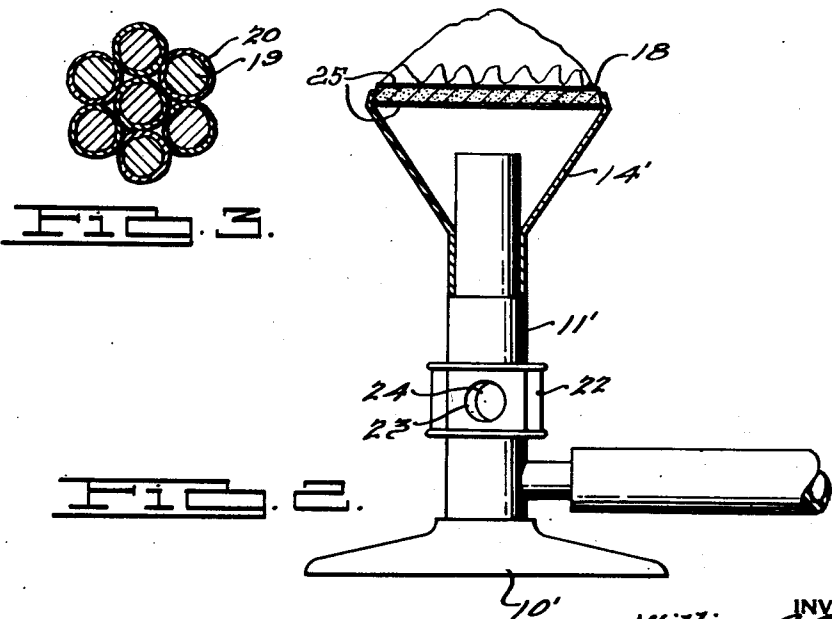
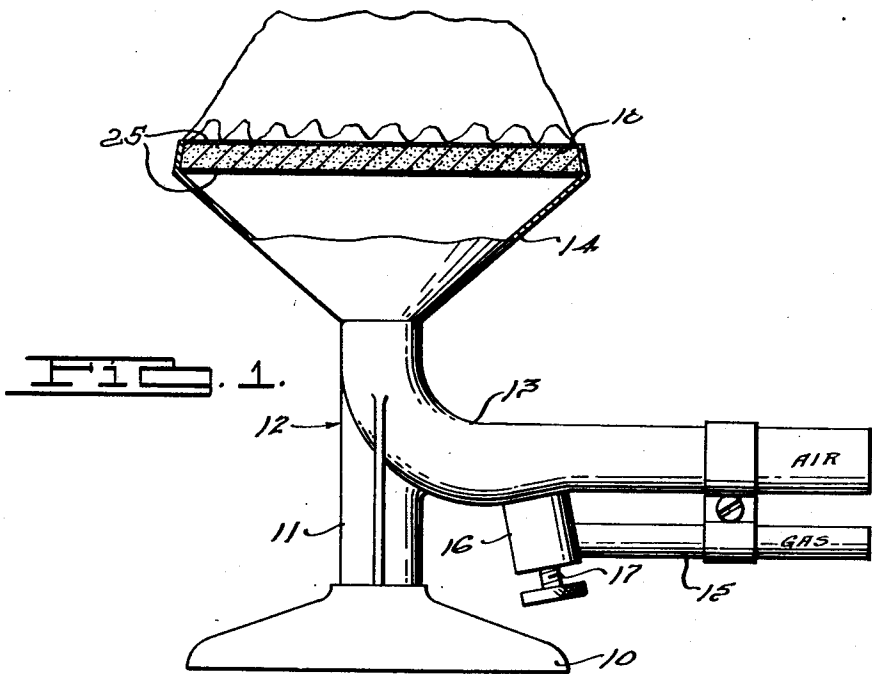


Nov. 7, 1950

W. G. CALKINS ET AL
FUEL BURNER FLAME PLATE
Filed Nov. 27, 1944

2,528,738



INVENTORS
*William G. Calkins AND
Edward W. Upham.*
BY *Harness & Harris*
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,528,738

FUEL BURNER FLAME PLATE

William G. Calkins, Detroit, and Edward W. Upham, Birmingham, Mich., assignors to Chrysler Corporation, Highland Park, Mich., a corporation of Delaware

Application November 27, 1944, Serial No. 565,228

5 Claims. (Cl. 158—116)

1

This invention relates to improvements in fluid fuel burners, and more particularly to burners of the type having a flame plate at a face of which combustion occurs.

An object of the invention is the provision of a burner of the foregoing type having a flame plate characterized by a maze of pore-forming voids through which the combustible fuel is passed to the combustion surface at a rate sufficient to maintain a steady and continuous flame; and to provide a burner in which components of the combustible fuel are intimately mixed at the combustion surface by flow through a flame plate of the foregoing character.

More particularly an object of the invention is the provision of a burner flame plate formed from a mass or layer of metallic particles so united as to produce a structure that will not crumble incident to the heat generated by combustion and which embodies the pore-forming voids between particles for accommodating passage of and effecting intimate mixing of the fuel components as aforesaid.

A flame plate so formed may be of a minimum thickness yet sufficient in strength to withstand long usage. Should the plate become clogged by the fuel or by the products of combustion, this condition can be readily remedied by a force of air, for example, directed through the pores, the plate being of such minimum thickness as to permit this simple method of cleaning. Also, the combustion surface may be brushed to remove therefrom deposits of combustion without disturbing or dislocating the particles.

Other objects and advantages of the invention will be more apparent from the following description taken in conjunction with the embodiment of the invention included in the accompanying drawings, wherein:

Fig. 1 is a side elevational view, partly in section, of a burner of the pressure fuel feed type embodying the invention.

Fig. 2 is a view similar to Fig. 1, but illustrating an atmospheric type gas burner.

Fig. 3 is an enlarged fragmentary view illustrating the formation of the flame plate of Figs. 1 and 2.

Referring to the drawings, there is shown in Fig. 1 a burner of the type to which both air and fluid fuel, gas for example, are supplied under pressure. The burner includes a base 10 mounting an upright 12 having a conduit-like part 13 which opens into an inverted cone-shaped head 14 forming a mixing chamber into which fuel is fed from the part 13. An inflammable

2

mixture of gas and air constitutes the fuel, the conduit 13 being connected to a suitable source, not shown, of air, and a conduit 15 being so connected to a source of gas and communicating with the conduit 13 through a hollow projection 16. A stem 17 threaded into an opening in the projection 16 functions as a valve to adjustably predetermine the desired proportion of gas admitted to the conduit 13 for mixture with the air supply.

A flame plate 18 is mounted at the open end of the head 14 and retained in position by the inwardly deflected edge portion thereof. Fuel under pressure is discharged from the mixing chamber through the plate 18 for combustion at the exposed surface thereof, the plate having sufficient porosity, as will hereinafter be set forth, to insure passage of the fuel therethrough in sufficient quantity and at such rate as to maintain a flame when ignited.

Referring to Fig. 3, the flame plate 18 is preferably formed from a plurality of metallic particles secured together by a metallurgical bond between adjacent surfaces thereof. The metallic structure includes copper and tin constituents and in order to provide the desired porosity and mechanical strength, globular-like particles of copper are mixed with a quantity of tin powder, the particles of which are smaller than the copper particles, in such quantity as to provide a mixture representing approximately 90% copper and 10% tin. In order to avoid segregation of the constituents due to the relatively different size and shape of the particles, the globular-like copper particles are preferably wetted with any suitable agent, for example kerosene, to cause the tin particles to be adhered thereto and thereafter heated to cause a superficial diffusion of the tin into the copper, thus producing globular-like particles 19, each having a tin enriched surface as shown at 20.

While the foregoing method of operation is preferred, nevertheless the globular-like copper particles having the tin enriched surface can be produced, for example, by electro-depositing thereon the desired quantity of the tin constituent. Particles shaped other than globular-like may be employed although those having the latter shape are preferred because they produce uniform porosity and approximately 40% voids.

The particles are then deposited on a refractory or graphite surface and heated in a reducing, non-oxidizing atmosphere at a temperature and for a time sufficient to further diffuse the tin into the copper and thus effect a metallurgical

bond between the adjacent particles, the temperature employed being below the melting point of copper but sufficient to melt the tin. The particles are compacted only to the extent of insuring surface contact and relatively heavy briquetting pressure is avoided. The above operation may be carried out by arranging the particles in a mold having the shape of the finished product, or where the plate is flat, as illustrated, the structure may be made in sheet form and individual plates cut therefrom.

The plate 18 may if desired be formed from iron particles, preferably globular-like in shape, coated by electrodepositing thereon copper or copper and nickel and then heating for a time and at a temperature sufficient to effect a metallurgical bond between adjacent particle surfaces.

After formation of the plate 18 as aforesaid, the exposed face thereof constituting the combustion surface may be protected against corrosion, resulting from oxidization for example, by a film of nickel, copper or other oxidization resistant metal or alloy as indicated at 25. This film may be applied by electrodeposition, for example, and for protection purposes a thickness of three to five ten-thousandths of an inch is sufficient. While the film is deposited primarily on the particle surfaces at the periphery of the plate, nevertheless the same may penetrate the plate due to the porosity of the latter, but the thickness of the film is so slight relative to the size of the pores of the plate as to produce no appreciable closing of the pores and hence passage of the fuel components through the latter is not materially affected even though the entire peripheral surface of the plate may be exposed to and receive the film-forming metal during application thereof by the aforesaid process.

Referring to Fig. 2, the burner is of the atmospheric type and includes a base 10' supporting a hollow upright 11' on which is mounted the head 14' forming the mixing chamber and having the flame plate 18 identical with that shown in Fig. 1. Gas is supplied to the upright 11' by a hose 21 connected with a suitable source of supply, not shown, and air is admitted to the upright 11' under control of a sleeve 22 rotatably to align an opening 23 thereof with an opening 24 in the upright. The plate is equally effective here in the Fig. 2 embodiment in intimately mixing the fuel components and discharging the same to the combustion surface.

The plate 18 effectively mixes the fuel components by the passage of the same through the tortuous path provided by the maze of pores and thus there is provided a concentrated heat and flame temperature of a value which cannot be obtained by the use of plates or burners wherein the fuel components are passed through an apertured plate or spider and hence are not intimately mixed.

Although but several specific embodiments of the invention have been shown and described, it will be understood that various changes in the size, shape and arrangement of parts may be made without departing from the spirit of the invention.

We claim:

1. In a fluid fuel burner including a casing forming an open-ended chamber for receiving components of a combustible mixture for discharge to a combustion surface, a flame plate over the open end of the chamber and secured to said casing having an exposed face forming

the combustion surface, said plate including a mass of metallic particles including metals having relatively different melting points, adjacent particles having surface contacting portions secured together by diffusion of the metal having the lower melting point into the metal having the higher melting point to form a metallurgical bond therebetween and other surface portions of adjacent particles being spaced apart to form voids therebetween, said voids cooperating to provide a maze of intercommunicating pores through which the combustion components flow from the chamber to the combustion surface-forming face of the plate.

2. In a fluid fuel burner including a casing forming an open-ended chamber adapted to receive components of a combustible mixture for discharge to a combustion surface, a flame plate secured to the casing extending across the open end of the chamber having an outlet face thereof forming the combustion surface and an inlet face communicating with the chamber, said plate including a mass of globular-like metallic particles, adjacent particles having surface portions secured together by diffusion of the metal of one such particle into the other forming a metallurgical bond therebetween and other surface portions of adjacent particles being spaced apart to form voids therebetween, said voids cooperating to provide a maze of intercommunicating pores extending from one of said faces to the other thereof and through which the combustion components are discharged from the chamber to the combustion surface of the plate.

3. In a fluid fuel burner including a casing forming an open-ended chamber adapted to receive components of a combustible mixture for discharge to a combustion surface, a flame plate secured to the casing extending across the open end of the chamber having an outlet face thereof forming the combustion surface and an inlet face communicating with the chamber, said plate including a mass of globular-like metallic particles, adjacent particles having surface contacting portions secured together by a metallurgical bond therebetween and other surface portions of adjacent particles being spaced apart to form voids therebetween, said voids cooperating to provide a maze of intercommunicating pores extending from one of said faces to the other thereof and through which the combustion components are discharged from the chamber to the combustion surface of the plate, said particles including copper and tin constituents with the tin diffused into the copper forming said bond.

4. In a fluid fuel burner including a casing forming an open-ended chamber adapted to receive components of a combustible mixture for discharge to a combustion surface, a flame plate secured to the casing extending across the open end of the chamber having an outlet face thereof forming the combustion surface and an inlet face communicating with the chamber, said plate including a mass of globular-like metallic particles, adjacent particles having surface contacting portions secured together by a metallurgical bond therebetween and other surface portions of adjacent particles being spaced apart to form voids therebetween, said voids cooperating to provide a maze of intercommunicating pores extending from one of said faces to the other thereof and through which the combustion components are discharged from the

5

chamber to the combustion surface of the plate, said particles including a ferrous metal constituent and another metallic constituent having a melting temperature lower than said ferrous metal constituent and diffused into the latter to form said bond.

5. In a fluid fuel burner including a casing for receiving components of a combustible mixture for discharge to a combustion surface, a flame plate for said casing having an exposed face forming the combustion surface, said plate including a mass of metallic particles, adjacent particles having surface contacting portions secured together by a metallurgical bond therebetween and other surface portions of adjacent particles being spaced apart to form voids therebetween, said voids cooperating to provide a maze of intercommunicating pores through which the combustion components flow from the casing to the combustion surface-forming face of the plate, and a film of oxidization resistant metal deposited on the particle surfaces at said face.

WILLIAM G. CALKINS.
EDWARD W. UPHAM,

25

6

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,197,503	Land	Sept. 5, 1916
1,213,470	Finlay	Jan. 23, 1917
1,259,029	Lucke	Mar. 12, 1918
2,042,635	Schellens	June 2, 1936

FOREIGN PATENTS

Number	Country	Date
2,100	Great Britain	of 1900
17,899	Great Britain	of 1911

OTHER REFERENCES

Surface Combustion and Its Industrial Applications, by William A. Bone, March 1911. (A copy of this pub. may be found in Div. 19.)