J. P. ROE.

RECUPERATOR FOR OSCILLATING FURNACES.

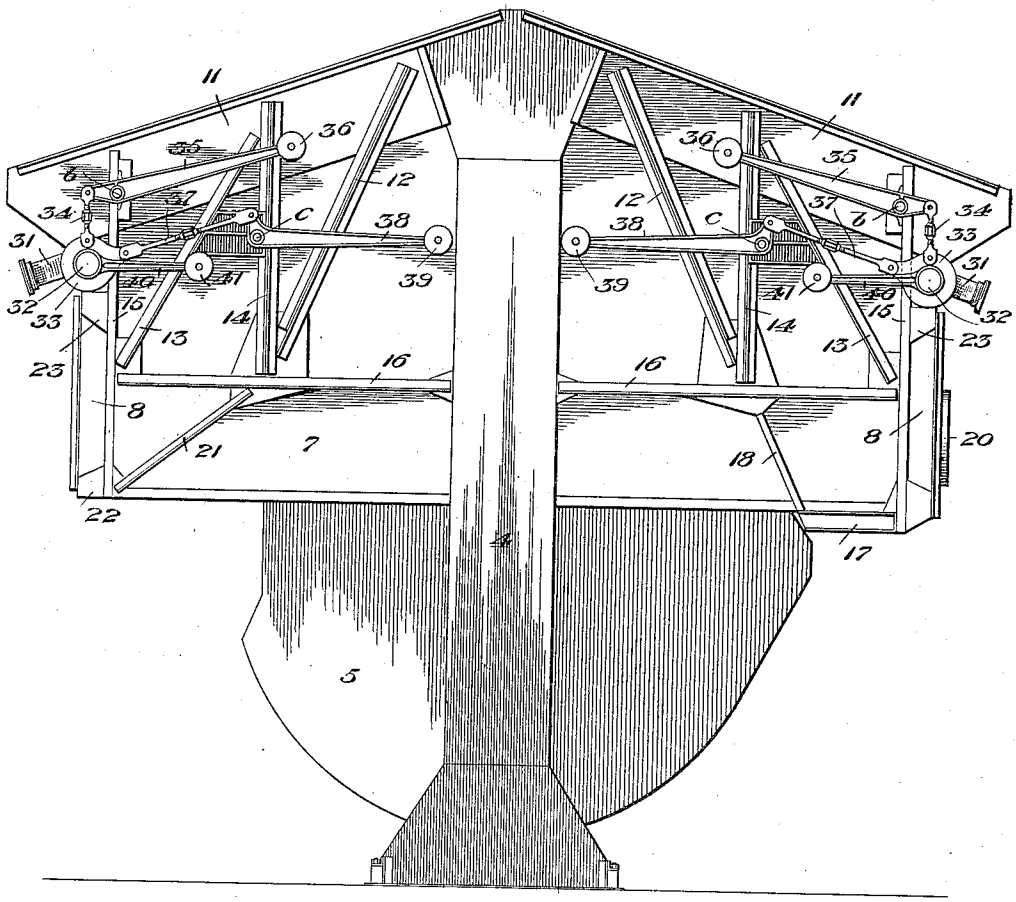
APPLICATION FILED SEPT. 9, 1910.

1,064,933.

Patented June 17, 1913.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 2.

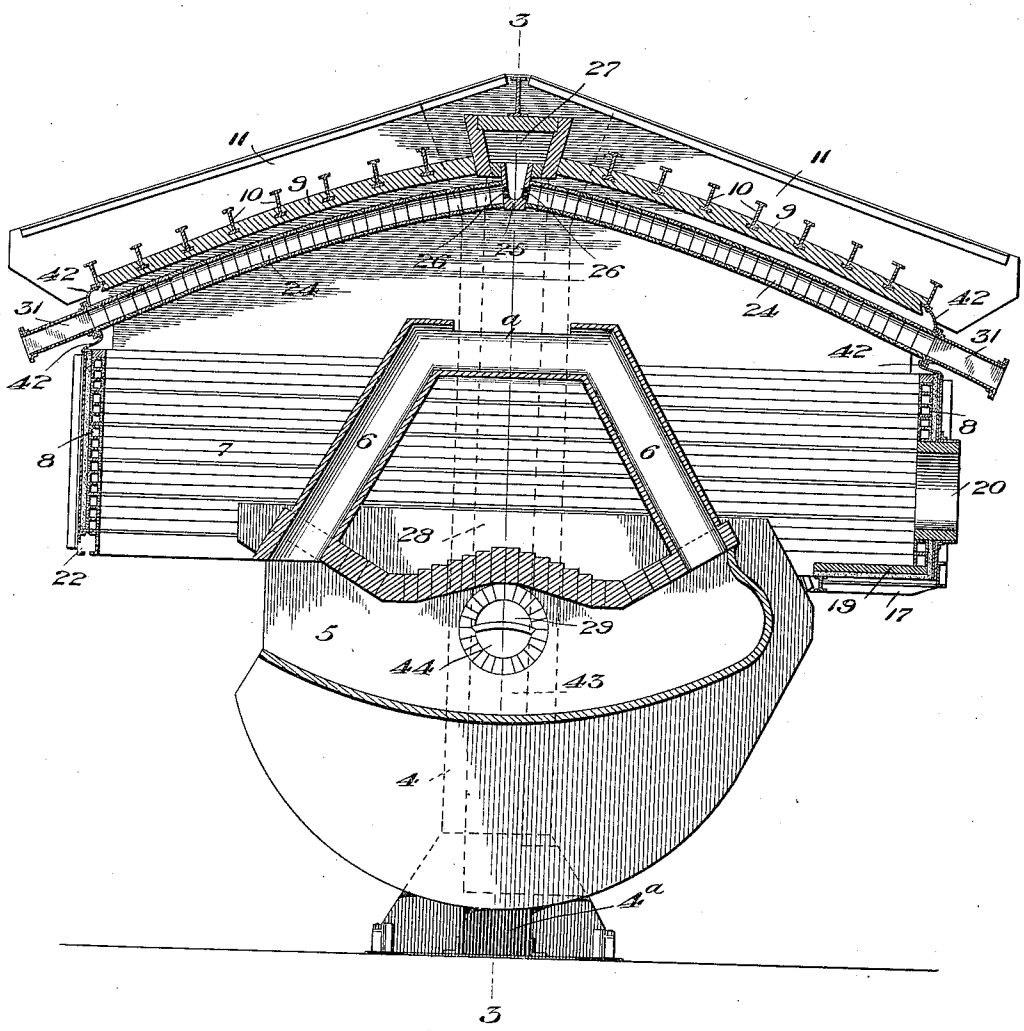

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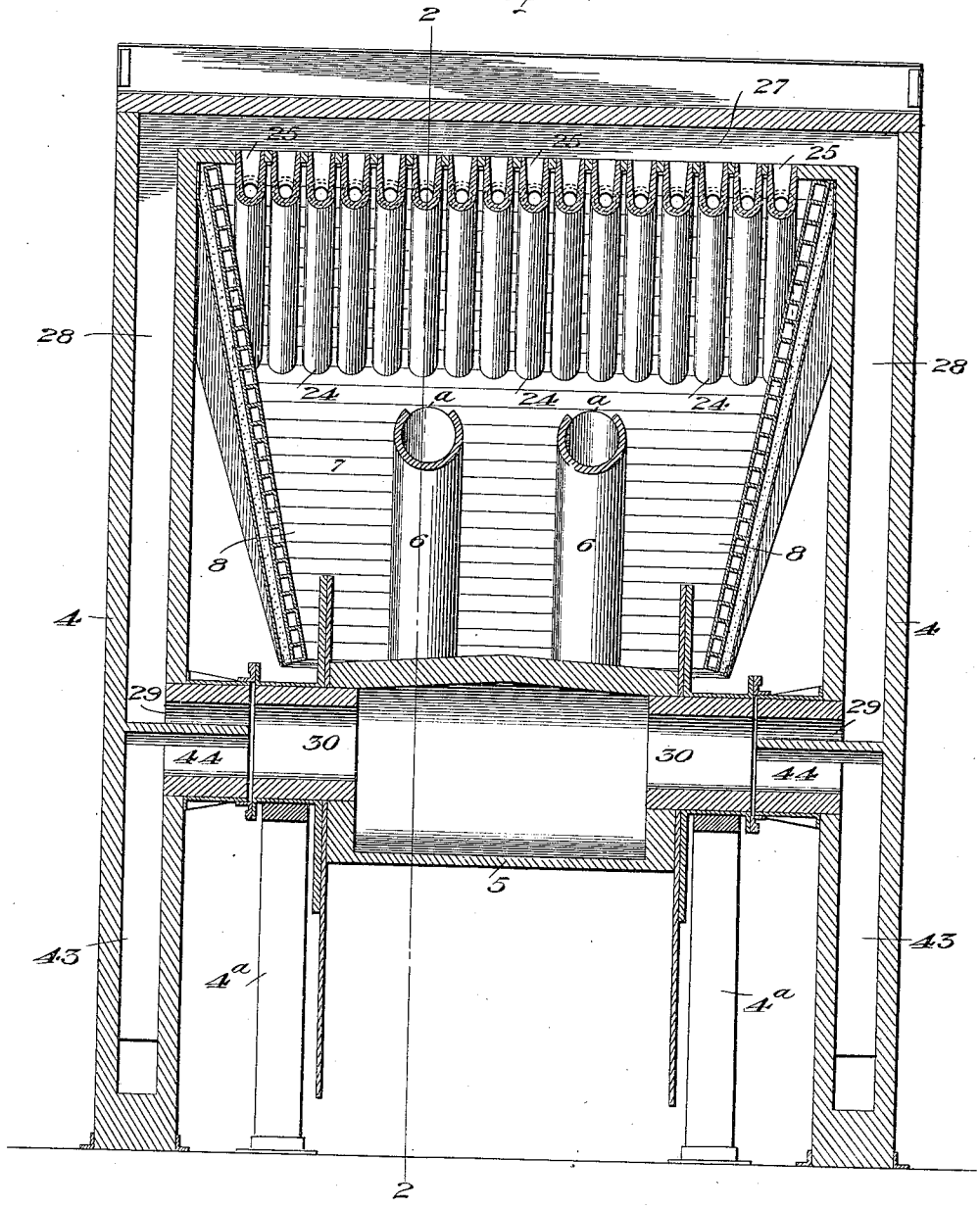
Fig. 3.



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UNITED STATES PATENT OFFICE.

JAMES PETER ROE, OF POTTSTOWN, PENNSYLVANIA.

RECUPERATOR FOR OSCILLATING FURNACES.

1,064,933. Specification of Letters Patent. Patented June 17, 1913.

Application filed September 9, 1910. Serial No. 581,299.

To all whom it may concern:

Be it known that I, JAMES P. ROE, a citizen of the United States, residing at Pottstown, in the county of Montgomery and State of Pennsylvania, have invented a certain new and useful Recuperator for Oscillating Furnaces, of which the following is a specification.

This invention relates, generally, to apparatus for recovering heat from the waste gases of oscillating furnaces, and particularly to an apparatus for furnaces of the type shown in United States Letters Patent granted to me on the 9th day of July 1901, numbered 678281, and it has for its object to provide an apparatus for the purpose named of few parts, comparatively inexpensive, and adapted to extract and utilize the heat of the gases now wasted and apply it to the heating of fresh cold air to be fed to the furnace, and it consists in the parts and combinations of parts hereinafter described and claimed.

In the accompanying drawings forming a part of this specification, Figure 1 is a side elevation of my improved apparatus applied to a furnace. Fig. 2 is a longitudinal vertical section on the line 2—2, Fig. 3. Fig. 3 is a transverse vertical section on the line 3—3, Fig. 2.

Similar letters and numerals refer to similar parts throughout the several views.

Referring to the drawings, the numeral 4 represents columns arranged at each side and centrally of the structure for supporting upper works, and 4^a columns arranged alongside of column 4 and between and from which is hung the oscillating furnace 5 having the stacks 6 arranged in pairs at each end thereof, said stacks inclining toward each other and meeting over the furnace and having a common discharge opening *a* for each pair of stacks. Above the furnace a chamber is formed into which the stacks extend and discharge the hot waste gases from the furnace. The chamber is formed by the side walls 7, preferably converging downwardly, the perpendicular end walls 8, and the roof 9, the latter being supported by the beams 10 from the upper tension members 11 of the girders, said tension members, 11, extending from the sides of the columns at the top thereof, and being connected through the diagonal tension members 12, 13, and vertical compression members 14, 15, to the lower tension members 16, which project at right angles from the columns.

At one end of the structure beams 17 are tied to the end walls 8 and the tension members 16 by the bars 18 to support a bottom or flooring 19 at a point below the discharge opening 20 formed in one end wall for the escape of the cool gases to a chimney, or the atmosphere, while a similar bar 21 serves to tie the supporting beam 22 for the other end wall to said tension members 16. As best shown in Fig. 2 the end walls 8 terminate at a point below the roof to provide space for the skewbacks, hereinafter described, and said walls are tied to the vertical compression members 15 by the plates 23.

A series of hollow arches 24 are arranged and spaced apart at a suitable distance below the roof within the chamber and are practically parallel therewith, and extend from the hollow keystones 25, into the space provided between the top of the end walls and the roof at each end of the structure, said arches communicating with the hollow keystones through the opening 26 in the walls of said keystones, the upper part of the latter opening into the transverse air conduit 27 which communicates at each end with the vertical ducts 28 formed in the columns 4 and which lead to the horizontal hot air ports 29 opening into the ports 30 of the furnace. The keystones are fixed securely in place and form a part of the walls of the conduit 27. The outer walls or feet of the arches rest on the hollow skewbacks, which are formed with the square or rectangular body portion 31 and the cylindrical end portions 32, the latter being loosely inserted in and supported by the suspension rings 33 which are connected to the ends of the rods 34. The other ends of said rods 34 are connected to the short arms of levers 35, fulcrumed at *b*, the long arms of which carry the balance weights 36.

A tension rod 37 is attached at one end to each of the rings 33, and at the other end to a bell-crank lever 38, said lever being fulcrumed at *c*, and carrying a balance weight 39 on its long arm. A lever arm 40 is secured to each end of the skewbacks and carries a balance weight 41.

The arches rest on or spring from the squared portion of the skewbacks and are in communication therewith, so that cold air, under pressure from any convenient

source of supply, fed into the ends of the skewbacks is distributed to the arches 24. As the air moves through the arches it absorbs the heat passing through their walls from the waste gases, and passes through the hollow keystones and into the conduit 27, and thence through the ports 29 and 30 to the furnace. The spaces between the end walls and skewbacks and between the latter and the roof are closed by a suitable flexible and non-combustible material 42, such as asbestos cloth.

The fuel, in the shape of gas, enters the conduits 43 formed in the columns 4 and passes through the ports 44, 30, to the furnace where combustion takes place, and the products of combustion escape through the stacks 6 to the chambers, as above described. The arches 24 expand and contract as they vary in temperature, and change in degree of curvature as the tops of the arches vary in relative temperature to the bottoms of the arches, and, with the above variations, the angle of the skewbacks must necessarily change or the arches would be destroyed. To meet the varying changes in size and form of the arches the skewbacks are freely supported in the manner above described. The rectangular parts of the skewbacks have their working faces approximately on the line of the axis of the circular parts thereof in order to give the greatest variation in angle of face with the least motion. This puts the skewbacks out of balance, with a tendency for the backs of the skewbacks to fall, and their faces to assume the horizontal. To overcome this tendency the levers 40 with their weights 41 are secured to the ends of the skewbacks and act to place them in equilibrium—ready to respond to the greater expansion of the bottom of the arches over the top or vice versa.

The skewbacks are retained in their varying horizontal positions by the rods 37 extending from the rings 33 to the bell-cranks 38, the weights 39 on the latter giving a greater pressure on the skewbacks than the thrust of the arches due to structure, and said weights responding to the expansion of the arches by rising, and to the contraction of the arches by falling.

The skewbacks are supported in their varying vertical positions by the rings 33 through their connections with the levers 35 by the rods 34, the weights 36 on said levers balancing the weight of the skewbacks and the outer ends of the arches, and thus putting the skewbacks in equilibrium, and free to rise if the underside of the arches expand more than the top, and depress if the upper part of the arches expand more than the bottom.

This construction and arrangement of parts produces flexible arches with flying skewbacks, the joints of the parts of the hollow arches remaining air-tight when made of non-elastic material, such as fire brick.

Having thus described my invention what I claim is:

1. An apparatus for recovering heat from the waste gases of oscillating furnaces, comprising a chamber having a bottom opening to receive and permit the oscillation of the stack of the furnace therein, hollow arches for the air to be heated, and an outlet at a point below the center of the chamber for the escape of the cooled gases.

2. An apparatus for recovering heat from the waste gases of oscillating furnaces, comprising a chamber receiving the products of combustion from the furnace, hollow arches arranged in said chamber and having their crown ends fixed and their outer or springer ends free to respond to the expansion and contraction of the arches.

3. An apparatus for recovering heat from the waste gases of oscillating furnaces, comprising a chamber receiving the products of combustion from the furnace, hollow arches arranged in said chamber, and hollow skewbacks from which said arches spring and with which they communicate, said skewbacks being free to respond to the expansion and contraction of the arches.

4. An apparatus for recovering heat from the waste gases of oscillating furnaces, comprising a chamber to receive the products of combustion from the furnace, arches arranged in said chamber, and skewbacks in equilibrium and suspended in equilibrium and free to move as the arches resting on them expand and contract.

5. An apparatus for recovering heat from the waste gases of oscillating furnaces, comprising a chamber to receive the products of combustion from the furnace, arches arranged in said chamber, skewbacks for supporting said arches, and means for suspending said skewbacks, whereby they are free to move as the arches expand and contract.

In testimony whereof, I affix my signature, in the presence of two witnesses.

JAMES PETER ROE.

Witnesses:
HARRY S. CAMPBELL,
JNO R. BRIGGS.