the process of forming the joint. These tubes are made of extremely dense and hard-burned fire-clay.

It may be explained that the mixture formed in the mixing chamber 2 passes through these tubes and disseminates throughout a mass of refractory fragments 10 and is burned in intimate association on the surface of said fragments. For efficient and satisfactory operation, it is essential for the gas to enter the combustion zone only through the tubes mentioned above, and it is therefore necessary that a gas-tight septum be formed to separate the mixing chamber 2 from the combustion zone 10. Heretofore great difficulty has been experienced in accomplishing this in a satisfactory manner.

Now, in effecting a gas-tight septum in accordance with invention, the tubes 8 are first carefully provided with an intimate plating or coating of some suitable metal, such for instance as copper, zinc, or the like. This coating may be formed either by electro-plating, or by sherardizing, or by means of a gas blast, or by zinc condensation, in a manner analogous to the formation of a zinc film in a zinc condenser. This step results in an extremely intimate infiltration of the

metallic particles into the pores of the fireclay so as to leave no room for gas leakage.

After the tubes, prepared as above specified, are assembled as indicated by the drawing, the apparatus is preferably brought to a sufficiently high temperature, say 300° C., and then molten metal, such as zinc, is poured into the space around the lower portions of the tubes, forming a molten bath 11 which will "wet" or form a solder joint with the already deposited film of difficultly fusible metal 12, thus superficially alloying with it, and when the bath 11 is solidified the furnace is ready for operation and the septum 11 will be connected to the porous pipes under conditions forming a joint exceedingly tight to the stray passage of gases, and the structure formed will be found to be durable and capable of withstanding severe usage. For the purpose of insuring superficial amalgamation, a mild soldering flux or a reducing or a neutral atmosphere may be used to prevent any slight superficial oxidation of the film which might tend to interfere with the alloying. The metal used for forming the septum 11 will, of course, vary in accordance with the severity of the working conditions. Thus, in certain cases brass or copper may be desirable, and of course the depth may vary in accordance with the prevailing conditions. After the metal has been poured, it may be compacted and caused to permeate all spaces by means of a plunger-like apparatus in the nature of a die element, capable of being forced down by a proper mechanical means to amalgamate and closely fit the metal with all contacting surfaces.

Having thus revealed this invention, I claim as new and desire to secure the following combinations of elements, or equivalents thereof, by Letters Patent of the United States:

1. A furnace combining a lower mixing chamber, an upper combustion zone, a plurality of non-metallic tubes formed of refractory material and arranged to establish communication between said chamber and zone, a portion of each tube having a roughened surface and having a built-up annulus of metal circumscribing said portion in intimate contact with the surface thereof by being deposited in a state of minute subdivision into the superficial pores thereof; and a metallic partition separating said zone and chamber and connected with said built-up annuli.

2. A surface-combustion furnace of the nature disclosed, comprising a tube of refractory material for converging a combustible mixture, a film of difficultly fusible metal coating a portion of said tube and permeating the superficial pores thereof, and a body of metal amalgamated with said film.

3. A furnace combining a lower mixing chamber, an upper combustion zone, a plurality of refractory tubes establishing communication therebetween, a metallic film coating a portion of each tube, and a continuous septum of metal amalgamated with the films and forming a gas-tight wall between the mixing chamber and the combustion zone.

In witness whereof, I hereunto subscribe my name, as attested by the two subscribing witnesses.

WOOLSEY McALPINE JOHNSON.

Witnesses:
M. J. COOPER,
H. J. BRUNJES.

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