June 30, 1931. G. TURKUS 1,812,458

AIR HEATER

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Fig. 1

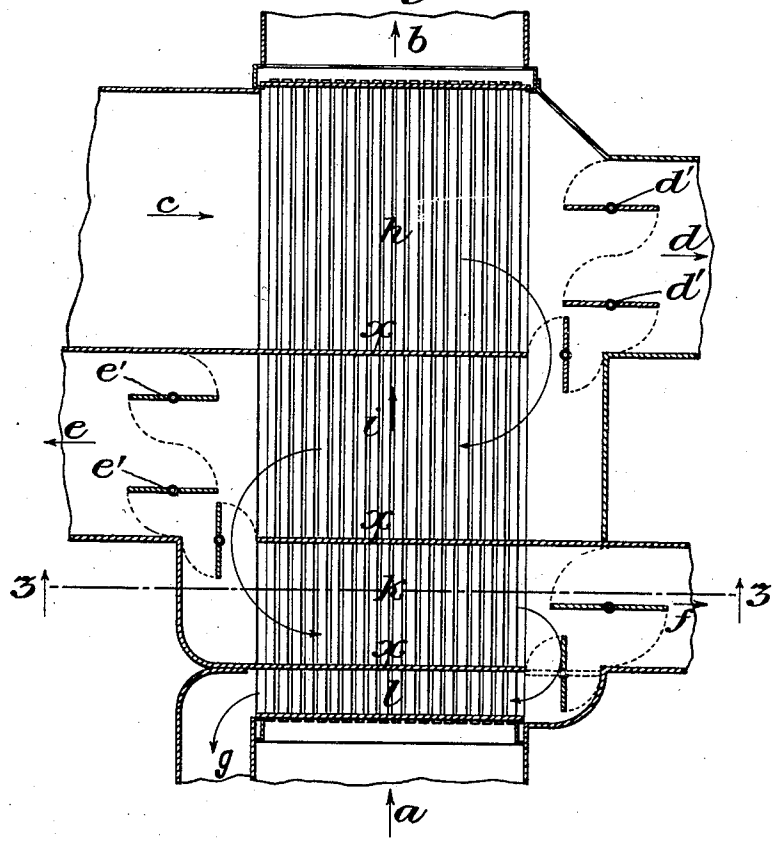
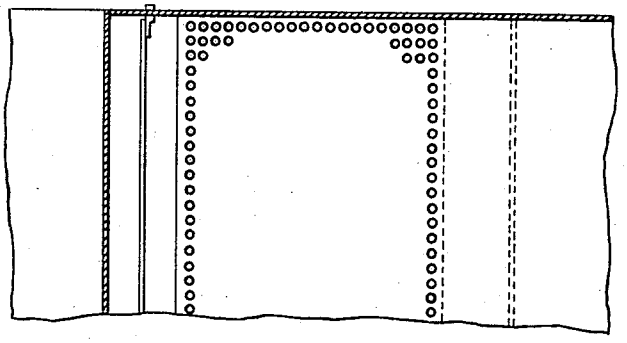


Fig. 3



INVENTOR
George Turkus
BY
Gifford & Sinn
ATTORNEYS

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Fig. 2

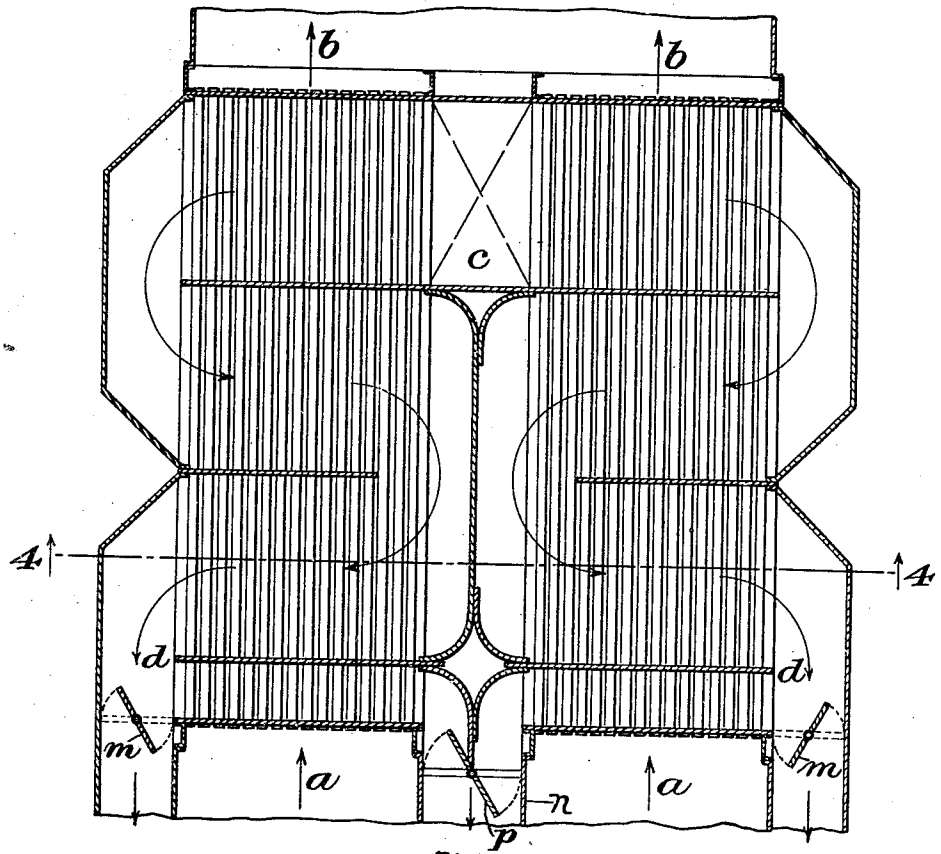
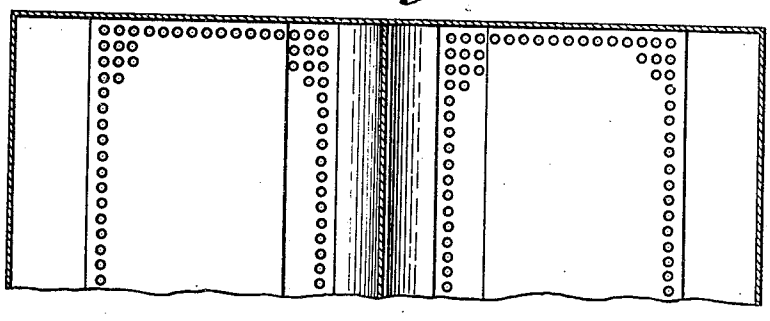


Fig. 4



INVENTOR
George Turkus
BY
Gifford & Scull
ATTORNEYS

Patented June 30, 1931 1,812,458

UNITED STATES PATENT OFFICE

GEORGE TURKUS, OF LONDON, ENGLAND, ASSIGNOR TO BABCOCK & WILCOX COMPANY, OF NEW YORK, N. Y.

AIR HEATER

Application filed July 20, 1928, Serial No. 294,259, and in Great Britain July 26, 1927.

This invention relates to improvements in air heaters of the type in which the hot gases travel through tubes or ducts while the air passes over the outer surfaces of such tubes or ducts, and is applicable to heaters of contra-flow, of parallel and of mixed flow design. The invention has for an object to permit of obtaining by means of one and the same air heater air at two or more different temperatures.

With this object in view in accordance with the invention, at points spaced in relation to the flow of the air there are provided in the casing of the air heater damper-controlled openings through which a fraction or fractions of the volume of air being heated may be drawn off. The entire volume of air enters the heater at one point and flows over the heating surface to the point where it has become heated to the lowest of the several required temperatures, at this latter point, the first bleeding point, the quantity of air required at that temperature is led off through a damper-controlled opening or openings, the remainder of the air flowing over the heating surface to the point where it has become heated to the next higher of the several required temperatures, i. e. the second bleeding point where the quantity of air required at that temperature is led off through a second damper-controlled opening, the remaining air flowing over the farther heating surface and the fractions of the total air quantity required at the various higher temperatures being led off at the proper points.

In order to obtain advantageous rates of heat transmission throughout the air heater notwithstanding that the quantities of air passing over different parts of the heater are unequal the cross-sectional areas of the air passages in the several parts of the heater are made unequal by disposing the transverse air baffles at unequal distances apart, these distances being largest for the first stage in advance of the first bleeding point and smallest for the last stage from the last bleeding point to the point where the last fraction of air leaves the heater.

In a duplex air heater contrived to provide a main supply of heated air and a supply of secondary air of much higher temperature an outlet passage fitted with a damper may be provided at the outer side of each heater unit adjacent to the last pass for the main air supply, a common air withdrawal duct fitted with a damper connected with the final pass of each heater providing the secondary air supply.

The invention is illustrated diagrammatically in the accompanying drawings in which Fig. 1 is a vertical sectional view of a single air heater in accordance with the invention by which air is obtained at different temperatures; while Fig. 2 is a vertical sectional view of an air heater with central air passages in which a small fraction of the total volume of air herein referred to as secondary air is heated to a temperature exceeding the temperature of the primary air supply, Fig. 3 is a cross sectional view taken through the heater of Fig. 1 and Fig. 4 is a cross sectional view taken through the heater of Fig. 2.

Referring to Fig. 1 of the drawings *a* is the gas inlet and *b* the gas outlet of the heater; *c* indicates the air inlet.

As shown, at points spaced in relation to the flow of the air there are provided in the body of the air heater damper-controlled openings *d e f* and *g* through which fractions of the air being heated may be drawn off. The entire volume of air enters the heater at *c* and flows over the heating surface to the point *d* where it has become heated to the lowest of the several required temperatures. At this point the quantity of air required at that temperature is taken away through an opening *d* controlled by dampers *d'* whilst the remainder of the air flows over the heating surface to the point *e* where it has become heated to the next higher of the several required temperatures, when the quantity of air required at that temperature is taken away through a second opening *e* controlled by dampers *e'*, the remaining air flowing over the further heating surface to the points *f* and *g* where fractions at higher temperatures are drawn off.

In order to obtain advantageous rates of

heat transmission throughout the air heater notwithstanding that the quantities of air passing over various parts of the heater are unequal the cross-sectional areas of the air passages *h*, *i*, *k* and *l* in successive parts of the heater are made unequal by disposing the transverse air baffles *x* at unequal distances apart, these distances being largest between *c* and *d* and smallest between *f* and *g*.

In the embodiment shown in Fig. 2 intended to provide a main supply of heated air and a supply of secondary air and in which as before *a* indicates the gas inlet, *b* the gas outlet and *c* the air inlet, an air outlet passage *d* fitted with a damper *m* is provided at the outer side of each heater and adjacent to the last pass for the main air supply, a common air withdrawal duct or outlet duct *n* fitted with a damper *p* connected with the final pass of each heater leading off the secondary air supply.

I claim,

1. An air heater adapted to be heated by hot gases comprising ducts for the passage of the hot gases and air passages for the flow of the air around said ducts, said air passages formed with an outlet opening intermediate the air inlet and outlet at a point spaced in relation to the flow of the air, and a damper controlling such openings.

2. An air heater comprising ducts for the passage of the hot gases and air passages around said ducts for the passage of air to be heated, said air passages being constituted by baffles spaced unequally apart, said air passages formed with an outlet opening and a damper controlling such openings.

3. An air heater comprising a pair of juxtaposed heaters each comprising gas ducts, a plurality of air passes around said ducts and an air inlet common to both, an outlet opening in the last pass of each heater, a damper controlling each such outlet, and an outlet common to both heaters and connected with the last pass of each heater, said last-mentioned outlet also fitted with a damper, substantially as and for the purpose set forth.

4. In an air heater, a passageway for hot gases, means for causing air to flow across said passageway a plurality of times in succession, and an outlet for the air at a point intermediate its traverses across said passageway.

5. In an air heater, a passageway for hot gases, means for causing air to flow across said passageway a plurality of times in succession, through paths whose cross-sectional areas decrease successively, and an outlet for the air at a point intermediate its traverses across said passageway.

In testimony whereof I have signed my name to this specification.

GEORGE TURKUS.