April 28, 1942. J. A. HYSON ET AL 2,281,498

FUEL LOADING AND INTERMIXING METHOD
Original Filed July 6, 1939

3 Sheets-Sheet 1

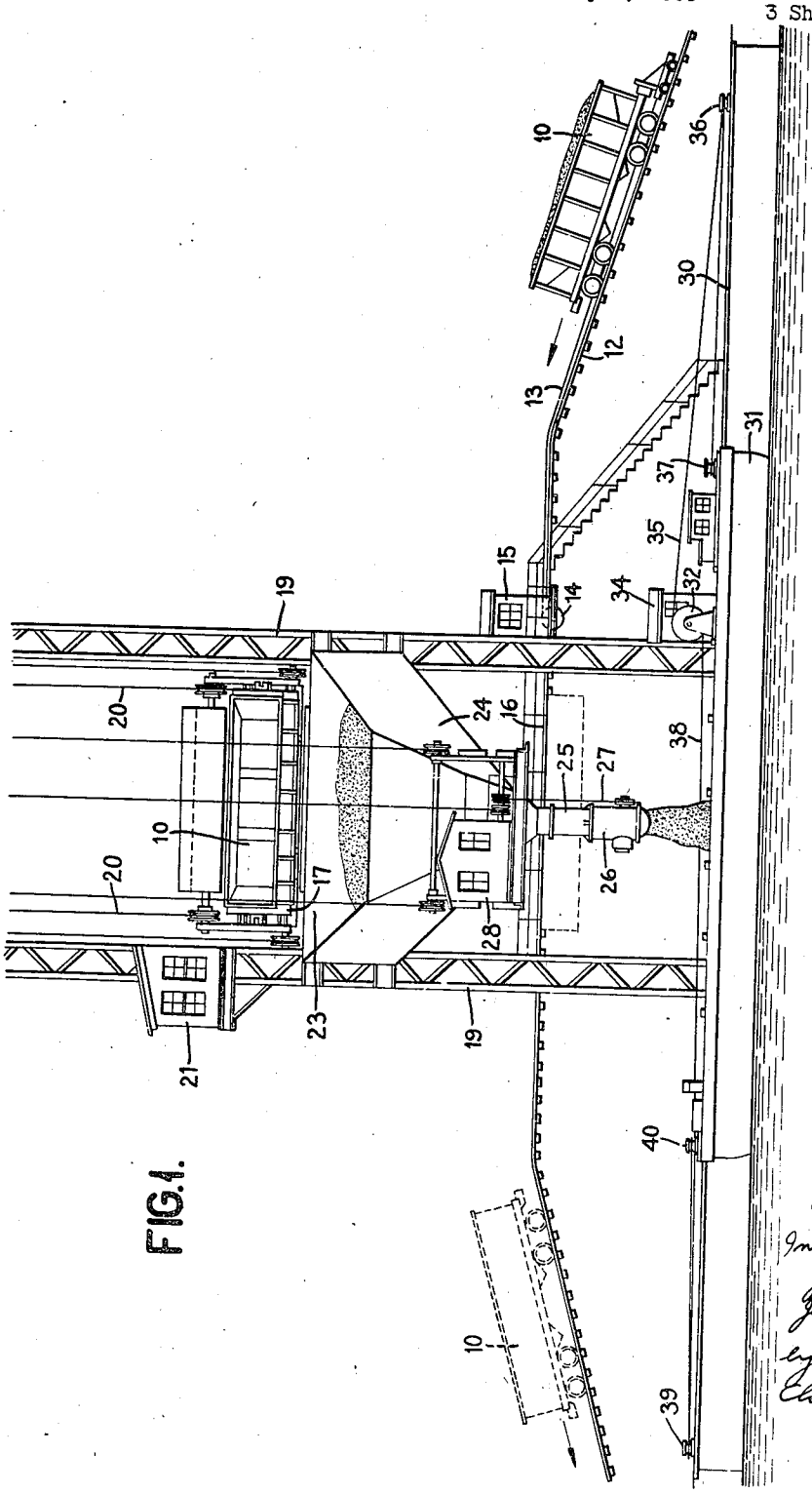


FIG. 1.

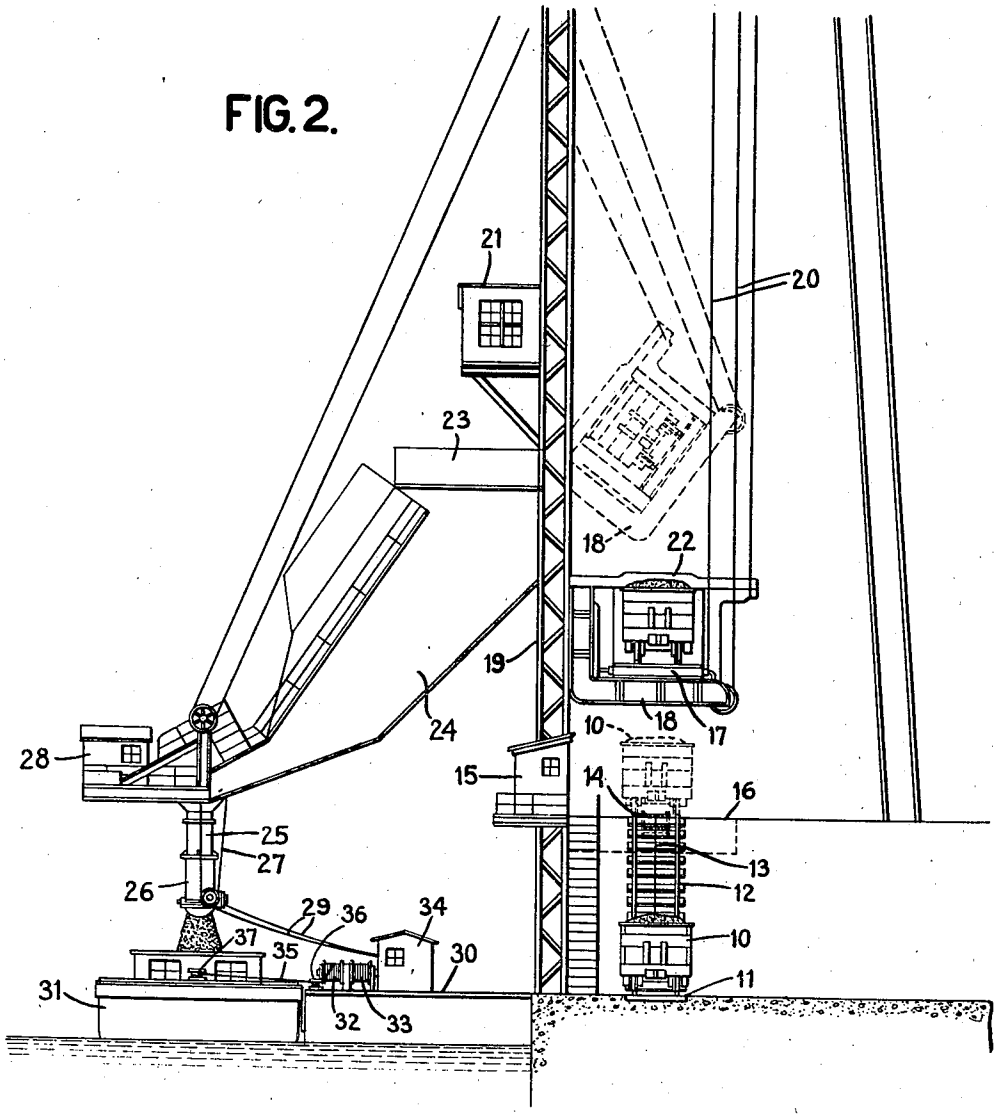
Inventors:
John A. Hyson
Joseph H. Kenick
by
Clarence D. Kerr
attorney.

April 28, 1942. J. A. HYSON ET AL 2,281,498

FUEL LOADING AND INTERMIXING METHOD

Original Filed July 6, 1939 3 Sheets-Sheet 2

FIG. 2.



Inventors:
John A. Hyson
Joseph H. Kerrick
by Clarence D. Kerr
attorney

April 28, 1942. J. A. HYSON ET AL 2,281,498

FUEL LOADING AND INTERMIXING METHOD

Original Filed July 6, 1939 3 Sheets-Sheet 3

FIG. 3.

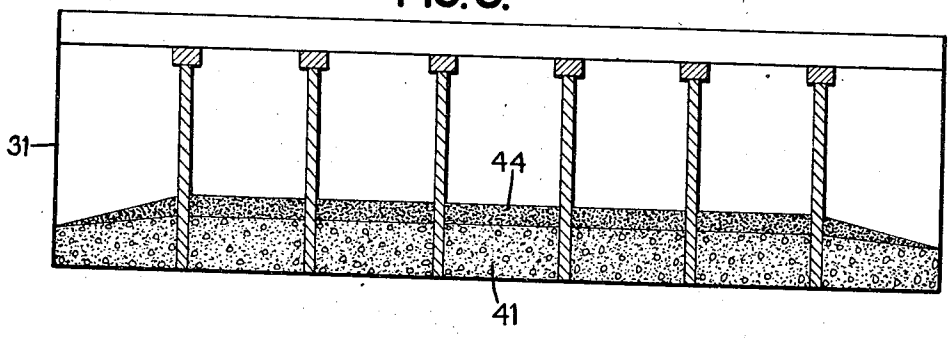


FIG. 4.

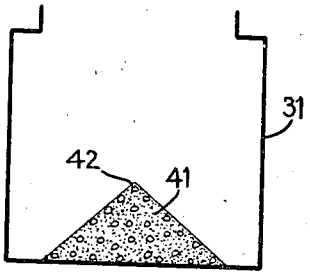


FIG. 5.

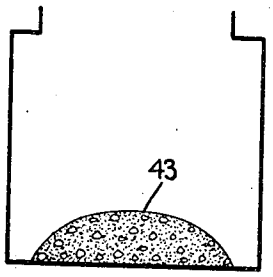


FIG. 6.

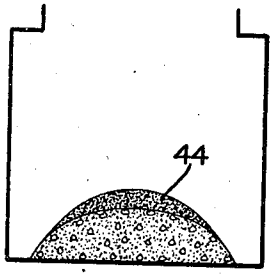


FIG. 10.

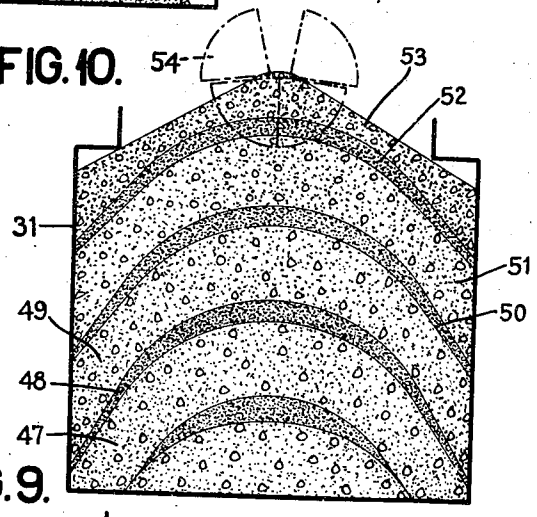


FIG. 7.

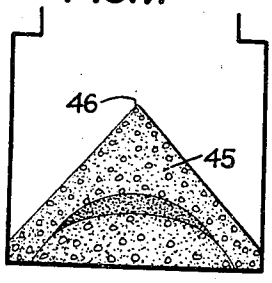


FIG. 8.

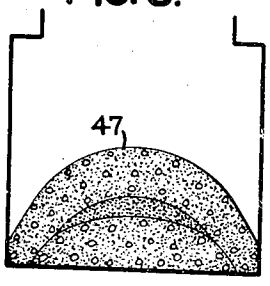
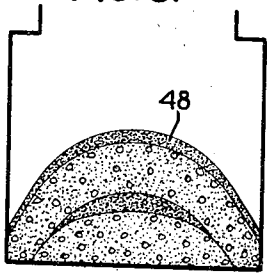


FIG. 9.



Inventors:
John A. Hyson
Joseph H. Kenrick
by Clarence R. Kerr
Attorney.

Patented Apr. 28, 1942 2,281,498

UNITED STATES PATENT OFFICE

2,281,498

FUEL LOADING AND INTERMIXING METHOD

John A. Hyson, Merwood Park, and Joseph H. Kerrick, Philadelphia, Pa., assignors to The Philadelphia and Reading Coal and Iron Company, Philadelphia, Pa., a corporation of Pennsylvania

Original application July 6, 1939, Serial No. 282,968. Divided and this application December 31, 1940, Serial No. 372,626

8 Claims. (Cl. 214—152)

This invention relates to an improved method of loading a barge or similar carrier and has particular reference to the loading of coal. A special purpose of the invention has been to facilitate the production of a mixture of different kinds of coal, such as bituminous and anthracite coals.

An object of the invention has been to devise a method of delivering different types of coal to a barge or similar carrier in a way to distribute the coal with substantial uniformity over the area of the barge in alternate layers of different types, the quantity of coal distributed in each layer depending upon the character of the ultimate mixture desired.

This is a division of our pending application Ser. No. 282,968, filed July 6, 1939.

In the production of mixtures of the character contemplated, it is important to obtain a reasonably uniform and thorough intermixture of the selected coals. However, the expense of such intermixture must be kept as low as possible in order to make the use of the mixture commercially practicable. Accordingly, a special feature of the invention has been to bring about the loading of a barge or other carrier, employed in the transfer of coal from a railroad terminal or the like to a point of use, in such a way as to facilitate the production of the desired mixture and with little or no additional expense in the handling of the coal.

Briefly, the mixing method involves the dumping of the coal in alternate layers of bituminous and anthracite into a barge, boat or other means of conveyance used for transporting the fuel from one point, such as a railway siding, or the like, to an unloading point adjacent the point of use. At the unloading point a grab bucket, or the like, capable of biting through two or more layers of the fuel, is used to remove the fuel from the barge. This serves to bring together, in the approximately correct proportions, the two types of coal, at the same time effecting a certain degree of intermixture. In the subsequent handling of the coal by means of a series of belts or bucket conveyors, with the dumping of the coal a number of times from one conveyor to another, a more thorough intermixture is obtained. The present case, however, is concerned merely with the improved method and means employed at the loading point. Other phases of the invention, such as the mixing method and means as a whole and the features at the unloading point as well as the improved mixture itself, form the subjects matter of the above-mentioned parent case and another division thereof.

Other features, objects and advantages of the present invention will appear from the detailed description of the illustrative method and apparatus which will now be given in conjunction with the accompanying drawings, in which:

Fig. 1 is a front elevational view of the apparatus employed for loading a barge.

Fig. 2 is a side elevational view of this apparatus.

Fig. 3 is a longitudinal, sectional view through the barge, partly loaded.

Figs. 4 to 9, inclusive, are schematic views in transverse section through the barge, indicating successive stages in the loading of the barge, and

Fig. 10 is a similar schematic view showing the barge fully loaded and indicating a grab bucket used in the unloading of the coal.

Referring now particularly to Figs. 1 and 2 of the drawings, there is shown the apparatus for loading the coal or similar solid fuel into a barge. The fuel is delivered to the loading apparatus in an open railway car 10, arriving on a track 11 at the level of the ground at the loading point. The car is then drawn up on a trestle or inclined section of track 12 by means of a cable 13 having a hook or other fastening means at its end adapted to be attached to a suitable portion of the car. The cable is wound upon the drum of a winch 14, which may be operated by any suitable power means, such as an electric motor, under the control of an attendant in the control house 15. By means of the cable 13 the loaded coal car is brought to the lower level 16 of a platform 17 of an appropriate car-elevating structure. In Fig. 2 the elevator is shown, in full lines, intermediate its upper and lower positions. The car may be drawn onto the platform 17 by means of the cable 13, sufficient momentum being imparted to it for this purpose.

The elevator may be of any conventional and desired form, capable of lifting a loaded car and tilting it through an angle of 90° or more to dump its contents. It may suitably comprise a pair of spaced, angular supporting members 18 adapted to travel upwardly along suitable guideways provided in a pair of towers or columns 19. When the elevator has been raised to the point indicated in broken lines in Fig. 2, it is tilted about an appropriate pivot provided adjacent the upper ends of the angle members 18. Cables 20, under the control of an operator in a control house 21 above the dumping point, serve to rock the elevator about its pivot through the required angle. To retain the car in a fixed position on the tracks of the platform 17, during the dump-

ing operation, any suitable anchoring means, such as cross-members 22, may be provided. These cross-members extend over the top of the car and serve to clamp it firmly against the tracks. It will be understood that the cross-members are suitably bolted or otherwise clamped to the frame of the elevator.

As a loaded car is tilted by the elevator through an angle of 90°, its contents will be dumped into a hopper 23 at the top of a chute 24, which serves to deliver the coal to a down spout 25. This down spout may be of a conventional telescopic construction adapting it to be lengthened or shortened, as desired. The lower member 26 of the spout is also adapted to be turned about its vertical axis into any desired position and it carries a gate, preferably of the rotary type, at its lower end for either closing off the spout or opening it to any desired extent. Swivel and gate constructions of this character are well known and may be of any suitable and conventional form. Turning of the lower portion of the down spout about its vertical axis may be effected by a cable 27 operated under the control of an operator in a control house 28. The opening and closing of the gate may be controlled by cables 29 extending to a suitable point on the dock 30 along the side of which the barge 31 is positioned for appropriate manoeuvering. An operator, stationed on the dock 30 in a position to observe the loading of the barge, may operate the cables 29 for opening and closing the rotary gate, as desired.

During the loading operation the barge 31 is shifted back and forth longitudinally beneath the down spout to insure the proper distribution of the coal in layers throughout the length of the barge. For the purpose of so shifting the barge, a pair of winches 32 and 33 is provided, these winches being under the control of an operator in a control house 34. A cable 35, wound upon the drum of the winch 32, is passed around a post 36 fixed to the dock 30 at a point beyond the right end of the barge (Fig. 1) when the latter is shifted to its extreme righthand position. The end of the cable 35 is secured in any desired way to the end of the barge, as by means of a loop thrown around a post 37. A similar cable 38, wound upon the drum of the winch 33, is passed around a post 39 carried by the dock at a point beyond the left end of the barge (Fig. 1) when the latter is in its extreme lefthand position. The end of cable 38 is attached in any suitable way to the end of the barge, as by means of a loop thrown around a post 40.

It will be understood that the winches 32 and 33 are adapted to be driven by power from any suitable source, such as an electric motor, and are arranged to be rotated in opposite directions under the control of an operator in the control house 34. Accordingly, as the cable 35 is being wound upon its drum, the cable 38 will be unwound and the barge will be shifted toward the right in Fig. 1. When the winches are reversed, and the cable 38 is wound while the cable 35 is unwound, the barge will be shifted toward the left in Fig. 1. If desired, the two cables might be wound upon a single drum in such a way that one would be wound on one end of the drum while the other is being unwound from the other end of the drum. However, the employment of separate winches enables the use of simple loops at the ends of the cables to be thrown over the posts 37 and 40 and permits the cables to be separately drawn taut in the handling of barges of different lengths.

In the operation of the loading apparatus, the bituminous and anthracite coals are alternately dumped into the hopper 23 by the tilting of the elevator, although a number of cars of bituminous will be dumped for each car of anthracite dumped. The preferred, improved mixture for underfeed stokers, subject to high peak loads, is substantially 80% of bituminous coal and 20% of anthracite, by weight. To provide this preferred mixture it has been found desirable in loading a barge of 1000 tons capacity to first elevate and dump two cars of the bituminous coal, each car being of 50 tons capacity. As these cars are being dumped, the barge will be shifted from end to end at a sufficient speed to enable the coal to be distributed in an elongated pile of substantially uniform cross-section extending from one end of the barge to the other. For this purpose the speed of travel of the barge may appropriately be about ½ foot per second, although the speed may be varied to suit the particular requirements. In cross-section the pile or ridge of coal will be substantially as indicated at 41 in Figure 4. In introducing this and subsequent layers of bituminous, the gate of the down spout is preferably left wide open so as to offer no obstacle to the flow of the coal, which may contain a substantial quantity of large lumps. The bituminous employed in the improved mixture is preferably run of the mine, having a moisture content between 3 and 4%. Its preferred character is more fully set forth in the parent application. The first layer or load of bituminous is not spread to the extreme sides of the barge but the peak 42, indicated in Figure 4, is eliminated by the spreading of the top portion of the elongated pile into the rounded form indicated at 43 in Figure 5. This spreading or trimming of the coal may suitably be done by manual labor.

After the two carloads of bituminous have been introduced into the barge and trimmed, a 50-ton car of anthracite is delivered to the elevator and dumped into the chute 24. This anthracite is then spread over the top of the ridge of bituminous forming the first layer, by the movement of the barge longitudinally beneath the down-spout. At this time the speed of movement of the barge is preferably increased to about 1 foot per second and the gate at the lower end of the down-spout is partially closed so that the opening through which the coal is discharged is only about ¼ or ⅓ the maximum available. This is for the reason that the anthracite flows freely, like sand, and the single carload of 50 tons would not be distributed throughout the length of the barge if its movement were not speeded up and the gate of the down-spout partially closed. The anthracite preferably employed is a fine buckwheat commonly designated #4. Its particles ordinarily range from 3/64" to 3/32". Other preferred characteristics of the anthracite are set forth in the parent case. In practice it has been found desirable to completely close the gate of the down-spout as the last hatch adjacent the end of the barge passes beneath the down-spout. This guards against the accumulation of an excessive amount of the fuel at the ends of the barge.

The rate of movement of the barge and the rate of discharge of the fuel into the barge may be such that the complete load of bituminous or anthracite, as the case may be, will be deposited upon a single movement of the barge in one

direction or these rates may be such that a complete reciprocation of the barge, or several to-and-fro movements of the barge, are required to deposit each layer. As the barge is shifted beneath the down spout the member **26** may be turned or oscillated, if desired, by the operator in the control house **28** so as to bring about a more uniform spreading of the coal. Trimming of the bituminous might be avoided in this way. However, in practice it has been found best to leave the spout in a position in which the coal will be directed in a direction opposite to that in which the barge is being shifted. It will be understood that the lower end of the downspout has a tendency to direct the coal in a definite direction away from the vertical axis of the spout particularly when the gate is partially closed. Accordingly, in the preferred practice the member **26** is swung 180° about its axis as the barge reaches each end of its travel so that the coal will be thrown in the opposite direction from the vertical center line of the spout as the movement of the barge is reversed.

Upon completion of the introduction of the first layer or load of anthracite coal, designated **44** in Figure 6, the two layers will present in cross-section substantially the appearance indicated in Figure 6. No trimming of the top layer of anthracite is necessary since it has a normal tendency to flatten out as indicated. It will be observed that even at this stage little or no coal is spread to the extreme side edges of the barge.

Another layer of bituminous coal, as indicated at **45** in Figure 7, is now introduced, in the same manner as the first layer. This second layer of bituminous is preferably 200 tons, in the production of the preferred mixture with the aid of a 1000-ton barge, so that four 50-ton cars of bituminous are dumped into the hopper **23** for the formation of the layer. As indicated in Figure 7, a substantial deposit of fuel will have been spread from this second bituminous layer to the extreme side edges of the barge. After trimming of the peak **46** to provide the rounded effect indicated at **47** in Figure 8, another 50-ton layer **48** (Figure 9) of anthracite is introduced and spread over the second layer of bituminous, this being accomplished, without trimming, by the simple movement of the barge beneath the down spout, in the same manner as the first layer of anthracite.

This operation of introducing successive layers of bituminous and anthracite is continued until the capacity of the barge is reached. The member **26** of the down spout may be lowered at the beginning of the loading process and then raised as the barge becomes filled or it may be left continuously with its discharge end at substantially the level of the top of the barge to minimize loss of the fine particles in the air. The successive layers of bituminous are preferably in 200-ton quantities, when the barge is of 1000-ton capacity, while the successive layers of anthracite are preferably 50 tons. Figure 10 illustrates the arrangement of the succeeding layers **49**, **51** and **53** of bituminous and **50** and **52** of anthracite. It will be understood that the successive layers of bituminous require trimming while the successive layers of anthracite do not. The top layer **53** of bituminous, however, need not be trimmed and this layer preferably is reduced to 100 tons, corresponding with the lowermost layer. The quantities of coal employed in the several layers may, of course, be varied to suit particular requirements. Thus the ultimate proportioning of anthracite and bituminous may vary, as will be later explained and even in arriving at the same proportions the number of layers and the quantities of coal employed in the successive layers may be varied. Some variation is necessarily brought about through the impossibility of insuring the presence of a precise amount, such as 50 tons, of coal in each car. However, in general it is best to form the top and bottom layers of bituminous and preferably of somewhat less magnitude than the intermediate bituminous layers. An advantage in topping off with bituminous coal is that it serves to shield the anthracite which would be likely to take on more moisture in the event of rain.

After the barge has been loaded in the manner indicated, the cables **35** and **38** are disconnected from it and it is towed to the unloading point. Here, the coal is removed from the barge, preferably by means of a grab bucket **54** (Figure 10) carried by a derrick or unloading tower of conventional design. As illustrated in Figure 10, the grab bucket should be of such capacity and shape as to dig through or bite into at least two layers of the coal upon each operation. This, in view of the distribution of the coal in the various layers, insures substantially the correct proportioning of bituminous and anthracite coal for each load of the grab bucket. It has been found, upon analysis of the final coal mixture obtained from the operation of the grab bucket upon different portions of the load in the barge, that the proportioning of bituminous to anthracite is maintained substantially uniform. There is, of course, a slight variation but the variation is well within permissible limits.

As explained more fully in the aforementioned parent case the coal taken from several layers upon each operation of the grab bucket is delivered to an appropriate conveyor system which, through successive transfers by dumping or the like, serves to bring about a desirable, intimate intermixture.

By preventing the anthracite from spreading freely to the edges of the barge, which is in part accomplished by the timely opening and closing of the gate of the down spout, the presence of an excessive amount of anthracite in any portion of the mixture is avoided. As explained in the parent case, an excessive amount of anthracite would so increase the moisture content of the mixture as to cause trouble in its use.

While a preferred method and apparatus employed in accordance with the present invention have been described in considerable detail it should be understood that various modifications may be made 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.

We claim:

1. A method of loading different types of solid fuel into a carrier for the purpose of aiding the inter-mixture thereof which comprises dumping the different types of fuel successively in desired ratio from a series of cars through a hopper, delivering the fuel from said hopper to a predetermined point, and shifting the carrier back and forth with respect to said point to distribute the fuel in a series of layers within the carrier as it is delivered from the hopper.

2. A method of loading and unloading different types of solid fuel into and from a carrier for the purpose of aiding the inter-mixture thereof

which comprises dumping first one and then another of the different types of fuel in desired ratio from a series of cars successively through a hopper, delivering the fuel from said hopper to a predetermined point, shifting the carrier back and forth with respect to said point to distribute the fuel within the carrier in successive layers of first one and then another type of fuel as it is delivered, and removing successive portions of the fuel from the top of the carrier, each portion being taken from a plurality of layers and containing the different types of fuel in substantially the proportions in which they are disposed in the layers.

3. A method of loading different types of solid fuel into a carrier for the purpose of aiding the inter-mixture thereof which comprises dumping first one and then another of the different types of fuel in desired ratio from a series of cars successively through a hopper, delivering the fuel from said hopper to a predetermined point, shifting the carrier back and forth with respect to said point to distribute the fuel in a series of layers within the carrier, and varying the rate of discharge of the fuel from the hopper as the different types are delivered.

4. A method of loading different types of solid fuel into a carrier for the purpose of aiding the inter-mixture thereof which comprises dumping first one and then another of the different types of fuel in desired ratio from a series of cars successively through a hopper, delivering the fuel from said hopper to a predetermined point, shifting the carrier back and forth with respect to said point to distribute the fuel in a series of layers within the carrier, changing the speed at which the carrier is shifted for the different types of fuel, and varying the rate of discharge of the fuel from the hopper as the different types are delivered.

5. A method of loading bituminous and anthracite coal into a carrier for the purpose of aiding the inter-mixture thereof which comprises delivering successively to a hopper quantities of bituminous and anthracite coal in the ratio desired, separately delivering said two types of coal from said hopper to a predetermined point, shifting the carrier back and forth with respect to said point to distribute the coal therein in a series of layers, and varying the rate of discharge of the coal from the hopper into the carrier as the different kinds are delivered.

6. A method of loading bituminous and anthracite coal into a carrier and removing the same therefrom for the purpose of aiding the inter-mixture thereof which comprises delivering successively to a hopper quantities of bituminous and anthracite coal in the ratio desired, separately delivering said two types of coal from said hopper to a predetermined point, shifting the carrier back and forth with respect to said point to distribute the coal therein in layers, varying the rate at which the carrier is shifted and the rate of discharge of the coal into the carrier as the different kinds are delivered, and removing successive portions of the coal from the top of the carrier, each portion being taken from a plurality of layers and containing the bituminous and anthracite coal in substantially the proportions in which they are disposed in the layers.

7. A method of loading bituminous and anthracite coal into a carrier and removing the same therefrom for the purpose of aiding the inter-mixture thereof which comprises delivering successively to a hopper quantities of bituminous and anthracite coal in the ratio desired, separately delivering said two types of coal from said hopper to a predetermined point, shifting the carrier back and forth at a rate of about 0.5 to 1.0 foot per second with respect to said point to distribute the coal therein in layers, varying the rate of discharge of the coal into the carrier as the different kinds are delivered, and removing successive portions of the coal from the top of the carrier, each portion being taken from a plurality of layers and containing the bituminous and anthracite coal in substantially the proportions in which they are disposed in the layers.

8. A method of loading different types of solid fuel into a carrier for the purpose of aiding the inter-mixture thereof which comprises dumping first one and then another of the different types of fuel in desired ratio from a series of cars successively into a hopper, separately delivering the different types of fuel from said hopper to a predetermined point, shifting the carrier back and forth with respect to said point to distribute the fuel within the carrier in successive layers of first one and then another type of fuel as it is delivered, and trimming each layer of one type of fuel before distributing the next layer of another type.

JOHN A. HYSON.
JOSEPH H. KERRICK.