

J. B. McKENNAN & F. E. PARKS.  
METAL PORT AND END WALL CONSTRUCTION FOR REGENERATIVE FURNACES.  
APPLICATION FILED MAR. 15, 1909.

932,411.

Patented Aug. 24, 1909.

4 SHEETS—SHEET 1.

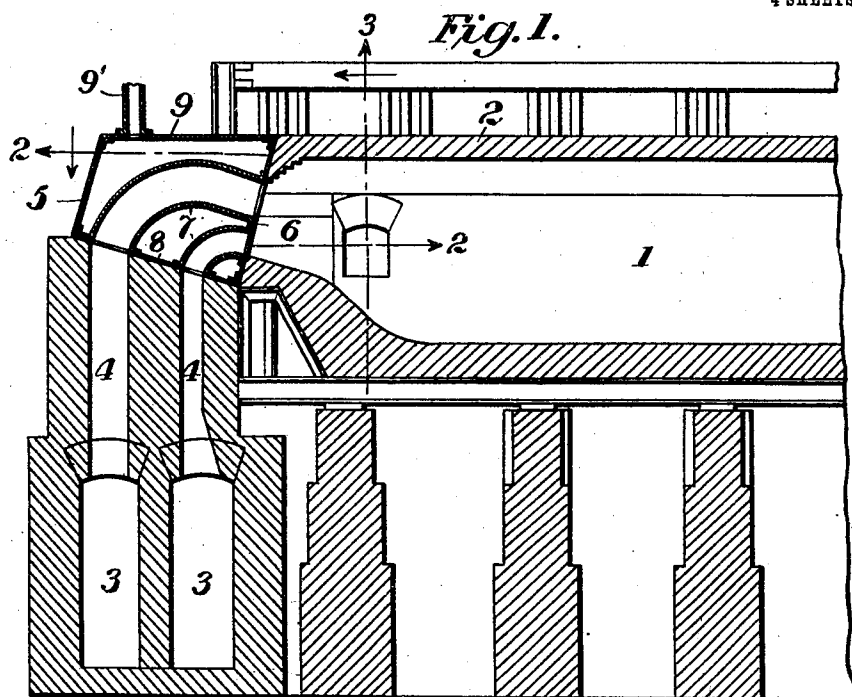


*Fig. 2.*

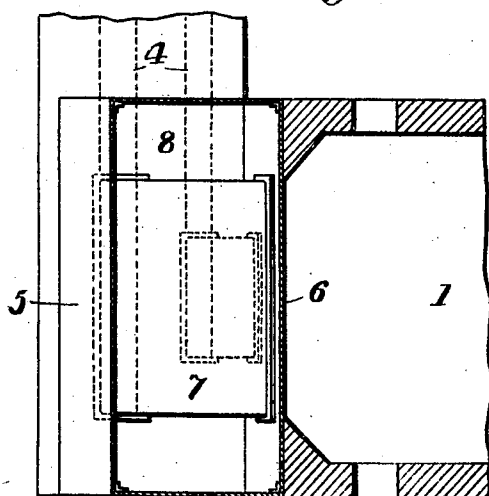
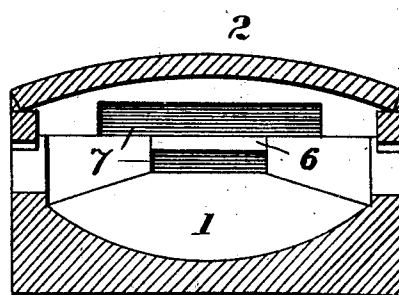


*Fig. 3.*



Witnesses

*J. G. Strickel*  
Charles N. Murray.

Inventors  
*Jacob B. McKennan.*  
*Frank E. Parks.*  
by *Eugene C. Brown*  
Attorney

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*Fig. 4.*

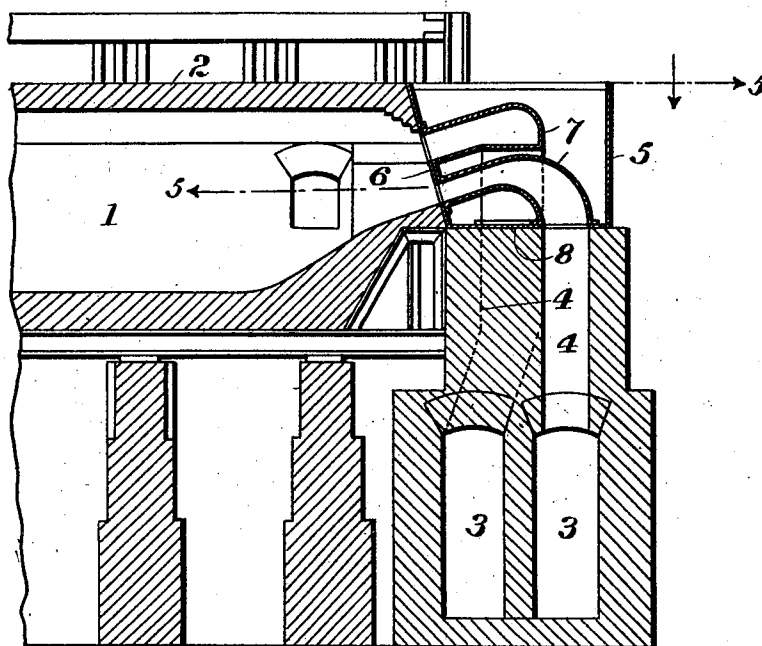
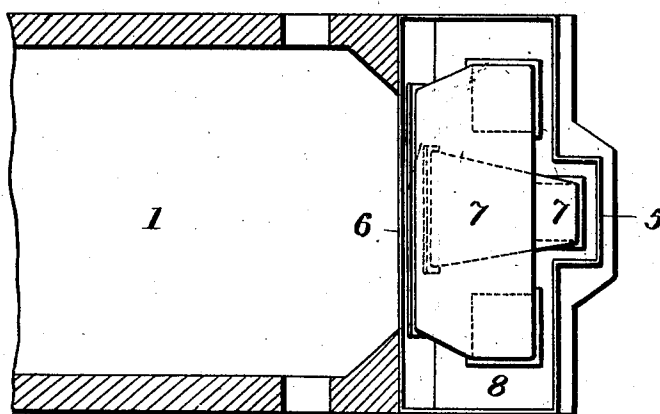


*Fig. 5.*



Witnesses

*J. G. Hinkel*  
*Charles W. Murray*

Inventors  
*Jacob B. McKennan.*  
*Frank E. Parks.*

by *Eugene C. Brown*  
 Attorney

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4 SHEETS—SHEET 3.

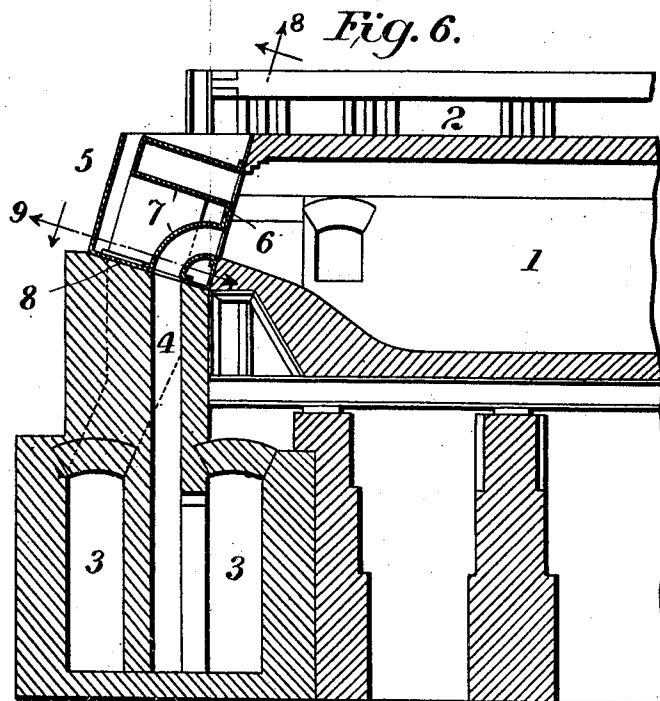
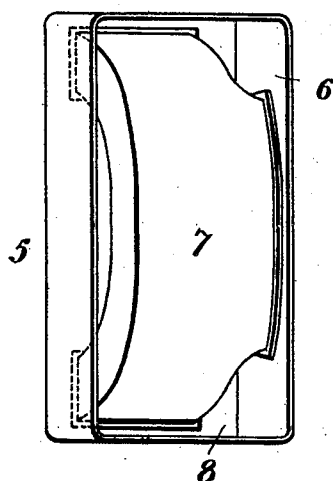


*Fig. 7.*



Witnesses  
*J. G. Stinkel*  
*Charles H. Murray.*

*Fig. 8.*

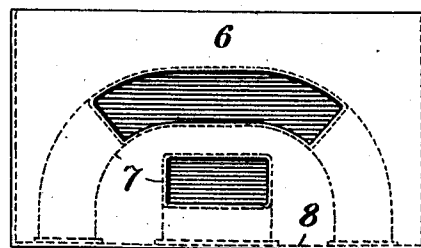
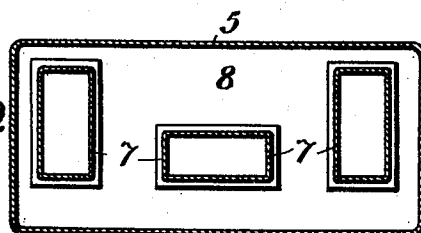


*Fig. 9.*



Inventors  
*Jacob B. McKennan.*  
*Frank E. Parks.*

by *Eugene C. Brown*  
 Attorney

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4 SHEETS—SHEET 4.

*Fig. 10.*

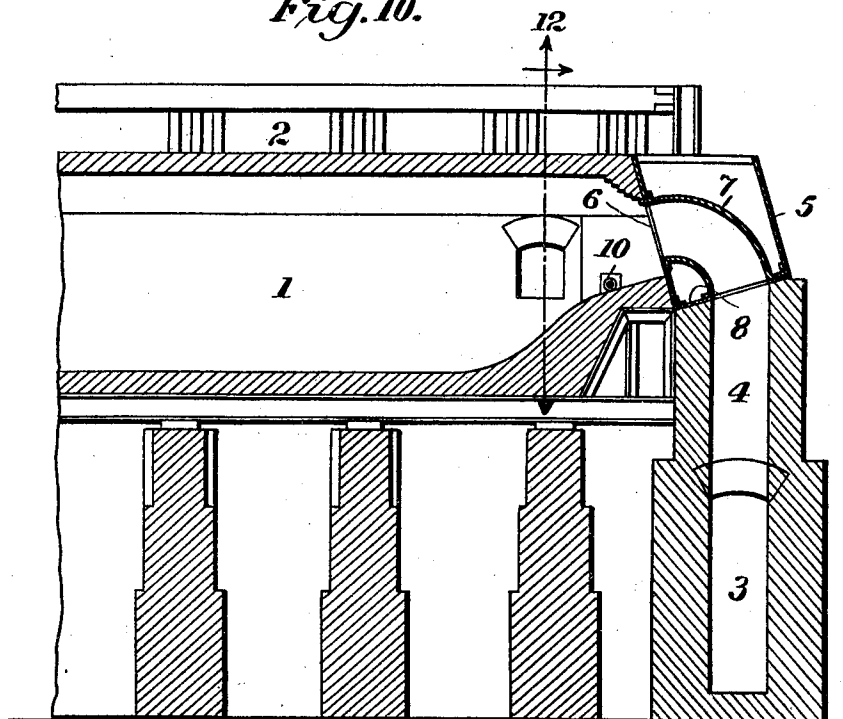


*Fig. 12.*

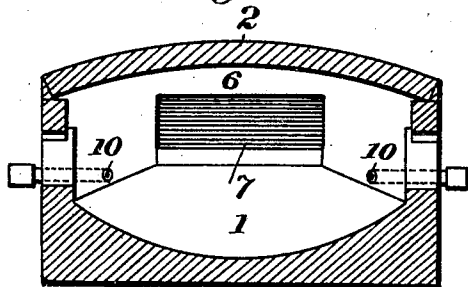
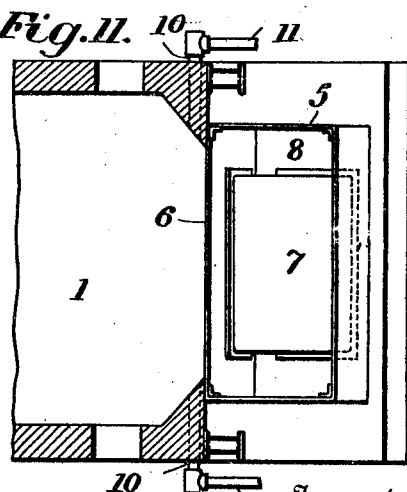


*Fig. 11.*



Witnesses:  
*Jefferson*  
 Charles N. Murray.

Inventors  
 Jacob B. McKennan.  
 Frank E. Parks.  
 by *Eugene C. Brown*  
 Attorney

# UNITED STATES PATENT OFFICE.

JACOB B. McKENNAN AND FRANK E. PARKS, OF PUEBLO, COLORADO.

METAL PORT AND END-WALL CONSTRUCTION FOR REGENERATIVE FURNACES.

932,411.

Specification of Letters Patent.

Patented Aug. 24, 1909.

Application filed March 15, 1909. Serial No. 483,473.

*To all whom it may concern:*

Be it known that we, JACOB B. McKENNAN and FRANK E. PARKS, citizens of the United States, residing at Pueblo, in the county of Pueblo and State of Colorado, have invented certain new and useful Improvements in Metal Port and End-Wall Construction for Regenerative Furnaces, of which the following is a specification.

Our invention relates to metallurgical furnaces, particularly to the ports and end-wall construction of regenerative furnaces, and its objects are further to simplify the construction shown in the application of Jacob B. McKennan, Serial No. 419,690; while effecting further economies not readily secured by the construction therein shown, and without sacrificing any of the advantages thereof.

In the drawings—Figure 1 is a longitudinal central section of one half of our improved type of furnace, showing at the left end thereof, in section, one embodiment of our improved port construction adapted to furnaces in which the gas regenerators are located between the air regenerators; Fig. 2 is a plan of the ports shown in Fig. 1, on the line 2—2, thereof; Fig. 3 is a section on the line 3—3 of Fig. 1, looking in the direction of the arrows; Fig. 4 is a section symmetrical with Fig. 1, showing at the right end a modification of the port structure adapted to furnaces in which the air regenerators lie between the gas regenerators; Fig. 5 is a plan of the port arrangement of Fig. 4, on the line 5—5, thereof; Fig. 6 is a sectional view similar to Fig. 1, showing a port structure adapted to furnaces in which the regenerators have either relative position and in which the furnace end of the air ports not only overlie but partly embrace the gas ports; Fig. 7 is a plan of the modified port structure of Fig. 6; Fig. 8 is a section on the line 8—8 of Fig. 6; Fig. 9 is a section on the plane 9—9 of Fig. 6, looking downwardly; Fig. 10 is a symmetrical section of a furnace having air regenerators only and having fittings for supplying natural gas or oil as fuel; Fig. 11 is a plan of the port structure of Fig. 10; and Fig. 12 is a section on the line 12—12 of Fig. 10, looking in the direction of the arrows.

As described in the application above mentioned, the ports, flue-walls and breast-walls of regenerative furnaces as ordinarily constructed, are gradually fused in the high

temperatures developed, and waste away into the uptakes or slag-pockets, gradually filling the latter with a slag very difficult to remove when repairs become necessary. Moreover, the furnace ends of the ports cut back under the flow of the heated gases, particularly the out-going products of combustion; so that the points of admission and direction of flow of the incoming gases are uncertain, except when the furnace is new or newly repaired.

In our improved construction, we entirely dispense with refractory breast-walls for the furnace-ends and the gas- and air- ports; substituting therefor a substantially unitary metal structure which constitutes the end-wall and contains the port openings; the whole resting upon the uptake walls and against the furnace ends, preferably at an oblique angle to each. By this means, we eliminate the use of breast-wall buckstays, secure an ample supply and good circulation of the cooling fluid, and may also, if desired, utilize the structure for generating steam, without fuel cost and without detriment to the operation of the furnace.

Referring to the several figures, in which like reference numerals indicate similar parts, 1 is the furnace chamber, 2 the roof, 3, 3, the slag-pockets, and 4, 4, the uptakes. These may be of the usual or any preferred construction; and adapted to any desired arrangement of regenerators.

Above the uptakes is situated the metal port and end-wall structure comprising a casing 5, the inner side 6 of which constitutes the end-wall. Passing through this casing, which forms the fluid receptacle, are the port-walls 7, 7. The arrangement of Figs. 1, 2, and 3 shows the structure adapted to furnaces in which the gas regenerators lie between the air regenerators. In this case the air-port may be a single port, without branches, partially surrounding and overlying the gas-port, as best shown in Fig. 3. The inclination of the base wall 8 and end-wall 6 (preferably about 15°) serves to hold the structure in place against the furnace end by reason of its weight alone. If the structure is to be utilized as a steam generator, it will, of course, be inclosed by a top plate 9 having a pipe connection 9' and may be suitably stayed internally as will be readily understood without illustration.

In the modification of Figs. 4 and 5 the structure is adapted to a furnace construc-

tion in which the air-regenerators lie between the gas-regenerators; the necessary branching of the air-port being illustrated in Fig. 5. The port mouths, viewed from within the furnace, will have the same relative arrangement as that illustrated in Fig. 3.

In the modification of Figs. 6, 7, 8, and 9, the structure may be readily adapted to either arrangement of existing regenerators by a slight variation of the slag-pockets and flues; but, as illustrated, the gas regenerators are located between the air-regenerators. As shown most clearly in Fig. 8, the air-port is curved above and brought quite close to the gas-port at their delivery ends; thus securing an intimate mixture and complete combustion.

The modification illustrated in Figs. 10, 11, and 12 is adapted to furnaces having air-regenerators only and equipped to burn natural gas or oil as fuel. The gas, usually under comparatively high pressure, is delivered at 10, 10, through suitable supply-pipes 11, 11; the form shown illustrating a single embodiment of the invention, it being well understood that other arrangements may be readily devised by those skilled in the art. In case oil is used, the burners may be arranged above, below, or at the sides of the air-port opening and directed to discharge the fuel into the current of heated air as it enters the furnace from the air-port; as will be readily understood.

In all the modifications shown, it will be apparent that ~~our~~ construction readily lends itself to establishing and maintaining the air and fuel supplies so as to direct them continuously toward any desired part of the hearth. When once so directed, no fusing or cutting back occurs at the discharge ends of the ports to dissipate or deflect the incoming currents.

The advantages of our invention result from the simplicity and durability of the structure, and the certainty, uniformity, and efficiency of operation throughout the life of the ports. The structure disclosed herein will also effect an enormous saving in the cost of operation by avoiding the necessity of the frequent repairs to ports, breast-walls, and slag-pockets of the furnace heretofore

found necessary. We have further disclosed a means of utilizing the heat given off at the ports for the production of steam if it is so desired.

What we claim as new, and desire to secure by Letters Patent is—

1. In a regenerative furnace, a single, integral metal structure comprising an end-wall and port structure.

2. In a regenerative furnace, a self-supporting metal end-wall unattached to the furnace.

3. In a regenerative furnace, a self-supporting, water-cooled end-wall unattached to the furnace.

4. In a regenerative furnace, a water-cooled metal end-wall inclosing metal port-walls, and having connected passages for circulating a cooling fluid about said walls.

5. In a regenerative furnace, an inclosed metal structure comprising an end-wall, metal-walled ports passing through said structure, and means for circulating a cooling fluid about said wall and ports.

6. In a regenerative furnace, an inclosed metal structure comprising an end-wall, said structure having an inclined front portion and chambers for applying a cooling fluid to said wall and ports.

7. In a regenerative furnace, an inclosed metal structure comprising an end-wall, said structure having inclined front and base portions, and chambers for applying a cooling fluid to said wall and ports.

8. In a regenerative furnace, a single, integral metal structure comprising an end-wall, port-structure and steam-generator.

9. In a regenerative furnace, an inclosed metal structure comprising an end-wall, metal-walled ports passing through said structure, means for circulating a cooling fluid about said wall and ports, and connections for utilizing the steam generated by the heat of the furnace gases.

In testimony whereof we affix our signatures in presence of two witnesses.

JACOB B. McKENNAN.  
FRANK E. PARKS.

Witnesses:

JAS. H. ROBINSON,  
A. L. BENZ.