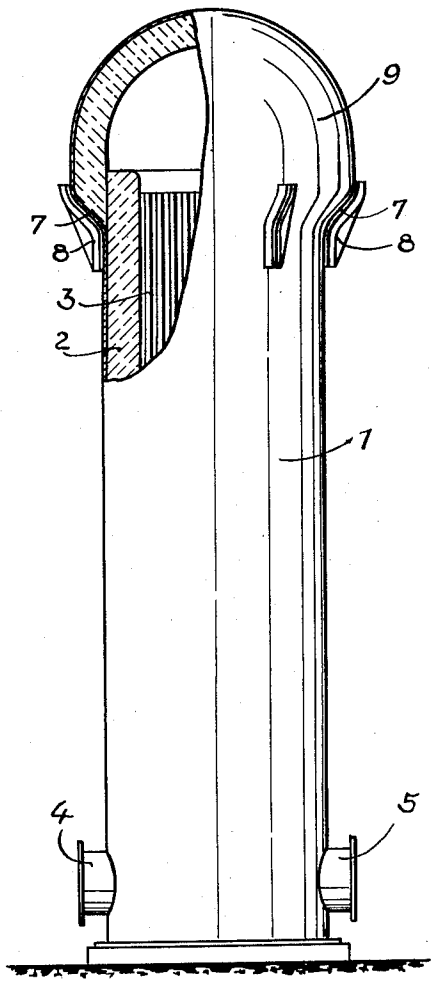
Jan. 4, 1938. H. KOPPERS 2,104,201

HEATER FOR GASEOUS MEDIA

Filed Sept. 3, 1936. 2 Sheets-Sheet 1

Fig. 1



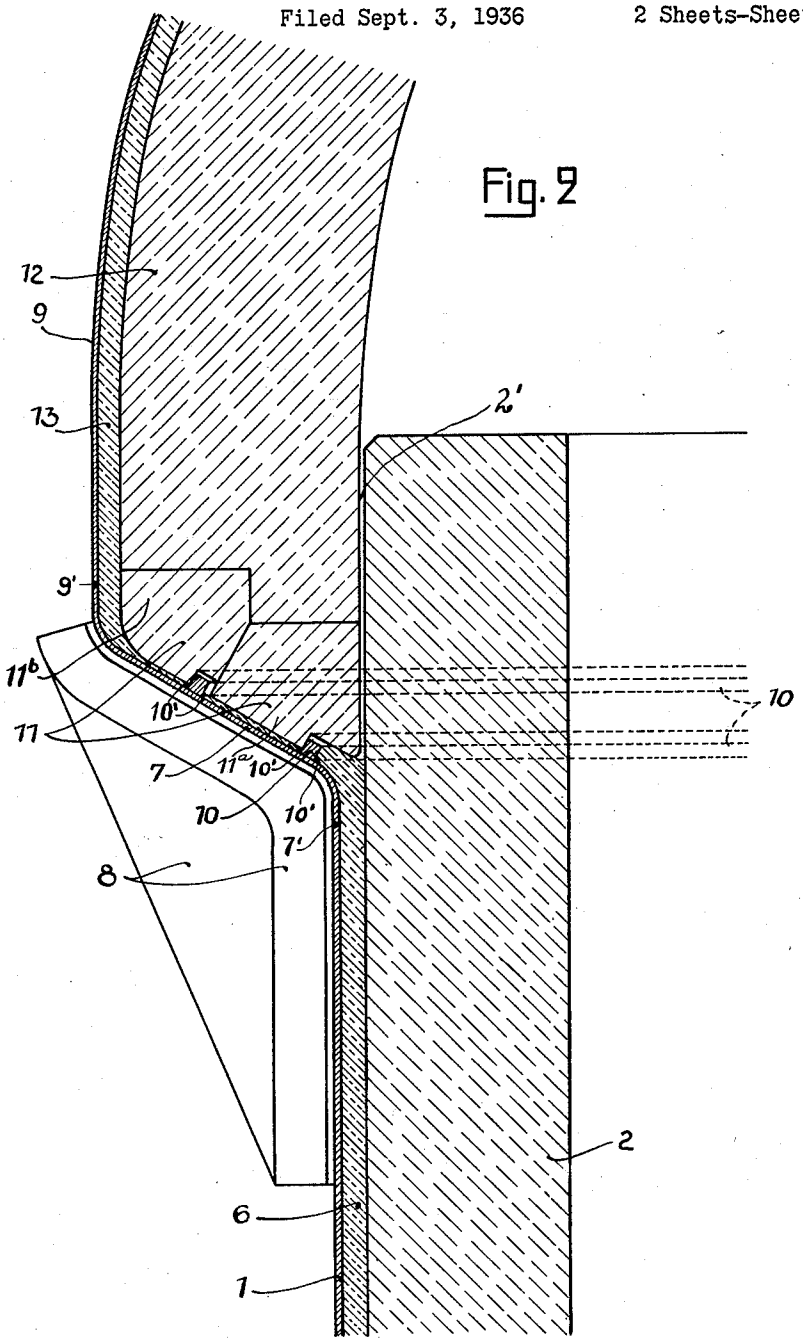
Inventor:
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Fig. 2



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UNITED STATES PATENT OFFICE

2,104,201

HEATER FOR GASEOUS MEDIA

Heinrich Koppers, Essen, Germany, assignor, by mesne assignments, to Koppers Company, Pittsburgh, Pa., a corporation of Delaware

Application September 3, 1936, Serial No. 99,326
In Germany September 4, 1935

3 Claims. (Cl. 263—19)

The invention relates to improvements in tower-like regenerators or heaters for heating-up gaseous media, for instance air or combustible gases, also known as Cowpers, and especially to improvements for such heaters which are provided with a dome-like ceiling inside the interior of which the refractory lining of the side walls can expand freely in upward direction.

With known heaters of this type, the dome-like ceiling rests upon a ring-shaped, vertical base, which base is fixed by a rectangular joint to the upper end of the substantially cylindrical casing of the heater and which is supported by means of brackets or in any other suitable way to said casing.

It is frequently found, that when operating such heaters, the heater casing is subjected to vast destructions so that the casing will become leaky and the valuable gases escape. Especially it is found, that the ring-shaped, vertical base of the dome-like ceiling and the cylindrical heater casing become loose at their joining line. When investigating these detrimental facts, which often make the heater entirely useless even after a short time, I found that the destructions in question may be traced to the uneven expansion of the dome-like ceiling base. On the one hand, that part of the ring-shaped platform, which is adjacent to the cylindrical heater casing, is heated-up higher than the outer zone of the platform by the flow of heat passing through the refractory lining of the heater, and on the other hand said inner zone *11a* of the ring-shaped platform is least affected by the cold air flowing along the outside of the heater and more affected by radiant heat from inside the heater than the outer zone *11b*. Therefore, the inner zone of the ring-shaped platform is brought much easier to and in operation is under a higher operating temperature than the outer platform zone. The platform being of refractory brick, the expansion and contraction of the inner portion is unequal relative to the outer portion, so that the outer portion resists the greater expansion and contraction of the inner portion causing cracking and crumbling of the platform. On account of this, the platform will soon be distorted and finally be torn-off the upper edge of the heater casing. Besides, any distortions of the ring-shaped base are detrimental with regard to the tightness of the refractory lining for the dome-like ceiling. The refractory dome becomes loose and tumbles down, on account of the different position of the base.

The principal object of my invention is to make such improvements to known gas heaters of this type in which the inner and outer zones of the platform may expand and contract independently of each other and of the lining they support, and in which the refractory lining of the cylindrical heater casing can expand freely relative to the interior of the dome-like ceiling, which is supported on a ring-shaped platform or base, that any damages to the ring-shaped base for supporting the dome-like ceiling are avoided.

My invention essentially consists in that the base of the heater dome is arranged in form of a cone, which extends slantingly upwards from the cylindrical heater casing, the refractory lining of the dome-like ceiling being supported on a conical base for expansion independently of the refractory lining of the cylindrical casing. Furthermore, the invention provides for ledges or other suitable projections, to be arranged at the upper side of the conical base in such a manner, that said projections prevent the abutment of the refractory lining from sliding downwards.

Still further objects of my invention may be taken from the following description of a preferred embodiment of my invention, which I will explain in particular on the lines of the accompanying drawings.

Figure 1 of the drawings shows a vertical section and partly a side view of the heater, according to my invention.

Figure 2 is a vertical section in an enlarged scale through a part of the heater to show clearly the connections between the dome-like ceiling and the cylindrical part of the heater casing.

On these drawings, *1* stands for the substantially cylindrical part of the heater interior, the casing of which is lined with brickwork **2**, consisting of refractory material. In the interior, the heater is provided with a suitable heat carrier for instance, a checkerwork **3**, consisting of refractory material or the like.

The gases to be heated-up enter the heater for instance by means of the pipeline **4** and pass then through a suitable channel, arranged inside the heater, (not shown on these drawings) up to the dome-like ceiling. Then the gases flow downwards through the checkerwork **3**, whereby they take up heat from the checkerwork, which was previously highly heated. Finally, the heated gases leave the heater through the pipeline **5**. After the temperature of the heater has been lowered, the checkerwork is heated again in a suitable manner, for instance by leading hot combustion gases through the heater.

The space between the refractory lining **2** and the casing **1**, which consists of sheet metal plates or any other suitable material, is filled up with an elastic heat insulating material **6** (see Figure 2) so that the refractory lining can expand when heated up without damaging casing **1**.

An inclined or conical part **7** is fixed to the upper edge of the casing **1**, extending upwards at a suitable angle from the casing **1** and being connected in a gas-tight manner to the casing, for instance by welding **7'**. The ring-shaped part **7**

is held in its proper position by supports 8, mounted on casing 1.

The casing 9 of the cone-like heater is similarly connected to the conical part 7 by welding 9'.

To the inner part of the conical part 7, there are welded as at 10' several ring-shaped ledges 10, against which fit the bottom bricks 11 of the ceiling lining 12 in such manner, that the bricks 11 cannot slide off the inclined base part 7. Advantageously, the ring shaped platform formed of bricks 11 are, as shown, constituted as separate inner and outer annular sections 11*a* and 11*b* separate from each other and from the refractory lining of the ceiling they support, for expansion and contraction of each of said sections independently of each other and of the lining they support so that the inner section 11*a* may undergo a greater degree of expansion and contraction than the outer section 11*b*. Advantageously a small space 2' is provided between the bricks 11 and the upper layers of the brickwork 2, in order that latter may expand freely in the interior of the dome-like ceiling when being heated-up to the operating temperature. The space between the ceiling lining 12 and the dome-like casing 9 is filled-up with a lining of an elastical heat insulating material, for instance with asbestos wool 13 which extends downwardly under the supports 11. Therefore, the refractory lining 12 may expand freely in the dome-like casing 9, without damaging the latter.

Instead of the ledges 10, other means may be provided for preventing the bricks 11 from sliding down along the conical part 7 against the brickwork 2. If the inclination of the conical part 7 is only a slight one, the special means for holding the supporting bricks of the ceiling lining in proper position may be dispensed with.

My invention is of special advantage for those gas heaters, which are to be operated at high temperatures for instance in the so-called two-Cowper system for blast furnaces. The two-Cowper system has many advantages compared with the usual arrangement of three Cowpers, which are heated up in one period and which are subsequently used in another working period for heating-up the blast. Moreover, the two-Cowper system could not achieve success in practice up to the present time, notwithstanding its recognized advantages, as the known type of gas heaters (Cowpers) could not be operated at such high working temperatures as are necessary in the two-Cowper system. The heater according to my invention now may be operated to any high temperature, limited of course by the duration of the refractoriness of the brick work, lining the heater casing, and no leakages will occur in the heater casing. The heater according to my present invention may be used for other purposes as well as the one described herein.

I have above described my present invention along the lines of a preferred embodiment thereof, but my invention limited in all its aspects to the mode of carrying it out as described and shown, since the invention may be variously embodied within the scope of the following claims.

I claim:—

1. A tower-like heater for gaseous media comprising a substantially cylindrical heater casing with a refractory brickwork inner lining and a dome-like ceiling casing with a refractory brickwork lining connected with the heater casing so that the brickwork lining of the heater casing may project into the interior of the ceiling, said tower-like heater comprising a ring shaped base for supporting the refractory lining of the ceiling and separable therefrom for expansion independently thereof, the brickwork lining of the dome-ceiling being supported on said base independently of the brickwork lining of the heater casing, and the ring shaped base being supported on the heater casing independently of the brickwork lining of the heater casing so that the upper part of the refractory lining of the cylindrical heater that projects into the ceiling may expand and contract freely of the dome-like ceiling lining and its supporting base into the interior of the ceiling.

2. A tower-like heater for gaseous media comprising a substantially cylindrical heater casing with a refractory brickwork inner lining and a dome-like ceiling casing with a refractory brickwork lining connected with the heater casing so that the brickwork lining of the heater casing may project into the interior of the ceiling, said tower-like heater comprising a ring shaped base for supporting the refractory lining of the ceiling and separable therefrom for expansion independently thereof, said base being inclined at its lower part upwardly and outwardly from the heater casing, the brickwork lining of the dome-like ceiling being supported on said base independently of the brickwork lining of the heater casing, and the ring shaped base being supported on the heater casing independently of the brickwork lining of the heater casing so that the upper part of the refractory lining of the cylindrical heater that projects into the ceiling may expand and contract freely of the dome-like ceiling lining and its supporting base into the interior of the ceiling, said base being supported by a correspondingly inclined portion of the casing, and projections on the inner side thereof engageable in recesses in the bottom of the base to hold the base in proper position relative to the refractory lining of the heater casing.

3. A tower-like heater for gaseous media comprising a substantially cylindrical heater casing with a refractory brickwork inner lining and a dome-like ceiling casing with a refractory brickwork lining connected with the heater casing so that the brickwork lining of the heater casing may project into the interior of the ceiling, said tower-like heater comprising a ring shaped base for supporting the refractory lining of the ceiling and separable therefrom for expansion independently thereof, the brickwork lining of the dome-like ceiling being supported on said base independently of the brickwork lining of the heater casing, and the ring shaped base being supported on the heater casing independently of the brickwork lining of the heater casing so that the upper part of the refractory lining of the cylindrical heater that projects into the ceiling may expand and contract freely of the dome-like ceiling lining and its supporting base into the interior of the ceiling, said ring shaped base comprising separate inner and outer annular sections separable from each other and from the refractory lining of the ceiling they support for expansion and contraction of each of said sections independently of each other and of the lining they support.

HEINRICH KOPPERS.