Nov. 24, 1964 G. B. CROSS 3,158,030

MECHANICAL COAL SAMPLER

Filed Oct. 13, 1960 3 Sheets-Sheet 1

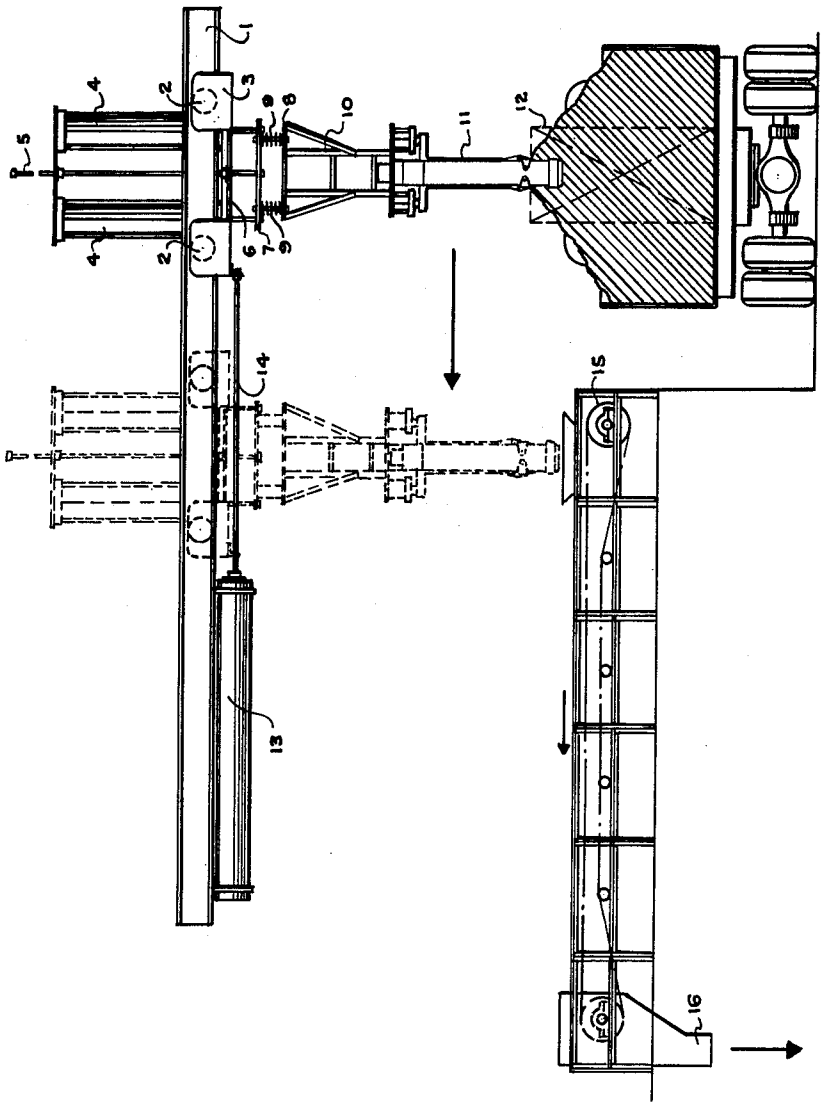


Fig. 1

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MECHANICAL COAL SAMPLER

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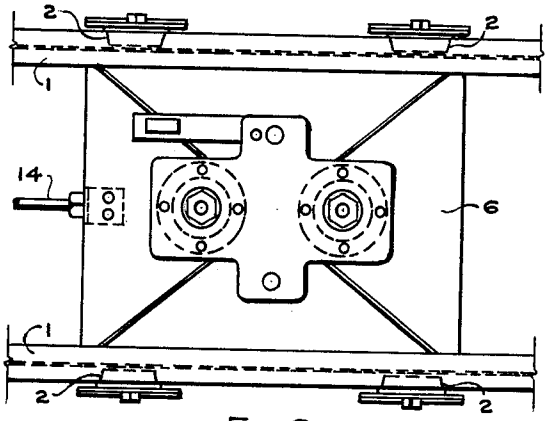


Fig. 2

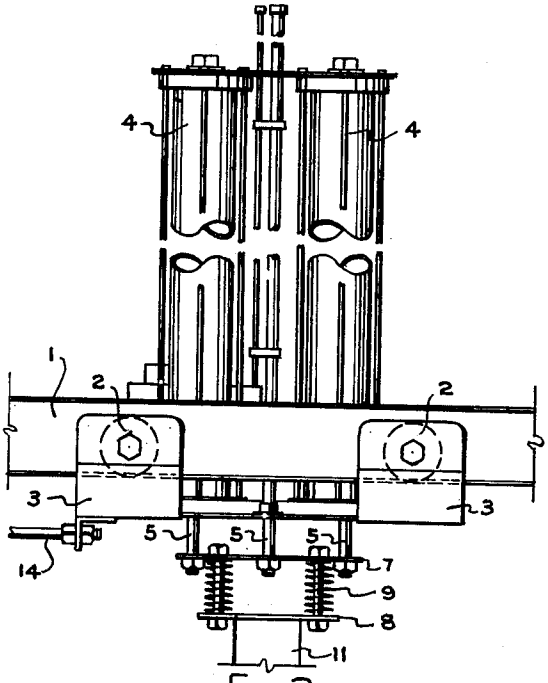


Fig. 3

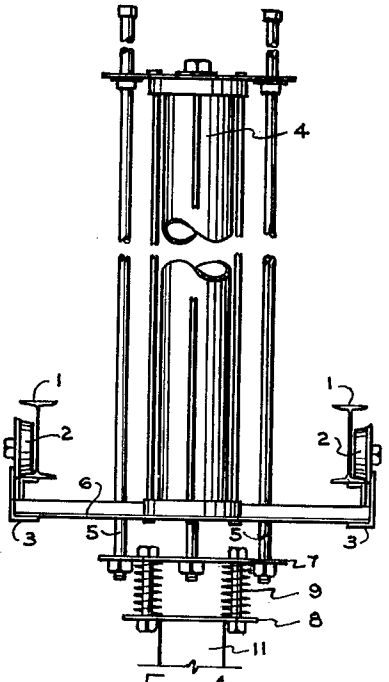


Fig. 4

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MECHANICAL COAL SAMPLER

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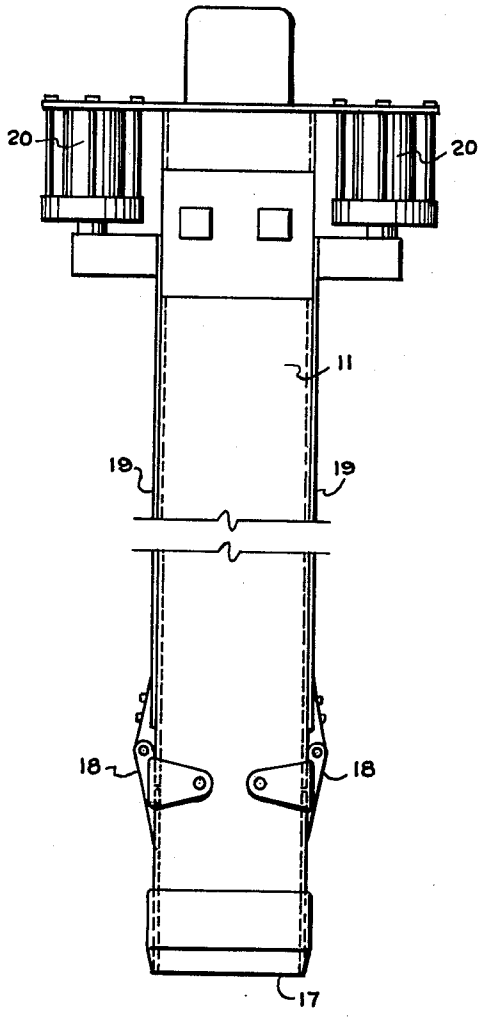


Fig. 5

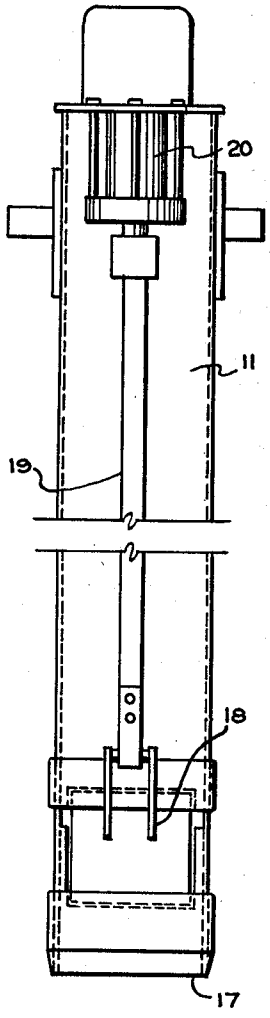


Fig. 6

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3,158,030

MECHANICAL COAL SAMPLER

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4 Claims. (Cl. 73—423)
(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention herein described may be manufactured and used by or for the Government for governmental purposes without payment to me of any royalty thereon.

My invention relates to coal-handling apparatus, and more particularly to a mechanical device for sampling coal delivered by truck or other open-type conveyance for subsequent analysis to determine the quality of the quality of the coal.

It is customary in the coal industry for coal operators to establish coal-preparation plants whereby they could better the quality of coal for their commercial trade. To determine the quality of coal in a conveyance or group of conveyances loaded for shipment, it has been necessary for the coal companies to establish means of collecting, preparing, and analyzing coal samples. By following this procedure, numerous coal companies have atempted to record the ash content of coal in each car shipped. It has been the practice in the past that samples of the coal being loaded into the car be taken at regular intervals while the car was being loaded. To take these samples, it has been necessary in the past to obtain the specimens by such means as passing a shovel or vessel of some kind through the stream of coal being discharged from a loading boom or conveyor into the car. Generally, it was left to the party who was taking the sample when and how the sample was to be taken. A truly representative sample collected in this manner depended almost entirely on the skill of the operator.

In recent years it has been the practice among numerous purchasers of coal to establish their own laboratories for collecting samples of coal as received and analyzing for quality. Purchasers of large quantities of coal, such as steam-plant operators, have found that it is necessary to analyze representative samples of coal as it is received at the steam plants to determine its heat value and certain other characteristics such as its sulfur and ash content. It has been found that analysis of the coal delivered must be made in order to carry out properly the provisions of coal-purchase contracts, the provisions of penalty-premium systems, and to obtain valuable operating data from the coal-burning operation. It is therefore important that reliable and representative samples of the coal be obtained, and this has been found to be somewhat difficult in the instance in which coal is delivered to the steam plants by truck or railroad car.

In many instances, purchase contracts for coal are awarded to responsible bidders offering coal of acceptable quality at lowest delivered cost per million B.t.u. Samples of coal received are analyzed to compare its quality with representations made by successful bidders. If analysis shows a producer's coal is better than specified, he is paid a premium. If the reverse is true, he is penalized.

The penalty-premium system makes it desirable to sample every shipment of coal received. Some coal vendors have learned that they could profit under the usual method of sampling near the surface of the load by simply placing a thin layer of good coal on top of a load of inferior coal. Thus, hand-sampling by shovel did not reveal the substandard coal beneath the thin layer of good coal. The contractor received a premium price and avoided having his coal rejected on its physical appearance.

Occurrences of the above-mentioned type have been rather frequent in the past, both in the instance of coal producers' loading trucks and railroad cars. I have thus found that, to insure the highest practical degree of accuracy in determining the quality of the coal already loaded, it is necessary for the sample to include coal from the top down as nearly as possible to the bottom of the load.

My invention is directed to an improved core-type coal-sampling device.

I have overcome the difficulties inherent in sampling methods and devices of the type used in the prior art to a substantial extent in the present invention by providing a rectangular-shaped sampling tube having a rigid cutting edge at its bottom and having closing gates located on two opposite sides of the tube just above the cutting edge. Furthermore, several new advantageous features over conventional coal-sampling methods and devices are realized by the present invention.

Among these advantageous features are rapid, efficient, and accurate samplings which may be obtained without the need for skilled help, samplings which give a substantially complete cross section of the coal pile from top to bottom, and a reliable, simple, rugged, and dependable sampling device.

It is therefore an object of the present invention to provide a coal-sampling device to enable the taking of undisturbed core samples to appropriate depths from the surface of a bed of coal.

Another object of the present invention is to provide a coal-sampling device to enable the taking of undisturbed core samples of coal to appropriate depths from the surface of the pile, which device is readily transportable and which may be easily operated by only one person under a minimum of supervision.

A further object of the present invention is to provide a coal-sampling apparatus for obtaining core samples from a bed of coal in such a manner as to substantially eliminate the element of human error associated with devices of the prior art.

A still further object of the present invention is to provide a coal-sampling apparatus of the core type having a rectangular-shaped tube which readily penetrates the bed of coal to the proper depth, regardless of whether the coal is fine and loosely packed or is lumpy and tightly packed.

In carrying out the objects of my invention in one form thereof, I employ two horizontal base plates positioned and separated vertically from each other by a spring means. These base plates are located above a vibrating means such as an air hammer. A rectangular-shaped sampling tube provided with a rigid cutting edge at its bottom is positioned directly beneath the vibrating means. Two sections on opposite sides of the rectangular-shaped cutting tube, just above the cutting edge, are removed for installation of two closing gates to hold a coal specimen while the sampling tube is being withdrawn from a coal bed. These closing gates are pneumatically operated.

In collecting a sample, the entire assembly is moved over a truckload of coal. If the coal is fine and loosely packed, the normal thrust of vertical air cylinders will force the rectangular tube into the coal bed. If the coal is lumpy or tightly packed, an air hammer may be used to drive the rectangular tube into the coal. After the tube has penetrated the coal bed to the predetermined proper depth, the gates are closed. The tube assembly with the core sample therein is then vertically removed from the coal bed and subsequently moved horizontally over a conveyor belt upon which the sample is discharged when the gates are opened.

My invention, together with further objects and advan-

tages thereof, will be better understood from consideration of the following description taken in connection with the accompanying drawings in which:

FIGURE 1 shows a side view and general layout of one preferred type of coal-sampling apparatus constructed according to my invention.

FIGURE 2 shows a top view of the coal sampler.

FIGURE 3 shows an enlarged side view of the positioning and driving mechanism beneath which is mounted the rectangular tube sampler.

FIGURE 4 shows an enlarged front view of the positioning and driving mechanism for the rectangular sampler tube.

FIGURE 5 shows an enlarged side view of the rectangular sampler tube.

FIGURE 6 shows an enlarged front view of the rectangular sampler tube.

Referring now more particularly to FIGURE 1, there is shown the support frame 1 upon which trolley wheels 2 ride for lateral positioning of carriage plates 3. Air cylinders 4 are mounted on plate 6. Guide rods 5 pass through apertures in plate 6. Horizontal base plate 7 is attached to guide rods 5 at a point below carriage plate 3. Horizontal base plate 8 is shown attached to and separated from base plate 7 by spring means 9. Alternatively, base plates 7 and 8 may be separated by other resilient means such as a block of rubber. A vibrating means, shown generally as air hammer mechanism 10, is attached to horizontal base plate 8. The rectangular sampling tube 11 is attached beneath air hammer 10 and may be positioned throughout the vertical limits of sampling range 12 by means of guide rods 5, and the piston rods from air cylinders 4. Rectangular sampling tube 11 may be moved in a horizontal direction by air cylinder 13 and piston rod 14. The horizontal limits of sampling are indicated by sampling range 12 and, in addition, rectangular sampling tube 11 may be moved horizontally over conveyor belt 15 for discharge of the coal sample. Conveyor belt 15 discharges the core sample into crusher 16, from which the sample obtained is subsequently prepared for chemical analysis.

Referring now more particularly to FIGURES 3 and 4, there is shown the side and front views of the horizontal and vertical positioning means for moving sampling tube 11 throughout sampling range 12 and horizontally over conveyor belt 15. I have found that separation of horizontal base plates 7 and 8 by spring means 9 provides the desired degree of mechanical dampening to ensure that the rectangular sample tube may easily penetrate the coal bed without unnecessarily disturbing the compaction of the core sample during successive stages of penetration of the sampler tube into the coal bed.

Referring now more particularly to FIGURES 5 and 6, there is shown the front and side views of the sampler tube 11 provided with rigid cutting edge 17. Clamshell gates 18 are located on two opposite sides of sampler tube 11 and are in the normally open position shown during penetration of tube 11 into the coal bed. After penetration of sampler tube 11 into the coal bed, clams 18 are closed by rods 19 activated by air cylinders 20 to hold the core sample within tube 11 until it is discharged onto the conveyor belt 15 shown in FIGURE 1.

Obviously, tube 11 may be made in any desired dimension to obtain and deliver a certain proportion of the coal in the vehicle. However, I have found that under normal operating circumstances the sampler tube works best when its inside dimensions are generally a 6-inch square and in which the clam openings in the sides therein are approximately 4 by 5 inches.

In the instance of a shipment of inferior coal top-loaded with a thin layer of good coal, the discharge of the core sample from tube 11 onto moving conveyor belt 15 has been found to reveal a line of demarcation between the good coal and the inferior coal on said belt. Thus, top-loaded shipments may be easily detected by visual inspection of the discharged sample on moving belt 15.

While I have shown and described a particular embodiment of my invention, modifications and variations thereof will occur to those skilled in the art. I wish it to be understood, therefore, that the appended claims are intended to cover such modifications and variations which are within the true scope and spirit of my invention.

What I claim is new and desire to secure by Letters Patent of the United States is:

1. A core-type coal-sampling apparatus comprising a vertical sampler tube, rectangular in horizontal cross section; rigid cutting means secured to the bottom edge of said sampler tube, said cutting means juxtaposed to the peripheral surface of said sampler tube; and core-keeper means to secure coal cores therein for removal with said sampler tube, said core-keeper means operatively mounted contiguous to the core-receiving end of said sampler tube and comprising clams hingedly mounted in apertures formed in two opposite walls of said sampler tube for operation by remotely controlled operatively engaged closing means, said clams, when in the open position, and said closing means disposed outwardly from said vertical sampler tube walls.

2. The apparatus of claim 1 in combination with vibratory means disposed for transmission of oscillatory motion to said apparatus in a substantially vertical direction.

3. The apparatus of claim 2 in combination with mechanical dampening means, said dampening means comprising two horizontally disposed base plates separated vertically from each other by resilient pressure-absorbing means.

4. The apparatus of claim 3 in combination with a sampler tube positioning means remotely controlled and operative in the vertical and horizontal planes.

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