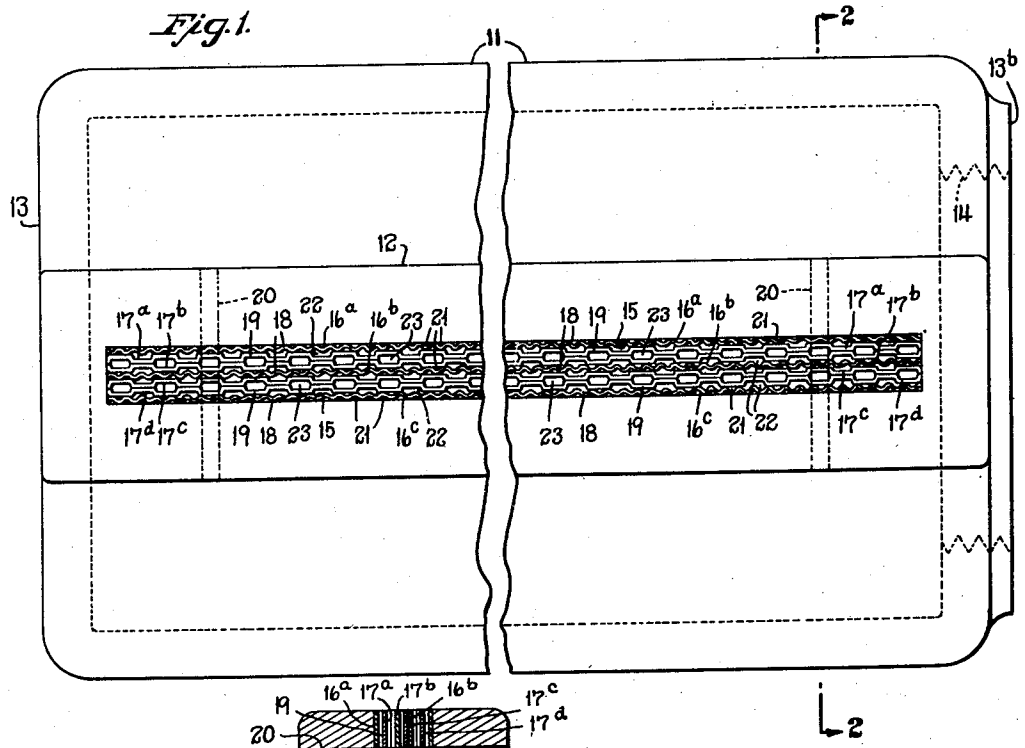
March 7, 1950 J. H. FLYNN 2,499,482

RIBBON-TYPE GAS BURNER

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Fig. 1.



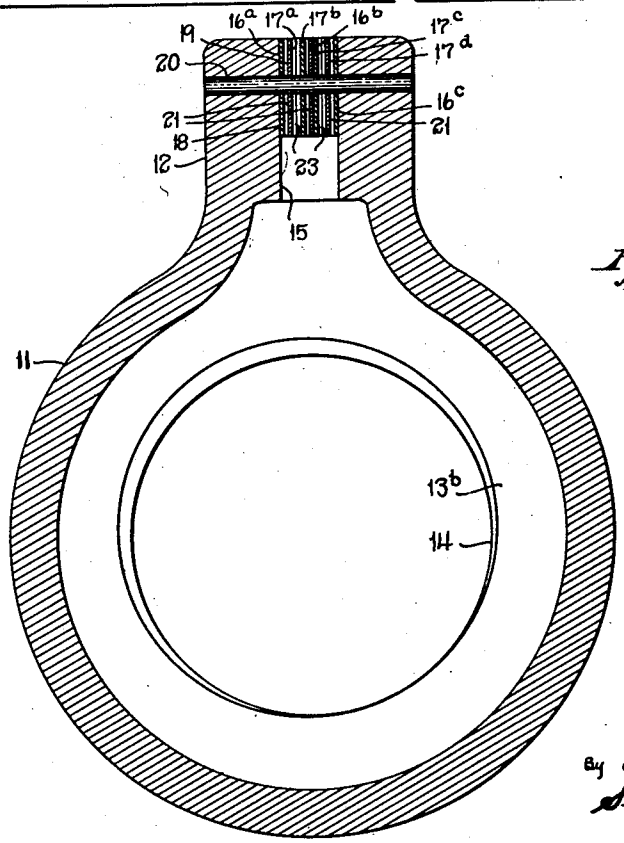


Fig. 2.

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RIBBON-TYPE GAS BURNER

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Fig. 3.

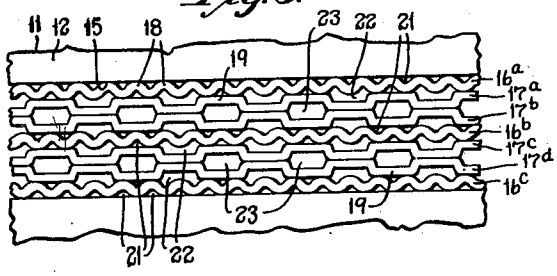


Fig. 4.

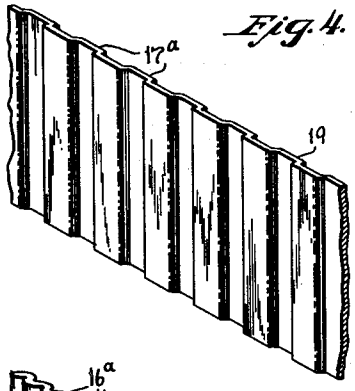
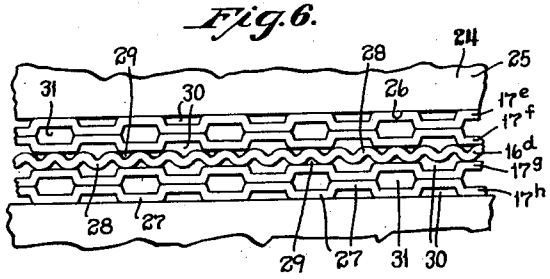


Fig. 6.



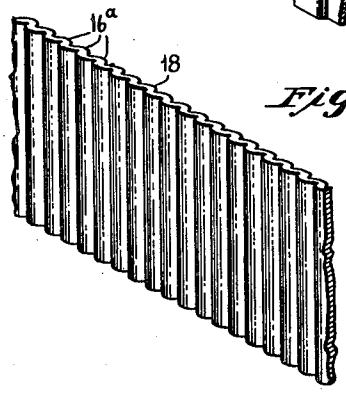


Fig. 5.

Fig. 7.

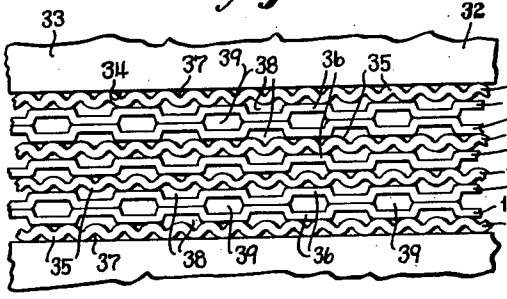
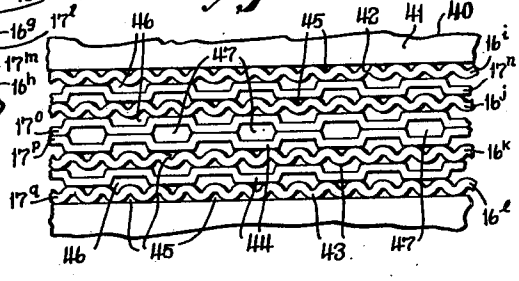


Fig. 8.



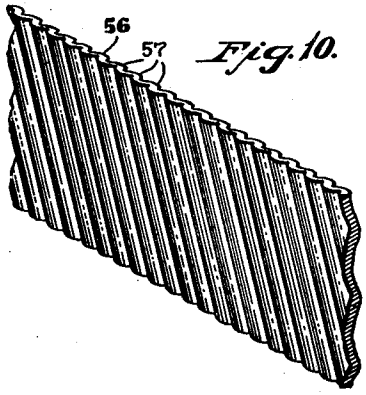
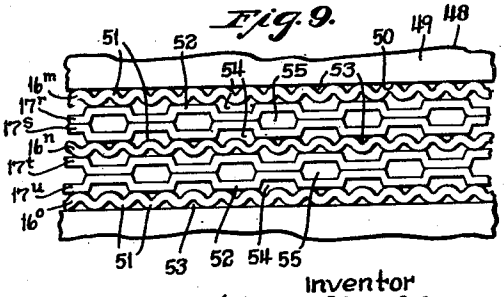


Fig. 10.

Fig. 9.



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UNITED STATES PATENT OFFICE

2,499,482

RIBBON-TYPE GAS BURNER

John H. Flynn, New Rochelle, N. Y.

Application December 18, 1947, Serial No. 792,416

8 Claims. (Cl. 158—116)

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The present invention relates to improvements in gas burners and relates more particularly to ribbon-type gas burners, i. e., gas burners comprising a slotted-hollow casing or body and a plurality of corrugated-metallic ribbons in the slot of the said casing to provide a plurality of gas-passages for the escape of gas from the interior of the said casing. Usually, the gas referred to is a combustible mixture of a hydrocarbon gas and air. In gas burners of the type referred to, it is necessary to provide two distinct types of gas-passages when combustible mixtures are employed under appreciable pressures, as is required for most industrial uses as well as for some domestic uses.

One of the types of gas-passages above referred to is of a high-velocity type to permit the gas to project itself with sufficient energy to provide a long flame extending to a point remote from the burner. The other type of gas-passage is of low-velocity type to provide suitable relatively-short pilot-flames immediately adjacent to the burner.

It may here be explained that the gas emerging from the high-velocity gas-passages usually has a velocity greater than the rate of flame-propagation of the gas so that the flame would not continue in the absence of a suitable pilot-flame to support combustion. It, therefore, becomes necessary to support the combustion of the high-velocity gas by relatively-short pilot-flames located close to the burner and provided for by the gas emerging from low-velocity gas-passages.

Inasmuch as the gas emerging from the relatively-low-velocity gas-passages is apt to cause a flash-back into the interior of the casing, due to the fact that the rate of flame-propagation of such gas is apt to exceed the velocity of the said gas as it emerges as described, it is, therefore, necessary in an effective and efficient gas burner of the type referred to, to so construct and arrange the parts that such flash-backs do not occur.

It is to be borne in mind also that combustible gases used in gas burners vary widely, not only with respect to calorific values but also with respect to their flame-propagation rates.

It is one of the main objects of the present invention, therefore, to provide a simple, reliable and efficient construction and arrangement of corrugated ribbons to provide pluralities of both high-velocity gas-passages and relatively-low-velocity gas-passages.

Another and more specific object of the present invention is to provide a superior ribbon-type gas burner which will reliably provide both high-

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velocity and relatively-low-velocity gas-passages without setting up distortion-stresses of a harmful nature when the gas burner becomes highly heated in use.

A further object of the present invention is to provide a superior gas burner of the type referred to which may be economically produced and which has high resistance to fouling, and which, further, may be readily cleaned in the event of actual fouling due to exceptional circumstances.

Still another object of the present invention is to provide a superior ribbon-type gas burner providing at least three types of gas-passages, i. e., high-velocity, low-velocity and medium-velocity or intermediate-velocity gas-passages.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art and not claimed by me in my copending application Serial No. 69,275 filed January 5, 1949.

In the accompanying drawings, in which certain modes of carrying out the present invention are shown for illustrative purposes:

Fig. 1 is a broken top or plan view of one form of a ribbon-type gas burner constructed in accordance with the present invention;

Fig. 2 is a transverse sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a fragmental plan view on an enlarged scale of a portion of the showing of Fig. 1;

Fig. 4 is a broken perspective view of one of the major ribbons;

Fig. 5 is a similar view of one of the minor ribbons;

Fig. 6 is a view similar to Fig. 3 but showing another arrangement of corrugated ribbons;

Fig. 7 is a view similar to Figs. 3 and 6 but showing still another arrangement of corrugated ribbons in accordance with the present invention;

Fig. 8 is a view similar to Fig. 7 and showing another arrangement of ribbons in accordance with the present invention;

Fig. 9 is a view similar to Fig. 8 but showing still another arrangement of corrugated ribbons in a gas burner constructed in accordance with the present invention; and

Fig. 10 is a broken perspective view of a modified form of minor ribbon.

The gas burner of Figs. 1 to 5 inclusive

The gas burner illustrated in the figures above referred to includes a relatively-long hollow casing or body generally designated by the ref-

erence character 11, and having a longitudinal rib 12 upstanding from its upper surface. In the instance shown, the casing 11 is provided at its respective opposite ends with gas-tight end walls 13a and 13b. The end wall 13b of the casing is provided with internal threads 14 adapted to receive a supply-pipe of any suitable nature (not shown) to supply a suitable gaseous combustible mixture to the interior of the casing 11.

The upstanding rib 12 of the casing 11 is formed with a longitudinal slot 15 extending from the interior to the exterior of the said casing and terminating short of the respective ends of the latter as is shown in Fig. 1.

Arranged in face-to-face relationship in the slot 15 of the casing is a group of transversely corrugated ribbons of stainless steel or other suitable material and including three minor ribbons 16a, 16b and 16c and four major ribbons 17a, 17b, 17c and 17d.

The term "minor" ribbons has been adopted for convenience of description, since each of the said ribbons is provided with minor corrugations 18, which have a shorter or minor distance between their respective peaks or apices (in a direction lengthwise of a given ribbon) than do the hereinafter described corrugations of the major ribbons 17a, 17b, 17c and 17d.

The term "major" ribbons has been applied to the ribbons 17a, 17b, 17c and 17d also for convenience of description, inasmuch as the said ribbons are formed with major corrugations 19 which have substantially-flat peaks or apices and which have a greater or major distance between them as compared to the aforesaid minor corrugations.

The minor ribbon 16a is located in contact with the adjacent wall of the slot 15 and in contact with the adjacent major ribbon 17a, which latter is in turn in contact with the major ribbon 17b. The major corrugations 19 of the major ribbons 17a and 17b are arranged in opposition as shown.

Flanking the major ribbon 17b is the minor ribbon 16b. Interposed between the minor ribbons 16b and 16c are the major ribbons 17c and 17d, which latter have their corrugations 19 arranged in opposition. The minor ribbon 16c thus is in contact or in substantial contact with the adjacent wall of the slot 15.

The ribbons above referred to may be retained in place in the slot 15 in any suitable manner such, for instance, as by transverse pins 20 indicated in Figs. 1 and 2. The arrangement of major and minor ribbons above described, results in the formation of a plurality of what may be aptly termed low-velocity gas-passages 21, a plurality of medium- or intermediate-velocity gas-passages 22 and a plurality of high-velocity gas-passages 23.

Each of the gas-passages 21 above referred to is of relatively-small cross-sectional area and has a relatively-large surface-area, with the result that gas passing therethrough will be materially slowed down as compared to the gas passing through the adjacent gas-passages 22 and 23. The gas-passages 21 are hence low-velocity gas-passages as compared to either of the gas-passages 22 and 23.

Each of the gas-passages 22 has a greater cross-sectional area than the gas-passages 21 and also a relatively-lesser surface-area (compared to its cross-sectional area) than do the said low-velocity gas-passages 21. The result is that under a given gas pressure, gas emerging from the intermediate-velocity gas-passages 22 will project

to a greater distance from the casing 11 than will the gas emerging from the low-velocity gas-passages 21.

Each of the high-velocity gas-passages 23 above referred to has a larger cross-sectional area as compared to the respective cross-sectional areas of both the gas-passages 21 and the gas-passages 22 and hence has lesser wall area (as compared to its cross-sectional area) than the gas-passages 21 and 22. The result is that there will be relatively-less skin friction, and gas emerging from the said gas-passages 23 will project a greater degree away from the casing or body 11 than will the gas emerging from the gas-passages 21 and 22.

Thus, the gas burner illustrated in Figs. 1 to 5 inclusive, will produce three different heights of flames with the long flames provided by the high-velocity gas-passages 23 being maintained by the flames provided by both the low-velocity gas-passages 21 and the intermediate-velocity gas-passages 22 and with the flames from the said intermediate-velocity gas-passages 22 in turn being maintained by the flames provided by the low-velocity gas-passages 21.

From the foregoing, it will be seen that in a relative sense, both the gas-passages 21 and 22 are low-velocity as compared to the gas-passages 23, while the gas-passages 22 are high-velocity as compared to the gas-passages 21.

The structure of Fig. 6

In Fig. 6 is shown a casing or body generally designated by the reference character 24 and basically corresponding to the casing or body 11 before described. Similar to the body 11, the body 24 has an upstanding-longitudinal rib 25 formed with a slot 26 corresponding to the slot 15 before described save that it is slightly narrower than the latter.

Mounted in the slot 26 is a group of transversely-corrugated ribbons comprising a single minor ribbon 16d and four major ribbons 17e, 17f, 17g and 17h.

The major ribbons 17e, 17f, 17g and 17h correspond to the major ribbons previously described and are provided with transverse major corrugations 27.

The minor ribbon 16d corresponds to the minor ribbons previously described and is formed with transverse minor corrugations 28.

The major ribbon 17e is arranged in contact with the adjacent wall of the slot 26 in the rib 25 and also in contact with the companion major ribbon 17f.

The major ribbon 17h is arranged in contact with the adjacent wall of the slot 26 and also in contact with its companion major ribbon 17g. The minor ribbon 16d is interposed directly between the major ribbons 17f and 17g.

The arrangement of the minor ribbon 16d and the major ribbons 17e, 17f, 17g and 17h is such that there is formed a plurality of low-velocity gas-passages 29, a plurality of intermediate-velocity gas-passages 30 and a plurality of high-velocity gas-passages 31.

The structure illustrated in Fig. 6 will thus provide three different heights of flames in a manner generally similar to the flames described in connection with the discussion of the showing of Figs. 1 to 5 inclusive.

The structure of Fig. 7

Fig. 7 illustrates another mode of assembling major ribbons and minor ribbons to provide a

plurality of relatively-high-velocity gas-passages and a plurality of relatively-lower-velocity gas-passages.

The gas-burner now being described includes, like the preceding forms, a suitable casing or body generally designated by the reference character **32** basically similar to the casings **11** and **24** before described, save that its rib **33** is provided with a longitudinal slot **34** having a greater width than the slots of either of the previously described gas-burners.

Mounted in the slot **34** is a group of transversely-corrugated ribbons comprising four minor ribbons **16***e*, **16***f*, **16***g* and **16***h* and five major ribbons **17***i*, **17***j*, **17***k*, **17***l* and **17***m*.

The minor ribbons **16***e*, **16***f*, **16***g* and **16***h* generally correspond to the minor ribbons previously described and are provided with transverse minor corugations **35**.

The major ribbons **17***i*, **17***j*, **17***k*, **17***l* and **17***m* also correspond to the major ribbons previously described and are provided with transverse major corrugations **36**.

The minor ribbon **16***e* is arranged in contact with the adjacent wall of the slot **34** and with the adjacent major ribbon **17***i*. Placed in contact and in opposition to the major ribbon **17***i* is the major ribbon **17***j*. Interposed between the major ribbons **17***j* and **17***k* is the minor ribbon **16***f* before described. The minor ribbon **16***g* is, in turn, located between the major ribbons **17***k* and **17***l*.

Located against and in opposition to the major ribbon **17***l* is the major ribbon **17***m*. Interposed between the major ribbon **17***m* and the adjacent wall of the slot **34** is the minor ribbon **16***h* previously referred to.

The minor ribbons **16***e*, **16***f*, **16***g* and **16***h* and the major ribbons **17***i*, **17***j*, **17***k*, **17***l* and **17***m* are so arranged in the slot **34** as to provide a plurality of low-velocity gas-passages **37**, a plurality of intermediate - velocity gas - passages **38** and a plurality of high-velocity gas-passages **39**.

Like the gas burners previously described, the structure illustrated in Fig. 7 will provide three different heights of flame, in a manner generally similar to the flames described in connection with the discussion of Figs. 1 to 6 inclusive, save that the flame-pattern is slightly different.

The structure of Fig. 8

In Fig. 8 is shown a casing generally designated by the reference character **40** and like the preceding forms, having a longitudinal rib **41** provided with a slot **42**. The features **40**, **41** and **42** just described correspond in substance to the similar features previously described.

Mounted in the slot **42**, is a group of transversely-corrugated ribbons comprising four minor ribbons **16***i*, **16***j*, **16***k* and **16***l* and a similar number of major ribbons **17***n*, **17***o*, **17***p* and **17***q*.

The minor ribbons **16***i*, **16***j*, **16***k* and **16***l* are provided with transverse minor corrugations **43**, while the major ribbons **17***n*, **17***o*, **17***p* and **17***q* are formed with transverse major corrugations **44**.

The minor ribbons and major ribbons just above referred to correspond in substance to the similar ribbons previously described.

The minor ribbons **16***i*, **16***j*, **16***k* and **16***l* and the major ribbons **17***n*, **17***o*, **17***p* and **17***q* are intermingled to provide a plurality of low-velocity gas-passages **45**, a plurality of intermediate-velocity gas-passages **46** and a plurality of high-velocity gas-passages **47**, which latter form a single row located substantially centrally of the structure.

Here, again, the structure now being described will provide flames of three different characteristics, in a manner similar to the flames produced by the structures previously described.

The structure of Fig. 9

Fig. 9 illustrates a slight variation in the arrangement of major and minor ribbons and includes, like the preceding forms, a casing, which in this instance is generally designated by the reference character **48**, which has an upstanding longitudinal rib **49**. The rib **49** is formed with a longitudinal slot **50** similar to the slots **15**, **26**, **34** and **42** previously described.

Secured in any suitable manner in the slot **50** is a group of transversely-corrugated ribbons comprising three minor ribbons **16***m*, **16***n* and **16***o*, together with four major ribbons **17***r*, **17***s*, **17***t* and **17***u*.

The minor ribbons and the major ribbons just above described, are respectively provided with minor corrugations **51** and major corrugations **52**. The arrangement of the minor ribbons and major ribbons above described, results in the provision of a plurality of low-velocity gas-passages **53**, a plurality of intermediate-velocity gas-passages **54** and a plurality of high-velocity gas-passages **55**.

The minor ribbons and the major ribbons in the structure of Fig. 9 correspond in number and transverse location to the similar ribbons in the structure of Figs. 1 to 5 inclusive. The longitudinal disposition of the various ribbons is, however, different.

It will be noted by reference to Fig. 9 that the pair of opposed major ribbons **17***r* and **17***s* is displaced longitudinally of the structure with respect to the opposed pair of major ribbons **17***t* and **17***u* so that one series of high-velocity gas-passages **55** is staggered with respect to the other series of similar gas-passages.

The ribbon of Fig. 10

In Fig. 10 is shown a transversely-corrugated minor ribbon generally designated by the reference character **56** and having transverse corrugations **57**.

The corrugations **57** instead of extending at a substantial right angle with respect to the longitudinal edges of the ribbon as is the case in the preceding structures, extend diagonally in this instance.

The minor ribbon **56** may be substituted in place of the previously-described minor ribbons and when so utilized, will provide gas-passages of a somewhat longer extent which may be preferable under some operating conditions.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. A ribbon-type gas-burner, including in combination: a casing having a slot leading from its interior to its exterior; a group of transversely-corrugated ribbons arranged in mutually-contacting face-to-face relationship in the slot of the said casing; the said group of ribbons including at least one ribbon having a continuous series of

major corrugations free of minor corrugations between them and at least one ribbon having a continuous series of minor corrugations free of major corrugations between them; the said major corrugations having substantially flat apices and being of lesser number per unit of ribbon length as compared to the said minor corrugations which are greater in number for the same unit of ribbon length; the two said ribbons being arranged in face-to-face engagement in the slot of the said casing to provide directly between them a plurality of relatively-large high-velocity gas-passages and a plurality of relatively-small low-velocity gas-passages.

2. A ribbon-type gas-burner, including in combination: a casing having a slot leading from its interior to its exterior; a group of transversely-corrugated ribbons arranged in mutually-contacting face-to-face relationship in the slot of the said casing; the said group of ribbons including at least one ribbon having a continuous series of major corrugations free of minor corrugations between them and at least one ribbon having a continuous series of minor corrugations free of major corrugations between them; the said major corrugations having substantially flat apices and being of lesser number per unit of ribbon length as compared to the said minor corrugations which are greater in number for the same unit of ribbon length, and the said minor corrugations being inclined with respect to the said major corrugations; the two said ribbons being arranged in face-to-face engagement in the slot of the said casing to provide directly between them a plurality of relatively-large high-velocity gas-passages and a plurality of relatively-small low-velocity gas-passages.

3. A ribbon-type gas-burner, including in combination: a casing having a slot leading from its interior to its exterior; a group of transversely-corrugated ribbons arranged in mutually-contacting face-to-face relationship in the slot of the said casing; the said group of ribbons including at least two ribbons each having a continuous series of major corrugations free of minor corrugations between them and at least one ribbon having a continuous series of minor corrugations free of major corrugations between them; the said major corrugations having substantially flat apices and being of lesser number per unit of ribbon length as compared to the said minor corrugations which are greater in number for the same unit of ribbon length; the ribbons of the aforesaid group of ribbons being arranged in face-to-face engagement in the slot of the said casing to provide between the two said ribbons with major corrugations a plurality of relatively-large high-velocity gas-passages and a plurality of both relatively-large high-velocity gas-passages and a plurality of relatively-small low-velocity gas-passages directly between one of the said ribbons with major corrugations and a contacting ribbon with minor corrugations.

4. A ribbon-type gas-burner, including in combination: a casing having a slot leading from its interior to its exterior; a group of transversely-corrugated ribbons arranged in mutually-contacting face-to-face relationship in the slot of the said casing; the said group of ribbons including at least two ribbons each having a continuous series of major corrugations free of minor corrugations between them and at least one ribbon having a continuous series of minor corrugations free of major corrugations between them; the said major corrugations having substantially flat

apices and being of lesser number per unit of ribbon length as compared to the said minor corrugations which are greater in number for the same unit of ribbon length, and the said minor corrugations being inclined with respect to the said major corrugations; the ribbons of the aforesaid group of ribbons being arranged in face-to-face engagement in the slot of the said casing to provide between the two said ribbons with major corrugations a plurality of relatively-large high-velocity gas-passages and a plurality of both relatively-large high-velocity gas-passages and a plurality of relatively-small low-velocity gas-passages directly between one of the said ribbons with major corrugations and a contacting ribbon with minor corrugations.

5. A ribbon-type gas-burner, including in combination: a casing having a slot leading from its interior to its exterior; a group of transversely-corrugated ribbons arranged in mutually-contacting face-to-face relationship in the slot of the said casing; the said group of ribbons including at least two ribbons having a continuous series of major corrugations free of minor corrugations between them and at least one ribbon having a continuous series of minor corrugations free of major corrugations between them with the last-mentioned ribbon located between the two first-mentioned ribbons; the said major corrugations having substantially flat apices and being of lesser number per unit of ribbon length as compared to the said minor corrugations which are greater in number for the same unit of ribbon length; the ribbons of the aforesaid group of ribbons being arranged in face-to-face engagement in the slot of the said casing to provide on each of the respective opposite sides of the said ribbon with minor corrugations one of two series of both relatively-large high-velocity gas-passages and relatively-small low-velocity gas-passages.

6. A ribbon-type gas-burner, including in combination: a casing having a slot therein which leads from its interior to its exterior; a group of transversely-corrugated ribbons arranged in mutually-contacting face-to-face relationship in the slot of the said casing; the said group of ribbons including at least a pair of ribbons each having a continuous series of major corrugations free of minor corrugations between them and at least one ribbon having a continuous series of minor corrugations free of major corrugations between them; the said major corrugations having substantially flat apices and being of lesser number per unit of ribbon length as compared to the said minor corrugations which are greater in number for the same unit of ribbon length; the said pair of ribbons with major corrugations being arranged in the said slot in opposition to each other in face-to-face engagement to provide directly between them a plurality of relatively-large high-velocity gas-passages and the said ribbon with minor corrugations being arranged on engagement with one of the said pair to cooperate with one side thereof to provide a plurality of both relatively-large high-velocity gas-passages and a plurality of relatively-small low-velocity gas-passages.

7. A ribbon-type gas-burner, including in combination: a casing having a slot leading from its interior to its exterior; a group of transversely-corrugated ribbons arranged in mutually-contacting face-to-face relationship in the slot of the said casing; the said group of ribbons including at least one ribbon having a continuous series of major corrugations free of minor corrugations be-

tween them and at least two ribbons having a continuous series of minor corrugations free of major corrugations between them and with the first-mentioned ribbon located between the two last-mentioned ribbons; the said major corrugations having substantially flat apices and being of lesser number per unit of ribbon length as compared to the said minor corrugations which are greater in number for the same unit of ribbon length; the aforesaid group of ribbons being arranged in face-to-face engagement in the slot of the said casing to provide one each of the respective opposite sides of the said ribbon with major corrugations one of two series of both relatively-large high-velocity gas-passages and relatively-small low-velocity gas-passages.

8. A ribbon-type gas-burner, including in combination: a casing having a slot therein which leads from its interior to its exterior; a group of transversely-corrugated ribbons arranged in mutually-contacting face-to-face relationship in the slot of the said casing; the said group of ribbons including at least a pair of ribbons each having a continuous series of major corrugations free of minor corrugations between them and a plurality of ribbons each having a continuous series of minor corrugations free of major corrugations between them; the said major corrugations having substantially flat apices and being of lesser number per unit of ribbon length as compared to the said minor corrugations which are greater in number for the same unit of ribbon length; the said pair of ribbons with major corrugations being arranged in the said slot in opposition to each other in face-to-face engagement to provide a plurality of relatively-large high-velocity gas-passages directly between them and the said ribbons with minor corrugations being arranged in the said slot adjacent the said pair to provide a plurality of relatively-small low-velocity gas-passages directly between one of the said ribbons with major corrugations and a contacting ribbon with minor corrugations.

JOHN H. FLYNN.

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