June 28, 1960 A. S. LUNDY 2,942,540

GAS FRACTIONATING APPARATUS

Filed Jan. 2, 1959

Fig. 1

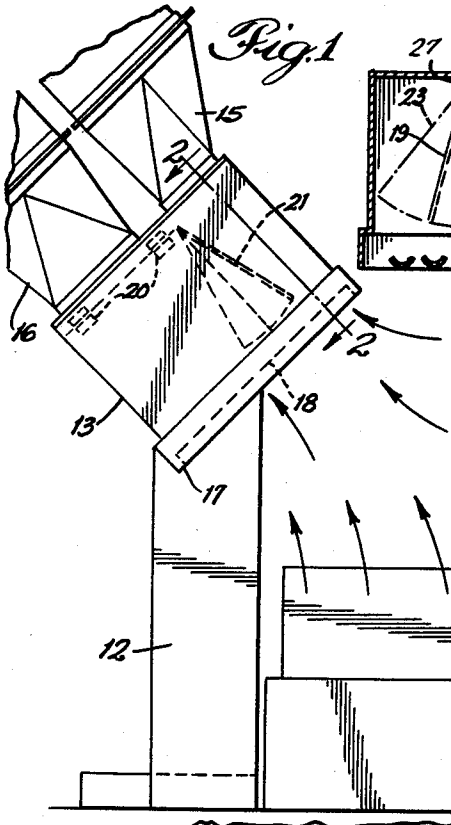


Fig. 2

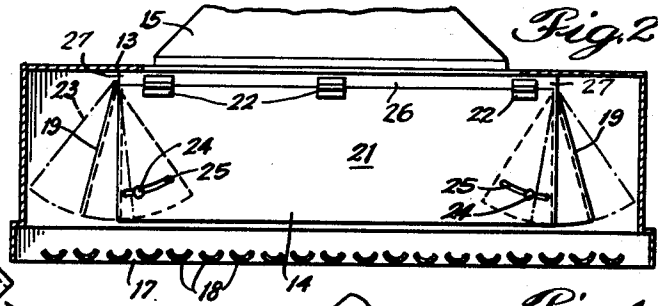
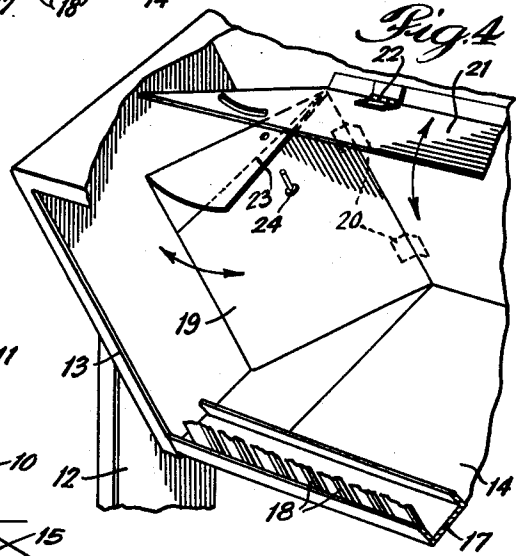


Fig. 4



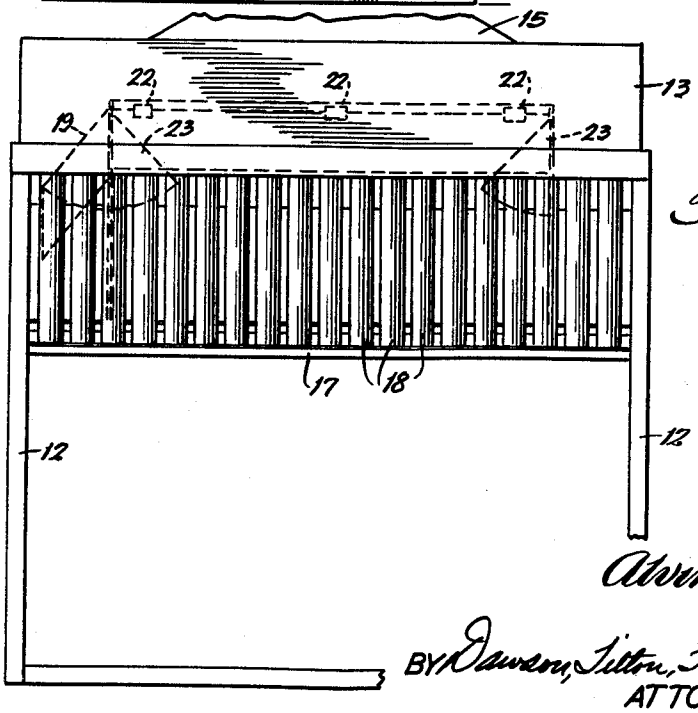


Fig. 3

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GAS FRACTIONATING APPARATUS

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This invention relates to gas fractionating apparatus, and more particularly to apparatus for separating a rising column of gas containing particulate matter into a heavily contaminated stream and into a lesser contaminated stream.

In my Patent No. 2,567,776, which issued September 11, 1951, for Treatment of Gases and the Like, a gas fractionating apparatus is provided adjacent a grate and is effective in removing a heavily contaminated stream so that the same may be passed through a tower or column while separating also a less contaminated stream which may be vented to the atmosphere. While, for the purpose of simplicity, two streams are referred to in the operation of the apparatus, it will be understood that any number of streams of gas varying in contamination or in the particle matter carried, may be separated for different desired purposes.

While the apparatus shown in my Patent 2,567,776 is very effective, when the casting or other product giving off the gas column is of a shape so that the gas column is encompassed by the intake of the fractionating apparatus, difficulty is encountered where the casting is of a different shape and projects a column of gas to which the intake of the apparatus is not adapted. For example, when a narrow, long casting is substituted for a square casting, the apparatus, which is designed primarily for the gas rising from the square casting, is not effective in treating the gas from the elongated casting. On the other hand, the problem is complicated by the fact that where the intakes on the apparatus are enlarged to encompass a larger column of gas, the increased gas volume nullifies the economies obtained by fractionating and requires additional floor space, which is usually not available.

I have discovered that fractionating apparatus can be employed for efficiently handling columns of gas of varying shapes and flow characteristics by designing the intakes to a multiple plenum or plenums for a constant velocity to give accurate separation and then providing means for changing the shape of the intake passage while maintaining the area constant. In other words, by maintaining a constant area ratio at the entrance of the plenums while changing the location of the point of separation between the two fractions of gas, I find that the apparatus can be adjusted to meet changing conditions brought about by the treatment of castings of varying shapes and other sources of gas columns.

An object of the invention is to provide apparatus for the fractionating of gas columns of different dimensions and flow characteristics while maintaining a substantially constant velocity of withdrawal. A further object is to provide a method and means for changing the manner in which exhaust gas is divided into two or more fractions. Yet another object is to provide apparatus in which a divided plenum chamber is employed and in which divider sheets may be swung to different positions to accommodate gas columns of different shapes while maintaining a constant area ratio at the entrance to the

plenums. Other specific objects and advantages will appear as the specification proceeds.

The invention is shown, in an illustrative embodiment, by the accompanying drawing, in which—

Figure 1 is a broken side view in elevation of fractionating apparatus embodying my invention; Fig. 2, a longitudinal sectional view, the section being taken at line 2—2 of Fig. 1; Fig. 3, a broken front view in elevation of the separating apparatus; and Fig. 4, a broken perspective detail view showing the operation of the flow control sheets.

In the illustration given, **10** designates a grate upon which rests a casting **11**. A support **12** adjacent the grate supports a casing **13** providing a plenum chamber **14**. Leading from the upper portion of the plenum is a pipe **15** which is adapted to discharge less contaminated gas to the atmosphere or to other desired destinations. A lower pipe **16** may lead to a tower column in which the gas is washed by liquid or otherwise cleansed. Both pipes **15** and **16** are preferably maintained under vacuum or suction so as to provide a constant velocity of flow through the plenum chamber **14**.

The entrance to the plenum chamber **14** is preferably through a frame **17** provided with spaced louvers **18**.

Within the casing **13** I provide hinged sheet members which may be moved to different positions to change the shape of the plenum intakes. Side sheets **19** are supported by hinges **20** fastened to bars **27** attached to casing **13**. Divider sheet **21** is supported by hinges **22** fastened to bar **26** attached to casing **13**. Side sheets **19** may be swung laterally of the plenum and divider sheet **21** may be swung up or down to vary the shapes of the plenum intakes. Triangular filler sheets **23** are secured by screws **24** to divider sheet **21**. Slots **25** in divider sheet **21** permit adjustment of filler sheets **23** to close any space between sheets **19** and **21** when the sheets **19** are swung laterally and sheet **21** is moved, as illustrated best in Figs. 2 and 4. For clarification, in Fig. 4, filler sheet **23** is shown separated from sheet **21** to which it is normally attached. Thus, when sheets **19** are swung outwardly and sheet **21** upwardly, the triangular sheets **23** move upwardly with sheet **21** and may be moved outwardly to bridge the space between sheets **19** and **21** to provide a closed inner chamber.

By employing the hinged longitudinal sheet **21** extending approximately 75% of the length of the hood, and hinged end sheets **19** swinging at right angles to sheet **21** and at the ends of sheet **21**, and by employing two adjustable, essentially triangular filler sheets **23** to close the openings between sheets **21** and **19**, there is provided an easy and accurate method of changing the manner in which the exhaust gas is divided into two fractions. For example, if the contaminant is concentrated near the middle of the hood and sheets **19** can be pivoted toward the center of the hood and divider sheet **21** swung toward the lip of the hood, effective fractionation is brought about. An increased amount of gas from the end portions of the hood would be exhausted to the outside and an increased portion of the gas stream near the middle of the hood would be passed to the collector. In this operation, there is maintained a constant area ratio at the entrance to the plenums at the louver frame **17** while changing the location of the point of separation between the two fractions of gas.

In operation, the column of gas rises, as indicated by the arrows in Figs. 1, and under the suction imparted through the pipes **15** and **16**, the rising column is divided into two fractions, the lower column containing more of the contaminants, while the upper fraction containing less contaminants is drawn into the upper pipe **15**. When the shape of the casting or other source of contaminant is changed, the divider in the plenum chamber may be

swung upwardly or downwardly and the side sheets **19** may be swung outwardly or inwardly. If the side sheets **19** are swung outwardly so as to increase the length of the chamber, the divider sheet **21** is preferably swung downwardly so as to maintain a constant velocity or intake area. In each change, the sector plates **23** are swung inwardly or outwardly to provide a closure between plates **19** and **21**. Thus, by the ready manipulation just described, the partition between the plenum chambers dividing the gas flow into the two separate outlets can be modified to provide an elongated narrow intake or a shorter broad intake, the area of the intake leading to the pipe **16** being maintained constant although the shape thereof is widely varied. By this means, effective separation of the heavy stream with its particulate matter or other contaminants may be accomplished irrespective of the shape of the gaseous column rising from the grate or other source below.

While, in the foregoing specification, I have set forth a specific structure in considerable detail for the purpose of illustrating an embodiment of the invention, it will be understood that such details may be varied widely by those skilled in the art without departing from the spirit of my invention.

I claim:

1. In apparatus for treating a column of gas, support means adjacent said column of gas, at least a pair of pipes carried by said support means and having inlets in spaced relation, a casing enclosing the inlets of said pipes and providing a chamber open at the front thereof, and a divider sheet pivotally mounted on said casing between said pipe inlets and swingable upwardly and downwardly within said chamber to divide the gas flow into said pipe inlets.

2. The structure of claim 1 in which side sheets mounted within said chamber are pivotally mounted within said casing substantially at right angles to the pivotal supports for said divider and in which sheet means is provided for closing the space between the divider and said side sheets whereby the shape of the chamber leading to one inlet may be changed while maintaining the area of the intake constant.

3. In apparatus for treating a column of gas rising in a general vertical plane, support means, a pair of pipes carried by said support and having intakes in spaced vertical relation, a casing enclosing the inlets of said pipes and providing a chamber open at the front thereof adjacent said column of gas, a divider sheet pivotally mounted in said casing between said pipe inlets and swingable upwardly and downwardly within said chamber to divide the gas flow into said pipe inlets, and means associated with said divider sheet for maintaining the area of the intake to each pipe constant when the divider is swung to different positions, said means comprising side sheets mounted on pivots carried by said casing substantially at right angles to the pivots and said divider sheet, and filler sheet means for closing the space between the divider and said side sheets.

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