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FUEL MIXTURE

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No Drawing. Original application July 6, 1939, Serial No. 282,968, now Patent No. 2,281,497, dated April 28, 1942. Divided and this application December 31, 1940, Serial No. 372,627

11 Claims. (Cl. 44—1)

This invention relates to an improved solid fuel, which is an intermixture of bituminous and anthracite coals, having certain definitely desirable properties and characteristics.

More specifically, the improved fuel is a mixture of a relatively large percentage, by weight, of bituminous coal and a relatively small percentage of a small-sized or finely divided anthracite coal. This mixture is especially suited for use in the firing of underfeed stokers which are subject to high-peak loads and to substantial variations in load. The bituminous coal with its relatively high volatile content provides a desirable flash which insures a rapid increase in the rate of combustion when a sudden increase in load is encountered and enables a high-peak load to be met over a desired period. The anthracite, on the other hand, imparts various desirable properties to the mixture. It has a weighting-down effect upon the finer particles of bituminous and hence prevents excessive loss of these fine particles up the chimney under heavy draft conditions. Thus, the efficiency of the fuel consumption is increased. Moreover, the anthracite, which may suitably be of the No. 4 buckwheat variety, provides an economical source of a substantial part of the B. t. u. value of the mixture. Accordingly, the mixture is ont only less expensive per ton than the bituminous coal employed but it is consumed with higher efficiency.

This application is a division of our pending application Ser. No. 282,968, filed July 6, 1939, which has matured into Patent No. 2,281,497, issued April 28, 1942, in which a method and means of producing the improved mixture are claimed.

Coal mixtures of the type primarily contemplated by the present invention should not only be capable of relatively rapid ignition and combustion as a sudden increase in the load on a boiler is encountered but they should also be such as to allow as nearly a maximum boiler efficiency as possible under the burning conditions normally encountered in their use. The water content of the composite fuel should be between about 4.0 and 6.4%.

It has been found that an exceptionally high boiler efficiency may be obtained through the use in an underfeed stoker of a mixture of substantially 80% of run of mine bituminous coal and 20% of anthracite coal of the type generally designated No. 4 buckwheat. Such a mixture has a moisture content within the permissible range and has certain distinct advantages in addition to the high boiler efficiency already mentioned. It is economical because of the cheapness of the No. 4 buckwheat anthracite. Heretofore the value of this type of fuel has not been appreciated, but in the mixture contemplated and economically produced by the present invention, it contributes its proportionate share to the heat value of the mixture as a whole. This mixture, moreover, is cheaper in relation to its B. t. u. value than straight bituminous. Due to the lower volatility of the mixture, as compared with bituminous alone, the danger of spontaneous combustion of the fuel in the bunkers is substantially eliminated and loss from this source is thus avoided and the usual periodic trimming of the bunkers may be dispensed with. At the same time the "flash" of the bituminous coal, which is important when heavy peak loads are to be met, is preserved. Use of the mixture, furthermore, is conducive to smoke abatement and to greater cleanliness in the boiler room.

Apparently the high efficiency in the use of the mixture and its cleaner burning qualities are due to the previously mentioned weighting-down effect of the anthracite upon the fine particles of bituminous and the coke derived therefrom. Less of these fine particles are carried away in the smoke or deposited in the back passes of the furnace. Thus the combustion of the bituminous is rendered more complete by the presence of the anthracite.

While the particular mixture specified is especially suited for underfeed stoker use under conditions of heavy peak loads, such as encountered, for example, in the operation of a subway system, it may be varied slightly for this use and other variations may be made to adapt the mixture for other uses. The amount of anthracite employed, however, should not be excessive since the moisture content of the armature is then likely to be increased to the point that trouble will be caused in its use. In general it may be said to be desirable to employ between 70 and 80% of bituminous and between 20 and 30% of anthracite in the mixture. The two types of coal, as already explained, should be thoroughly intermixed. This may suitably be accomplished by the method and means set forth in the afore-mentioned application, of which this is a division. The bituminous employed is preferably run of the mine and of a low volatile variety. Its volatility is preferably between 16 and 22%, although coal of higher volatility may be employed for some purposes. Its moisture content may be between 3 and 4%, its fixed carbon between 70 and 75%, its

sulphur content between 1 and 2%, its ash between 5 and 8%, and it may have a B. t. u. value of 14,000 or more.

The anthracite is preferably a fine buckwheat commonly designated No. 4. Its particles preferably range from 3/64" to 3/32" and it flows much like sand. It may suitably be the material which will pass through a 3/32" screen and will pass over a 3/64" screen. Not more than 5% of the material should be oversize and not more than about 25% should be undersize. There should be substantially no sub-mesh material in the anthracite. An excess of oversized particles tends to pass too much carbon to the ash while an excess of undersized particles tends to develop packing in the fuel bed with resulting uneven distribution of air and the formation of blow holes if the air pressure is increased to offset the packing. The anthracite volatile matter should range from about 4 to 8%, the moisture from about 8 to 12%, the fixed carbon from about 70 to 80%, or slightly higher, the ash from about 10 to 12%, and the sulfur should be less than 1%. Its as received B. t. u. value is somewhat lower than the bituminous and will ordinarily be between 11,500 and 13,000.

Typical fuels which have been used and the mixtures formed therefrom have had the following analyses as fired:

	Bituminous		Anthracite	
Fixed carbon, per cent	70.89	72.63	73.89	82.48
Volatile matter, per cent	19.36	19.97	4.49	5.52
Moisture, per cent	3.81	3.12	11.36	8.26
Ash, per cent	5.44	7.40	10.26	12.00
Sulfur, per cent	1.00	1.91	0.42	0.59
B. t. u. (as received)	14,291	14,530	11,536	12,770

	Mixtures			
Fixed carbon, per cent	75.26	76.71	74.80	76.87
Volatile matter, per cent	17.02	15.18	17.30	15.16
Moisture, per cent	4.13	4.61	5.13	5.67
Ash, per cent	7.72	8.11	7.90	7.97
Sulfur, per cent	1.14	1.11	1.36	0.99
B. t. u. (as received)	14,290	13,970	14,110	13,740

While a fuel mixture which has been found most effective for a specific purpose has been described in considerable detail, it should be understood that the mixture may be modified in a variety of ways without departing from the general principles and scope of the invention. The terms and expressions employed herein have been used as terms of description and not of limitation.

What we claim is:

1. An underfeed stoker fuel which comprises an intimate intermixture of between 70 and 80% by weight of bituminous coal and 20 to 30% by weight of anthracite coal of the number 4 buckwheat size.

2. An underfeed stoker fuel which comprises an intimate intermixture of about 80% by weight of bituminous coal and about 20% by weight of anthracite coal whose particles pass through a 3/32" screen and over a 3/64" screen.

3. An underfeed stoker fuel which comprises an intimate intermixture of between 70 and 80% by weight of bituminous coal and 20 to 30% by weight of anthracite coal of the number 4 buckwheat size, said mixture having a moisture content of not more than 6% and volatile matter not exceeding 20%.

4. An underfeed stoker fuel which comprises an intermixture of between 70 and 80% by weight of run of the mine bituminous coal having a moisture content not exceeding about 4%, and 20 to 30% by weight of a finely divided anthracite coal having substantially no sub-mesh material and having a moisture content of about 8 to 12%.

5. An underfeed stoker fuel which comprises an intermixture of between 70 and 80% by weight of run of the mine bituminous coal having between 16 and 22% volatile matter, and 20 to 30% by weight of a finely divided anthracite coal having substantially no sub-mesh material and having between 4 and 8% volatile matter.

6. An underfeed stoker fuel which comprises an intermixture of between 70 and 80% by weight of run of the mine bituminous coal having between 16 and 22% volatile matter and a moisture content not exceeding about 4%, and 20 to 30% by weight of a finely divided anthracite coal having substantially no sub-mesh material and having between 4 and 8% volatile matter and a moisture content of about 8 to 12%.

7. An underfeed stoker fuel which comprises an intermixture of between 70 and 80% by weight of run of the mine bituminous coal and 20 to 30% by weight of a finely divided anthracite coal all particles of which are capable of passing through a 3/32" screen and containing substantially no sub-mesh material.

8. An underfeed stoker fuel which comprises an intermixture of bituminous and anthracite coals, the anthracite constituting not more than about 30% of the mixture and being in a finely divided state but containing substantially no sub-mesh material, the mixture having between 15 and 18% volatile matter and a moisture content of between 4 and 6%.

9. An underfeed stoker fuel which comprises an intermixture of bituminous and anthracite coals, the anthracite constituting not more than about 30% of the mixture and being in a finely divided state but containing substantially no sub-mesh material, the mixture having between 15 and 18% volatile matter, between 70 and 77% fixed carbon, and a moisture content of between 4 and 6%.

10. An underfeed stoker fuel which comprises an intermixture of bituminous and anthracite coals, the anthracite constituting not more than about 30% of the mixture and being in a finely divided state but containing substantially no sub-mesh material, the mixture having between 15 and 18% volatile matter, an ash content of between 7 and 9%, and a moisture content of between 4 and 6%.

11. A method of generating heat which comprises burning a mixture of anthracite and bituminous coals in a furnace, and feeding said fuel to the furnace by an underfeed stoker, said mixture containing between 70 and 80% by weight of bituminous coal and 20 to 30% by weight of anthracite coal of the number 4 buckwheat size.

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CERTIFICATE OF CORRECTION.

Patent No. 2,328,147. August 31, 1943.

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 28, for "ont" read --not--; and second column, line 39, for "armature" read --mixture--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 9th day of November, A. D. 1943.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)